ARE YOU READY?

SILICA STANDARD

Guide to Understanding OSHA's
Respirable Crystalline Silica Standard

WHITEPAPER

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RESPIRABLE CRYSTALLINE SILICA IN CONSTRUCTION:

Understanding the OSHA Enforcement Guidance – Compliance Directive

For most OSHA standards, OSHA uses a "Compliance Directive" to help guide Compliance Safety and Health Officers (CSHOs) when inspecting a given construction site. However, OSHA's 13-page interim enforcement guidance document, effective October 23, 2017, is to be used while the standard's companion compliance directive is proceeding through the review process. It should be a similar, but more detailed document to assist CSHO's during their inspections.

This new standard is going to be dramatically impactful to many construction related companies all over the United States. **While the standard will affect "General Industry" June 23, 2018, the focus for this discussion is on the construction industry.** The concern primarily involves cutting, drilling or grinding of asphalt, brick, cement, concrete, drywall, grout, mortar, stone, sand and tile – activities found on many construction jobsites. OSHA Docket No. OSHA-2010-0034, reviewed 588 respirable dust samples from construction tasks, finding silica content varied from <1% - 50%, with an average of 9.1%. As you can see, the percent of silica in construction materials can vary greatly, even in different grades of concrete used across the nation.

Most concrete in the United States contains

5-40%

Silica content.

Hilti Silica Dust Webinar FAQ section, Page 4, June 23, 2017

Retrieved from: https://www.hilti.com/content/dam/documents/pdf/w1/dust-solutions/webinar/Silica-Dust-FAQs_Webinar.pdf

What is Important to Know about Respirable Crystalline Silica?

When considering dust, three dust fractions (sizes) are of main concern: the inhalable, thoracic and respirable dust fractions. The respirable dust fraction for crystalline silica corresponds to the proportion of that silica contaminant, which penetrates to the deep lung (aveoli). This fraction normally represents 10-20% of the inhalable dust fraction, but this proportion can vary considerably. Respirable particles are tiny, measuring only a few microns (thousands of a millimeter) in diameter. If these tiny dust particles travel deep into the lung, this is the point at which respirable crystalline silica can cause a health effect (lung cancer, COPD and kidney damage). This respirable crystalline silica is commonly released into the air when cutting, drilling and grinding on many of the materials mentioned earlier.

With this new standard, OSHA provides three options for employers to consider when there are job operations where employees can be exposed to respirable crystalline silica:

1) **Table 1**
2) **Objective Data**
3) **Self-Monitoring Program**

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TABLE 1

Identification Process Made Easy

This first option is the approach that OSHA would like most employers to consider first, as it helps keep programs neat and efficient. This table allows employers to follow 18 common equipment/work tasks that generate silica dust and use the required engineering and work practice control measures to avoid the painful process of using a scheduled air monitoring program.

Simply stated, if your work activities fit precisely with the information in the table and your powered equipment has either an integrated water delivery system (to keep the dust down) or a dust collection system (designed specifically by the manufacturer of your equipment), then you should follow the required respiratory schedule based on if the employees are working less than 4 hours per shift (or more than 4 hours per shift). This appears to be the easiest approach for any company program to use, providing their work activities match in Table 1. Not all 18 activities described are both vacuum and water spray, so this requires further review.

OSHA 1926.1153 – Respirable Silica

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 hr/shift	> 4 hr/shift
(i) Stationary masonry saws	Use saw equipped with integrated water delivery system that continuously feeds water to the blade.	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
(ii) Handheld power saws (any blade diameter)	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.		
	- When used outdoors	None	APF 10
	- When used indoors or in an enclosed area.	APF 10	APF 10
(iii) Handheld power saws for cutting fiber-cement board (with blade diameter of 8 inches or less)	For tasks performed outdoors only:	None	None
	Use saw equipped with commercially available dust collection system.		
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency.		
(iv) Walk-behind saws	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.		
	- When used outdoors	None	None
	- When used indoors or in an enclosed area.	APF 10	APF 10
(v) Drivable saws	For tasks performed outdoors only:	None	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.		
(vi) Rig - mounted core saws or drills	Use saw equipped with integrated water delivery system that continuously feeds water to the blade.	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		

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Equipment/Task	Engineering and work practice control methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hr/shift	> 4 hr/shift
(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)	Use drill equipped with commercially available shroud or cowling with dust collection system.	None	None
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	Dust collector must provide the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.		
	Use a HEPA-filtered vacuum when cleaning holes.		
(viii) Dowel drilling rigs for concrete	For tasks performed outdoors only:	APF 10	APF 10
	Use shroud around drill bit with a dust collection system. Dust collector must have a filter with 99% or greater efficiency and a filter-cleaning mechanism.		
	Use a HEPA-filtered vacuum when cleaning holes.		
(ix) Vehicle-mounted drilling rigs for rock and concrete	Use dust collection system with close capture hood or shroud around drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector.	None	None
	OR		
	Operate from within an enclosed cab and use water for dust suppression on drill bit	None	None
(x) Jackhammers and handheld powered chipping tools	Use tool with water delivery system that supplies a continuous stream or spray of water at the point of impact.		
	- When used outdoors	None	APF 10
	- When used indoors or in an enclosed area.	APF 10	APF 10
	OR		
	Use tool 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 the air flow recommended by the tool manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism.		
	- When used outdoors	None	APF 10
	- When used indoors or in an enclosed area.	APF 10	APF 10
(xi) Handheld grinders for mortar removal (i.e., tuckpointing)	Use grinder equipped with commercially available shroud and dust collection system.	APF 10	APF 25
	Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions.		
	Dust collector must provide 25 cubic feet per minute (cfm) or greater of airflow per inch of wheel diameter and have a filter with 99% or greater efficiency and a cyclonic pre-separator or filter-cleaning mechanism.		

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Retrived from OSHA's Table 1 Respirable Silica <link>

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29 CFR 1926.1153

Milwaukee® OSHA® Compliance Solutions

To Whom It May Concern,

Milwaukee®, in partnership with the Wisconsin Occupational Health Laboratory, has conducted testing on the Milwaukee SDS Plus HAMMERVAC™ Dedicated Dust Extractors. Results show that the 2715-DE and 2712-DE HAMMERVAC™ Dedicated Dust Extractors are below the Permissible Exposure Limit (PEL) as described by OSHA 29 CFR 1926.1153 assuming they are used in accordance with manufacturer's instructions. Testing results and procedures are outlined below:

Unit Tested	Average Holes Drilled	Average Sample Duration (Minutes)	Average Respirable Crystalline Silica Concentration (µg/m3)	Permissible Exposure Limit (PEL) in OSHA 29 CFR 1926.1153
2715-DE 	81	63.33	14.27 µg/m³ TWA	50 µg/m³ over an 8 hour period

- All drilling was performed overhead using a Milwaukee Rotary Hammer and a Milwaukee HAMMERVAC™ Dedicated Dust Extractor.
- The hole size was 5/8" in diameter and 4" deep.*
- Test procedure included both the drilling of holes and a method of emptying the dust box:
  - The dust box on the extractor was emptied and the HEPA filter was knocked out every 5 holes.
  - The dust box and filter were knocked out lightly into a bucket placed on the ground next to the drilling location.
- Concrete blocks were poured from a 5000 PSI concrete mix.
- The room size was 12'9" x 26'5" x 8'.
- The room surfaces were wiped down between trials to ensure accurate measurements
- Samples were analyzed using OSHA ID-142 by the Wisconsin Occupational Health Laboratory, an AIHA Accredited laboratory. The sampling method used meets the definition of respirable crystalline silica in 1926.1153 (a) and Appendix A of the OSHA Respirable Crystalline Silica Standard (1926.1153).
- The Time Weighted Average (TWA) was calculated assuming zero exposure to respirable crystalline silica for the non-sampled portion of a 480 minutes (8 hour) shift. Longer exposure times, assuming that the dust exposures would be similar to those collected in these trials, would likely result in higher TWAs. Factors that would affect actual user exposures include, but are not limited to, the ventilation and air flow patterns in the work space, the presence of other respirable

*A 5/8" drill bit reflects the highest dust generating application, suggesting that other bit sizes would also be compliant when using the Milwaukee 2715-DE and 2712-DE HAMMERVAC™ Dedicated Dust Extractors

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Unit Tested	Average Holes Drilled	Average Sample Duration (Minutes)	Average Respirable Crystalline Silica Concentration (µg/m3)	Permissible Exposure Limit (PEL) in OSHA 29 CFR 1926.1153
2306-22 	55	62.5	33.5 µg/m³ TWA	50 µg/m³ over an 8 hour period

- All drilling was performed overhead using a Milwaukee 2713-22 M18™ FUEL™ 1" SDS Plus D-Handle Rotary Hammer and a Milwaukee 2306-22 M12™ HAMMERVAC™ Universal Dust Extractor.
- The hole size was 5/8" in diameter and 4" deep.*
- Test procedure included both the drilling of holes and a method of emptying the dust box:
  - The dust box on the extractor was emptied and the HEPA filter was knocked out every 2 holes.
  - The dust box and filter were knocked out lightly into a bucket placed on the ground next to the drilling location.
- Concrete blocks were poured from a 5000 PSI concrete mix.
- The room size was 12'9" x 26'5" x 8'.
- The room surfaces were wiped down between trials to ensure accurate measurements
- Samples were analyzed using OSHA ID-142 by the Wisconsin Occupational Health Laboratory, an AIHA Accredited laboratory. The sampling method used meets the definition of respirable crystalline silica in 1926.1153 (a) and Appendix A of the OSHA Respirable Crystalline Silica Standard (1926.1153).
- The Time Weighted Average (TWA) was calculated assuming zero exposure to respirable crystalline silica for the non-sampled portion of a 480 minutes (8 hour) shift. Longer exposure times, assuming that the dust exposures would be similar to those collected in these trials, would likely result in higher TWAs. Factors that would affect actual user exposures include, but are not

*A 5/8" drill bit reflects the highest dust generating application, suggesting that other bit sizes would also be compliant when using the Milwaukee 2306-20/22 M12™ HAMMERVAC™ Universal Dust Extractor

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OBJECTIVE DATA

Analyze a Cross-Section of Industry Data

The second option, Objective Data, refers to a collection of sampling data conducted by employers, government agencies, academic institutions and manufacturers. The data is typically public and is generally accepted to signify potential exposure levels. Be forewarned, there are organizations that will require you to be a paid member to view similar data. Keep in mind, this standard is relatively new and that it could take some time to get pertinent, objective data. More importantly, you have to be extremely careful that the data you obtain truly fits your work scenario. In the final silica rule, OSHA defines objective data as:

> **"Information, such as air monitoring data from industry-wide surveys or calculations based on the composition of a substance, demonstrating employee exposure to respirable crystalline silica associated with a particular product or material or a specific process, task or activity." OSHA goes on to specify that: "The data 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 operation."**

With this specific definition, it is uncertain how OSHA will rule on the current objective data that is available as of today. Employers have to be extremely cautious in using this method of compliance in their facility. The first bullet item under the new OSHA interim enforcement guidance is to inform the OSHA compliance officer to "be prepared to collect personal breathing zone samples on the first day of the inspection." You need to be able to defend your objective data claim if this is the route you take.

03

SELF-MONITORING PROGRAM

Employers Maintain Control Measures for Non-Specific Scenarios

As the third option, the technique of maintaining compliance is used by employers working around crystalline silica dust with operations or equipment that do not fit one of the 18 activities/tasks listed in Table 1. And/or they choose not to investigate or find objective data that fits their work scenario. This option requires both initial and periodic air monitoring.

Stated specifically in the OSHA interim enforcement guidance document.

OSHA expects:

- **Employers must perform initial monitoring as soon as work beings to determine exposure levels and where to implement control measures.**
- **Employers must conduct periodic monitoring at specified intervals based on most recent monitoring results.**

The monitoring must assess the 8-hour TWA (time-weighted average) exposure for each employee on the basis of one or more personal breathing zone air samples that reflect the exposures on each shift, each job classification, and work area. For example, if you are sampling a given employee for only 2 hours during a specific work activity, you need to be careful in assuming the rest of their 6 hour work day is completely free of respirable crystalline silica. In other words, just because they are NOT cutting into concrete for 6 hours of the day, there could still be some silica exposure in the air.

When several employees perform the same tasks on the same shift and in the same work area, you can sample a given representative of the employee(s) who are expected to have the highest potential exposure. You are NOT expected to sample every employee, unless they are doing uniquely different tasks.

Don't think you can put everyone in respirators and you are done!

Remember, OSHA still requires employers to use engineering and work practice controls to reduce and maintain employee exposure to respirable crystalline silica to or below the PEL, unless the employer can demonstrate that such controls are not feasible. If you have implemented the various engineering and work practice controls and are still over the limit, then respirators can certainly (and should) be used. All components of the respiratory protection program from General Industry (1910.134) must be implemented when respirators are found to be required (per 1926.1153(e)(2)). While the various air sampling techniques (i.e., using a calibrated pump, filter cassette with/cyclone, sending sample to lab for analysis) OSHA discusses can be intimidating and complicated, they DO allow a more simplistic technique involving "direct read, digital dust monitors" that are on the market and designed to read respirable dust. While these devices cannot discriminate on the type of respirable dust it reads, the employer must determine the percent of crystalline silica in the product their employees work in. This can be done using objective data (reviewing Safety Data Sheet or other sources that have this documentation) or the employer could send in a piece of the material and have it sampled for the percent of crystalline silica.

Potential Objective Data Example:

- **You know the concrete your electricians will be drilling into is 25% crystalline silica and your direct read air monitor indicates that there are 96 micrograms/m3 of "respirable dust" in the air over an 8 hour TWA.**
- **Multiply 96 by .25 (25% crystalline silica) to arrive at the correct % of crystalline silica in the air (24 micrograms/m3). 24 is considered below the "action level" of 25 micrograms/m3 (the OSHA PEL is now 50 micrograms/m3).**

Source: Page 35 of OSHA's "Small Entity Guide for the Respirable Crystalline Silica Standard for Construction".

In essence, you could be using both Objective Data and a Self-Monitoring Program to help maintain compliance. Many might find this approach a little less difficult to deal with compared to learning how to use sampling pumps with cyclones and sending samples to a lab for analysis.

I assume that OSHA will expect employers who plan to use Objective Data (as their primary means of compliance) to have conducted some amount of air sampling to confirm that the data they are using truly applies to their particular work scenario. Time will tell how OSHA views the use of "Objective Data" and how that will apply to your particular situation.

Michael Tesmer, CSP
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