

Practical Aspects of Implementing the OSHA Crystalline Silica Rule

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Overview for Today

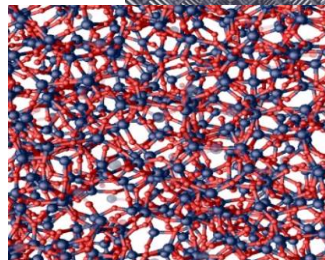
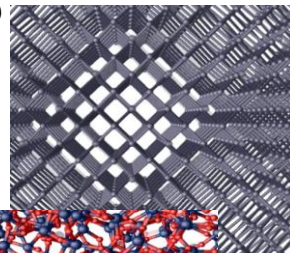
- Compliance dates, forms of crystalline silica, and health hazards
- Review of new PEL
- Overview of the Silica Rule
- Exposure assessments
 - Performance Based; Scheduled Monitoring; Objective Data
 - Notification of Exposure Monitoring
- Respiratory Protection
- Employee Training and Medical Surveillance
- Written Exposure Control Plan
 - Engineering Controls; Work Practice Controls; Housekeeping; Regulated Areas and Restricting Access
- Risk Allocation at Construction Work Sites
- Issues to Consider

Rule Overview

- ❑ Final OSHA rule: March 25, 2016 Fed Reg 606 pp long!
 - 30 pp of actual reg text and the rest is preamble/explanation of consideration of comments and alternatives/regulatory impact
 - Construction must comply by 9/23/17
 - General industry/maritime must comply by 6/23/18
 - Fracking must fully comply by 6/23/21
- ❑ Will affect 2 million construction workers and 300,000 in general industry and maritime sectors, including hydraulic fracturing

Crystalline vs Amorphous Silica?

- ❑ Chemical compound is silicon dioxide (SiO_2)
- ❑ Makes up majority of the planet's crust
- ❑ 3 mineralogical forms
 - ❑ Quartz – most common
 - ❑ Cristobalite
 - ❑ Tridymite
- ❑ Crystalline silica is significantly more hazardous than amorphous
- ❑ Classified as Group One Human Carcinogen by IARC in 1997 (also by NTP) – warning must be included on SDS of silica containing products



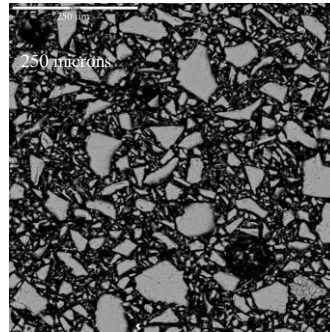
Source: I.S.A.A.C.S Program at Central Michigan University

Sand vs. Respirable Silica (Quartz)

Sand



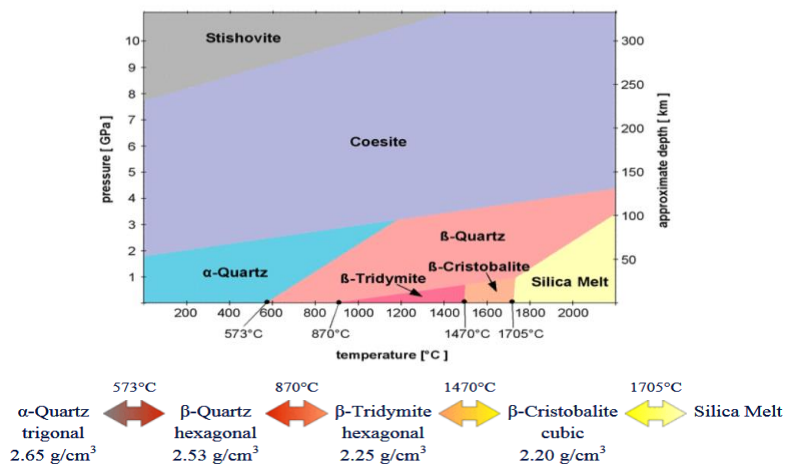
Respirable Silica (Quartz)



Respirable silica is 100 times smaller than ordinary sand on a beach

SEM image courtesy: Geoff Plumlee, Ph.D. Research Geochemist, Environment and Human Health U.S. Geological Survey, 2011

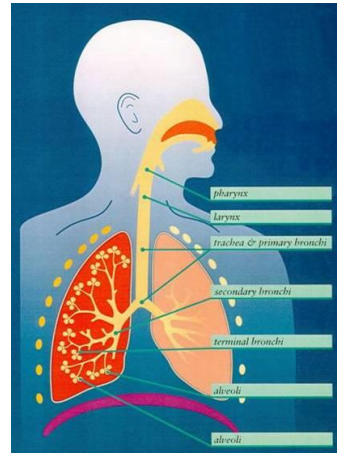
Quartz, Cristobalite, and Tridymite



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How Are Workers Exposed?

- ❑ Respirable dust means the particle is small enough to penetrate the respiratory system (can't be expelled)
- ❑ Inhaled when cutting, sawing, grinding, drilling, and crushing the materials.
- ❑ Also present during extraction, processing, transfer for storage and transit, or use during fracking
- ❑ "Silicosis" is caused by breathing of dust containing silica
- ❑ The dust causes "fibrosis" or scar tissue formation in the lungs
- ❑ This reduces the lung's ability to extract oxygen from the air



Where do we find silica?

- ❑ Crystalline silica is present as an ingredient in the following:
 - brick and mortar,
 - concrete,
 - slate,
 - dimensional stone (granite, sandstone),
 - engineered stone products (countertops etc.)
 - stone aggregate,
 - tile,
 - asphalt filler,
 - roofing granules,
 - plastic composites,
 - soils, and
 - wallboard joint compounds, paint, plaster, caulking and putty.

Health Findings in OSHA Rule

- ❑ Over 600 deaths/yr and 900 new silicosis cases prevented by rule
- ❑ Crystalline Silica categorized as respiratory toxin that causes silicosis, COPD and lung cancer
 - ❑ Three types of silicosis: Chronic (15-20+ yrs), Accelerated (5-10 yrs), and Acute (months-2 yrs)
- ❑ OSHA also links occupational silica exposure with kidney disease
- ❑ Rule states more than 50 peer-reviewed studies were evaluated and found links between silica exposure and lung cancer in at least 10 industries

Why is Silica an Occupational Health Hazard?

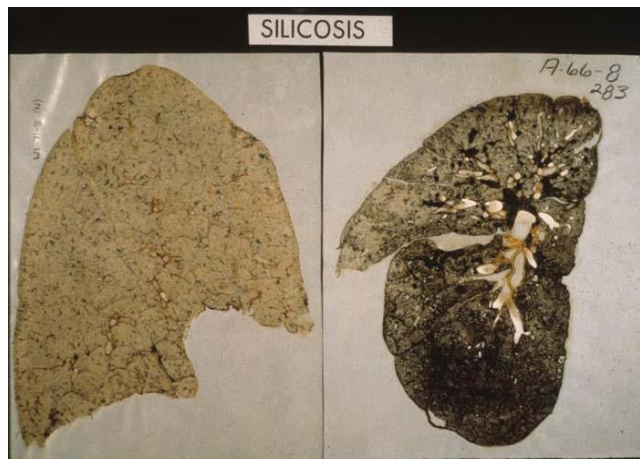


Photo: Val Vallyathan, Ph.D. NIOSH

What is the OSHA Permissible Exposure Limit (PEL) for Respirable Crystalline Silica (RCS)?

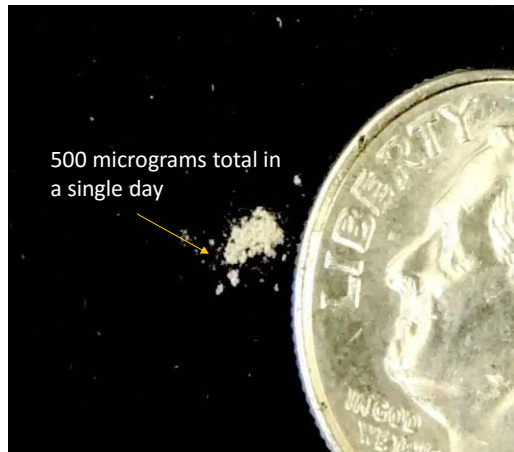


Photo: Geoff Plumlee, USGS

OSHA Permissible Exposure Limit (PEL) = 0.05 mg/m³ TWA

Calculated as an 8-hour Time Weighted Average

0.05 mg/m³ = 50 micrograms (μg)/m³

1 m³ of air = 1,000 liters

Normal breathing rate (moderate work, 1 work day) = 10 m³ (10,000 liters of air)

50 micrograms x 10 m³ = 500 μg

Must Comply with Respirable Crystalline Silica “Permissible Exposure Limits” (PEL)

□ OSHA Construction Job Sites

■ Current September 23, 2017
250μg/m³ → **50μg/m³ (80% ↓)**

□ OSHA General Industry (Mfg) and Maritime

■ Current June 23, 2018
100μg/m³ → **50μg/m³ (50%↓)**

- Current 29 CFR 1910.1000, “Z” table, 1971
- If less than the 25μg/m³ Action Level (AL), then rule does not apply
- PEL and AL mean a concentration calculated as an eight (8)-hour time-weighted average

Changes to Final Rule

- Scope of standards revised to **exclude tasks** that involve **low** exposures
- OSHA opted **not** to include worker **medical removal** provisions
- OSHA **removed** provisions that **barred worker rotation**
- Standards do not apply where worker exposures remain **below 25 µg/m³** for 8 hr TWA under foreseeable conditions (ER must have evidence to support this exception)
- Standard for GI/Maritime **doesn't** apply to exposures from processing **sorptive minerals**
- **No** requirement for **protective clothing**
- All employers must have **written exposure control plan** (and construction must have **competent person** to implement plan)

OSHA's Economic Analysis

- Total Annualized Costs: \$1.030 billion including:
 - **Engineering controls: \$661.5 million**
 - Respirators: \$32.9 million
 - Exposure assessment: \$96.2 million
 - Medical Surveillance: \$96.4 million
 - Familiarization & Training: \$95.9 million
 - Regulated Area: \$2.6 million
 - Written Exposure Control Plan: \$44.3 million
- Annualized benefits monetized: \$8.687 billion
 - Costs of prevented fatal lung cancers, silicosis and other respiratory diseases, renal disease and other silica-related mortality
- Net benefits: \$7.657 billion

OSHA's 2016 Construction Rule

- High risk tasks: masonry saws, grinders, drills, jackhammers, chipping tools, drilling rigs, milling crushing, heavy equipment used for demolition and other tasks
- Rule includes provisions for:
 - Use of control methods in Table 1 OR measure worker exposure and decide which controls work best to limit exposures to PEL in workplace
 - Written exposure control plan with designated competent person to ensure compliance
 - Restriction on housekeeping practices that expose workers to silica
 - Medical exams (chest X-ray and lung function tests) every 3 years for workers who use respirator 30+ days/yr.
 - Worker Notification Training & Recordkeeping

Construction "Table 1"

81 Fed. Reg. 16877-16879

- **Employers who follow Table 1 correctly are NOT required to measure worker exposure to silica and are NOT subject to PEL! Otherwise 50 $\mu\text{g}/\text{m}^3$ PEL and 25 $\mu\text{g}/\text{m}^3$ AL apply.**
- Table 1 lists:
 - Equipment/Task (18 tasks included),
 - Engineering & Work Practice Control Methods, and
 - Required Respiratory Protection and Minimum Assigned Protection Factor (APF) for shifts <4 hr and those > 4 hrs
- Chart lets employers know what they need to do, including use of water and ventilation, sometimes supplemented with respiratory protection.

Table 1: Work Tasks/Equipment

- | | |
|---|---|
| □ Stationary masonry saws | □ Jackhammers and handheld powered chipping tools |
| □ Handheld power saws | □ Handheld grinders for mortar removal (i.e., tuck pointing) |
| □ Handheld power saws for cutting fiber-cement board (blade diameter of 8" or less) | □ Handheld grinders for uses other than mortar removal |
| □ Walk-behind saws | □ Walk-behind milling machines and floor grinders |
| □ Drivable saws | □ Small drivable milling machines |
| □ Rig-mounted core saws or drills | □ Large drivable milling machines |
| □ Handheld and stand-mounted drills | □ Crushing machines |
| □ Dowel drilling rigs for concrete | □ Heavy equipment and utility vehicles used during demolition |
| □ Vehicle-mounted drilling rigs for rock and concrete | □ Heavy equipment and utility vehicles for grading & excavating |

Table 1 Task Example

Equipment/task	Engineering & WPCM	Resp protection and APF
(ii) Handheld power saws (any blade diameter)	<ul style="list-style-type: none"> - Use saw equipped with integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. 	<p>< 4 hrs: none if used outdoors, < 4 hrs: APF 10 if used indoors or in an enclosed area</p> <p>> 4 hrs: APF 10 whether indoors or outdoors</p>

Table 1 Task Example

Equipment/task	Engineering & WPCM	Resp protection and APF
(i) Stationary masonry saws	<ul style="list-style-type: none"> - Use saw equipped with integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. 	<p>< 4 hrs: none</p> <p>> 4 hrs: none</p>

Stationary Masonry Saws

Although this task is a Table 1 task at a general industry plant, an exposure assessment must still be conducted which will involve scheduled monitoring.



Equipment/task	Engineering & WPCM	Resp protection and APF
(xii) Handheld grinders for uses other than mortar removal	<p>-For tasks performed outdoors only: -Use grinder equipped with integrated water delivery system that continuously feeds water to grinding surface. -Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. OR -Use grinder equipped with commercially available shroud and dust collection system. -Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. -Dust collector must provide 25 cfm or greater airflow per inch of diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter cleaning mechanism. -When used outdoors. -When used indoors or in an enclosed area</p>	<p>< 4 hrs: none > 4 hrs: none < 4 hrs-none; > 4 hrs-none < 4 hrs-none; >4 hrs – APF 10</p>

A worker wearing a white hard hat, a high-visibility yellow vest over a grey hoodie, and blue jeans is bent over, working on a piece of industrial machinery. The worker is wearing safety glasses and gloves. The background shows various pipes, hoses, and industrial components.

Handheld Grinder – Full Contact

Control method for grinder operating on flush surface includes LEV.



Handheld Grinder – Used on Angle, Not Flush with Surface

Control method includes LEV with scheduled air monitoring to prove compliance with PEL. Variance or interpretative letter regarding technical feasibility based on use of tool.



Construction-Exposure Monitoring

- For tasks not listed in Table 1 or if employer does **not** fully implement controls and PPE:
 - Must ensure no exposures above 50 $\mu\text{g}/\text{m}^3$ PEL
 - Must assess EE exposure if \geq AL following either “performance option” or “scheduled monitoring option” ... if exposures $>$ PEL, repeat within 3 months. If $>$ AL and $<$ PEL, repeat within 6 months
 - Where non-initial monitoring indicates exposures $<$ AL, repeat monitoring within 6 months until 2 consecutive samples are $<$ AL ... then discontinue monitoring

Common Provisions to both Construction and GI/Maritime Rule

- Includes provisions for:
 - Measuring worker exposures to silica if at or above 25 $\mu\text{g}/\text{m}^3$ action level and notify workers of results – 15 (GI) or 5 (CI) working days;
 - Using engineering controls (e.g. water, ventilation, isolation) and work practices to limit exposures from exceeding 50 $\mu\text{g}/\text{m}^3$ over 8-hr time-weighted average workday;
 - Limiting access to Regulated Area (GI) or Restrict Access (CI) where workers could be exposed above the PEL;
 - Using respirators when necessary after implementing engineering and work practice controls;
 - Restricting housekeeping practices (no compressed air or dry broom) that expose workers to silica if feasible alternatives are available;
 - Medical exams for workers exposed $>$ AL (GI) or use respirator for 30+/yr (CI)
 - Worker training on work tasks that result in exposure and ways to limit exposure; and
 - Recordkeeping of workers’ silica exposure and medical exams.

Exposure Monitoring - GI

- Initial monitoring to assess 8 hr TWA for silica exposure of representative employees for each job classification (picking EE with highest expected exposure)
 - If initial monitoring shows below AL, employer may discontinue monitoring for those employees
 - IF most recent monitoring indicates exposure > AL but < PEL, repeat monitoring within 6 months
 - IF most recent monitoring indicates exposures > PEL, repeat within 3 months
 - Where non-initial monitoring indicates exposures < AL, repeat monitoring within 6 months until 2 consecutive samples are < AL ... then discontinue monitoring

Exposure Monitoring – Construction and General Industry

- Reassess exposures whenever change in production, process, control equipment, personnel or work practices indicate new or additional exposures above AL, or if employer has reason to believe exposures above AL have occurred.
- Sample analysis must conform to Appendix A.
- ❑ Employee representative has right to observe air monitoring and must be provided with appropriate PPE at no cost.
 - Exposure records and medical surveillance must be maintained and made available in accordance with 29 CFR 1910.1020

Exposure Monitoring - Performance Option

- ❑ The employer shall assess the 8-hour TWA exposure for each employee on the basis of any combination of **air monitoring data** or **objective data** sufficient to accurately characterize employee exposures to respirable crystalline silica.

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Exposure Monitoring - Scheduled Monitoring Option

- ❑ Initial monitoring of employees who are, or may reasonably be expected to be, exposed to airborne concentrations of respirable crystalline silica at or above the action level.
- ❑ The employer shall determine 8-hour TWA exposures on the basis of one or more air samples that reflect the exposures of employees on each shift, for each job classification, in each work area. Sample employees expected to have the highest exposure to silica.
- ❑ The employer may rely on existing data to satisfy this initial monitoring requirement. Preamble mentions 12 months look back at page 16759.

Exposure Monitoring - Objective Data

- ❑ Includes air monitoring data from industry-wide surveys or calculations based on the composition of a substance;
- ❑ It demonstrates employee exposure associated with a particular product or material or a specific process, task, or activity.
- ❑ Must reflect workplace conditions closely resembling or with a higher exposure potential than the processes, types of material, control methods, work practices, and environmental conditions in the employer's current operations.

Employee Notification

- ❑ Any time an exposure assessment has been completed, the results must be shared
- ❑ When do you have to share results with employee?
 - Within 5 days if construction
 - Within 15 days if general industry
- ❑ What do you have to share and what should you share?
 - Specific exposure results or if the Performance Option is used then ranges
 - When the PEL is exceeded, the corrective actions the employer intends to take
 - Corrective action can be the use of respirators until engineering controls and/or work practices can be defined or can be a plan to evaluate and assess possible solutions
- ❑ How do you have to share results?
 - In writing to the individual employee
 - Post the results accessible to all affected employees

Medical Surveillance

- ER must make medical surveillance available at no cost to EE
 - Construction - for each worker who uses a respirator for 30+ days/yr
 - General – for each worker exposed to RCS at or above AL for 30+ days/yr
- All exams and procedures must be performed by PLHCP – after initial, exam must be repeated every 3 years or more often if recommended Baseline exam includes:
 - past, present and anticipated exposure to RCS, dusts, and other agents affecting respiratory system,
 - history of respiratory system dysfunction and TB,
 - smoking status and history,
 - physical exam,
 - chest X-ray,
 - pulmonary function test,
 - testing for latent TB infection, and
 - any other tests determined appropriate by PLHCP.

Medical Surveillance

- PLHCP must explain exam results to worker and any limitations on exposure, and provide written medical opinion to ER within 30 days that includes:
 - Date of exam
 - Statement that exam meets requirements of standard
 - Any recommended limitations on worker's use of respirators
 - If employee provides written authorization, info on any recommended limitations to worker's RCS exposure, a statement that worker should be examined by specialist if chest X-ray is 1/0 or higher by B reader
- Employer must ensure worker gets copy of written medical opinion within 30 days.

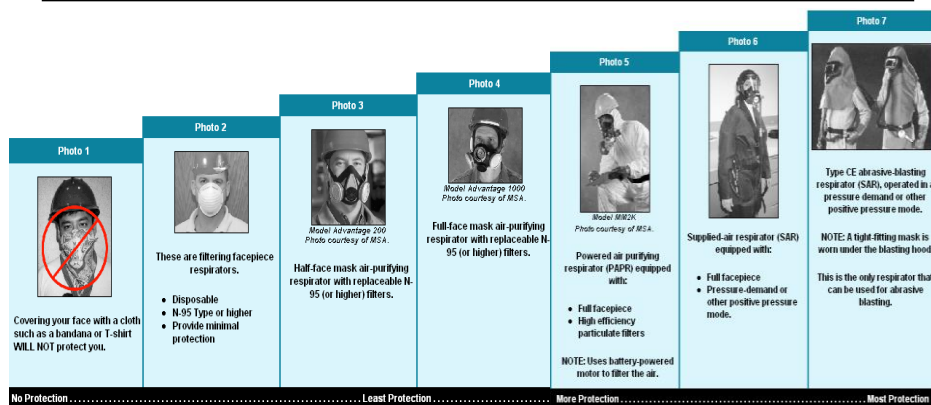
Employee Training

- Each covered employee must be trained, under OSHA's Haz Com Standard (29 CFR 1910.1200) on hazard of RCS containing products and have access to labels and SDSs
- Workers must also be trained on:
 - Health hazards associated with exposure to RCS
 - Specific tasks in workplace that could result in exposures
 - Specific measures ER has implemented to protect EE from exposure, including engineering and WPC, and respirators to be used
 - Contents of OSHA rule
 - Purpose and description of medical surveillance program

Written Exposure Control Plan

- Plan must include following elements:
 - Description of tasks involving exposure to respirable crystalline silica
 - Description of engineering controls, work practices, and respiratory protection used to limit worker exposure for each task – engineering and WPC must be used unless employer demonstrates not feasible.
 - Description of housekeeping measures used to limit employee exposure – dry sweeping, dry brushing, and use of compressed air not allowed (unless compressed air is part of ventilation system that captures dust cloud)
 - Procedures for determining Regulated Area or for Restricting Access
- ER must review and evaluate effectiveness of written plan at least annually and update as necessary
- Plan must be available for exam and copying by OSHA rep

Type of Respirators



Source: NIOSH Publication No. 2004-108: Silicosis: Learn the Facts!

Regulated Areas – General Industry

- ❑ Employer must establish regulated area if worker exposures are expected to be above PEL, and demarcate area from rest of workplace so minimizes number of exposed employees
- ❑ Must post signs at all entrances with: DANGER – RESPIRABLE CRYSTALLINE SILICA. MAY CAUSE CANCER. CAUSES DAMAGE TO LUNGS. WEAR RESPIRATORY PROTECTION IN THIS AREA. AUTHORIZED PERSONNEL ONLY.
- ❑ Limit access to persons authorized by employer and required by work duties to be present, anyone who is employee's designated representative to observe monitoring, anyone authorized by OSH Act or regulations to be in area
- ❑ Each person in regulated area must be provided by employer with appropriate respirator and it must be used while in regulated area.

Procedures for Restricting Access to Work Areas at Construction Work Sites

- ❑ Identify work areas where employees are likely to be exposed to silica. Use a general plat or map of the job site.
- ❑ Competent person shall regularly evaluate the job site and ensure that areas of exposure are properly restricted and employees informed
- ❑ Coordinate with other contractors on job site
- ❑ Employees shall maintain a safe distance from dust clouds generated by work activities
- ❑ Employees shall reposition themselves so that they will not be exposed to silica

Competent Person – Duties for Construction Industry

- ❑ Competent Person – Duties
 - Understand health hazards of silica
 - Know which tasks involve exposure to silica
 - Have a copy of and understand OSHA's silica standard, AL and PEL
 - Ensure proper use of engineering controls and work practices
 - For tasks requiring RP, ensure the correct RP is provided and properly worn and maintained
 - Ensure appropriate housekeeping measures are deployed
 - Enforce procedures to restrict access to work areas
 - Is able to identify situations that could result in high exposures such as equipment failure
 - Understand medical surveillance program
 - Conduct frequent and regular inspections of the work site to ensure the WECP is being fully and properly implemented

It is not my Dust!

- Because, what you don't want to happen is to recreate the Tammany Hall ring of "employers" pointing their fingers at the next employer and not willing to take any claim of responsibility for dust over exposure.



Construction Job Site-Who is Responsible for this Dust?



Responsibilities Managing Silica Dust at a Multi-Employer Construction Job Site

- Project Constructor/General Contractor/Controlling Entity
 - Written Exposure Control Plan-Address surface and windblown dust on Job Site
 - Assign Competent Person - Coordinate job site activities to minimize the silica exposure to all Subcontractors' employees and identify and enforce restricted areas provision
 - Conduct air sampling to ensure overexposures are not occurring due to common area dust
- Subcontractor/Employer
 - Written Exposure Control Plan-Define Job Tasks / Control Methods to ensure PEL is not exceeded
 - Manage Dust by Engineering Controls then Work Practice Controls then Respiratory Protection
 - Assign Competent Person(s); Coordinate with the Project Constructor; Train your employees
- Job Site Supervisor
 - Ensure implementation of the Written Exposure Control Plan on the Job Site
 - Ensure engineering controls are implemented and that employees are trained in their use
- Employee
 - Read, understand and demonstrate knowledge and understanding of WECP
 - Use the engineering controls, follow work practices, use respirators when required, and report issues

Summary of Risk Allocation

- Risk allocation can be handle by applying a simple approach:
 - Ensure all parties subject to the OSHA rule comply with its mandates of maintaining a written exposure control plan and having a competent person on the jobsite;
 - Identify which party has the authority to dictate work to control the silica dust exposure and ensure the contract language places responsibility and accountability clearly on that party; and,
 - Ensure the contract language is enforced because words without implementation is meaningless.

Issues To Consider

- Temporary employees:
 - Use of respiratory and obligation for medical surveillance applies to each employer – Clock starts over
 - Make certain training requirements are met
- New OSHA standard lowers PEL significantly:
 - If past the sampling data shows the silica level is over the “old” or “new” PEL, can the employer show that it provided the employee respiratory protection? If so, then the employer can show that the employee exposure was below the PEL by use of the respiratory protection.
 - The employer can explain that the impacts of exposure to respirable crystalline silica are considered over a lifetime of work.

Issues To Consider – Hiring Practices

- Hiring Practices:
 - The ADA precludes employers from discriminating due to preexisting conditions. An employer may only ask disability related questions and require medical examinations of an applicant after they have been given a conditional job offer. So, an employer may only take chest x-rays to show the existing condition of an employee after the conditional offer. An x-ray at the time of hire enables the employer to defend against future claims based on pre-existing conditions minimizing employer liability.
 - Employers can implement physical demands testing that represents reasonable testing criteria. For instance, lifting, walking, stepping up onto platforms, walking, and agility.
 - Employer can ask if the applicant has ever worn a respirator or been fit-tested.

Hiring Practices – Cont'd

- Review Job Descriptions for Tasks
 - Do they include language about the possibility that the task the employee is seeking may need to wear a respirator? If that is the case, then the employee will have to remove necessary facial hair in order to be properly fit tested unless there is another exception under the ADA.
 - Do they include a waiver that the employer can receive medical reports from the doctor in the event the employee is placed in a medical surveillance program?
- Employer can ask for duration at previous jobs and the tasks performed, salary, positions held, and reasons for leaving. (Non-exhaustive list). You can ask for as much detail as you want regarding assignments completed, etc.
- If an employer discovers a misrepresentation on an Application, then disciplinary action could be taken against an employee.

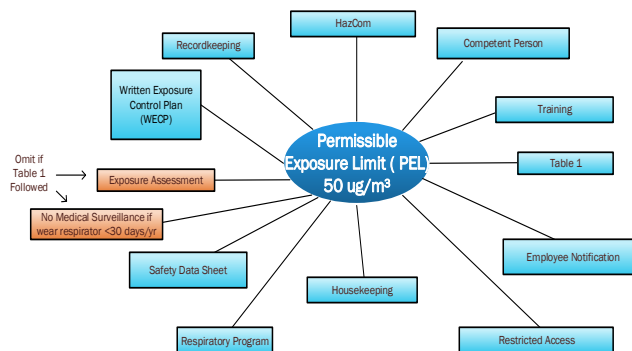
Respirator Fit Testing

- How far does an employer have to go with respirator fit testing before the employee is reassigned or terminated? For instance, the refusal to shave versus using a loose-fitting respirator that costs hundreds of dollars more.
- You must make all efforts to provide reasonable accommodations. If one does not work, then try another. However, it is not necessary to provide a reasonable accommodation if doing so would cause an undue hardship. Undue hardship means that an accommodation would be unduly costly, extensive, substantial or disruptive, or would fundamentally alter the nature or operation of the business. Among the factors to be considered in determining whether an accommodation is an undue hardship are the cost of the accommodation, the employer's size, financial resources and the nature and structure of its operation. If a particular accommodation would be an undue hardship, you must try to identify another accommodation that will not pose such a hardship.

Respirator Fit Testing – Cont'd

- ❑ It will be hard to establish undue hardship because in the grand scheme of things, the cost is not overly burdensome.
- ❑ This is why the labeling of job functions as “essential” or “nonessential” is so important. If a function (fit testing) is truly essential, and an applicant or employee cannot perform it even with a reasonable accommodation, then that person is not qualified for the job as a legal matter.

Prepare Plans and Programs



Questions?

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