

OSHA's New Crystalline Silica Rule—Potential Impact on Shotcrete Operations

By Charles S. Hanskat

Background

The Occupational Safety and Health Administration (OSHA) recently issued a final rule dealing with worker exposure to crystalline silica. The rule represents years of effort by OSHA to develop a standard that is intended to help protect over 2 million construction workers from respirable crystalline silica. This is one of the biggest rules OSHA has developed, and it is addressed to two different workplace environments: construction and general industry/maritime operations. Our field shotcrete operations fall into the construction category. This is a very comprehensive standard addressing not only permissible levels of exposure but also exposure monitoring, medical surveillance, and housekeeping.

Crystalline silica has been a known health hazard for decades. Significant levels of exposure can lead to silicosis, lung cancer, other respiratory diseases, and kidney disease. How is one exposed to respirable crystalline silica? Common jobsite concrete work including cutting, drilling, jackhammering, chipping, grinding, or sand blasting of concrete present the highest potential for exposure above the safe limits established in the rule.

The new rule was published June 23, 2016, and requires compliance of the rule by June 23, 2017, except for the requirements for laboratory evaluation of exposure samples that will begin 1 year later. The rule deals with all exposures of respirable crystalline silica, except those environments that have proven exposure less than an action level of $25 \mu\text{g}/\text{m}^3$ over an 8-hour time-weighted average (TWA). Many contend the $25 \mu\text{g}/\text{m}^3$ level is at or below the limit that can be measured accurately and consistently with current technology.

So what about silica fume, a common supplemental cementitious material widely used in

shotcrete? ACI defines silica fume in CT-13, ACI Concrete Terminology, as “very fine noncrystalline silica produced in electric arc furnaces as a byproduct of the production of elemental silicon or alloys containing silicon.” The key here is that silica fume is a noncrystalline material. However, most producers of silica fume do note that trace amounts of crystalline silica—less than 0.5% of the overall silica fume material—are present in their materials.

Thus, as OSHA significantly reduces the permissible exposure limits (PEL) in construction environments from the previous $250 \mu\text{g}/\text{m}^3$ over an 8-hour TWA to $50 \mu\text{g}/\text{m}^3$, there may be concern that even trace amounts of crystalline silica in silica fume may impact our shotcrete crew's exposures. All of our shotcrete mixtures use sand as an aggregate, so handling of quantities of sand in site-batching operations or from rebound may also produce small amounts of crystalline silica that add to the worker exposure. Also, many of our shotcrete projects involve repair of existing concrete, so surface preparation techniques may produce crystalline silica.

Two Alternative Approaches for Compliance Provided in Rule

Work Tasks Covered by Table 1: The new rule offers two ways to be in compliance. The first method, and the one OSHA expects most contractors to use, provides a table (refer to Table 1) that predefines specific equipment and associated exposure conditions, along with control and respiratory protection measures required. If the work environment is covered in Table 1 and the specified engineering and work practice control methods are met, along with the required respiratory protection, there

Technical Tip

is no need to monitor for crystalline silica or comply with the PEL. It is also noted that if combined tasks from Table 1 sum more than 4 hours, over-4-hour respiratory protection must be used.

Active Monitoring: The second method applies to any tasks that are not listed in Table 1, and can be selected as an alternative by the Contractor for tasks in Table 1. Unfortunately, shotcrete is not covered in Table 1, so the assumption is this method will be the only option available to shotcrete contractors. This method requires monitoring for crystalline silica at prescribed times and with activities that represent the highest exposure conditions, if the amount of silica may be at or above the action level of 25 µg/m³. If above the action level, the contractor must:

- Measure and record the amount of silica that workers are exposed to over an 8-hour TWA for all the tasks the employee may be reasonably exposed to. Exposure assessments must be repeated every 6 months or less if the exposure is above the action level but below PEL. If exposures are above the PEL, assessments must be made every 3 months or less;
- Protect workers from exposure to crystalline silica above the PEL of 50 µg/m³ over an

8-hour TWA. If control of the PEL below the 50 µg/m³ is not feasible, supplemental respiratory equipment may be needed;

- Use dust controls to protect from silica exposures above the PEL of 50 µg/m³; and
- Provide proper respirators to workers when dust control measures are not adequate to limit exposures to the PEL.

The monitoring option further requires employees to be notified in writing of the assessment results of the monitored levels of crystalline silica within 5 days. Also, if the PEL of 50 µg/m³ is exceeded, the employees must receive written notification of the corrective actions taken. Additionally, the employee (or their designated representative) must be allowed to observe the monitoring. The observer must also be provided clothing and equipment to protect them from exposure at no cost to the observer.

Additional Requirements for BOTH Alternatives

The construction employer must:

- Produce and implement a written exposure control plan. The plan must identify tasks that produce exposure, and engineering and work practice methods used to protect workers. This may include restricting access to partic-

Excerpt from 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 hours per shift	> 4 hours per shift
(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. <ul style="list-style-type: none"> • When used outdoors. • When used indoors or in an enclosed area. OR	None APF 10	APF 10 APF 10
	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. <ul style="list-style-type: none"> • When used outdoors. • When used indoors or in an enclosed area. 	None APF 10	APF 10 APF 10

ular work areas where high exposures may occur. Also, the plan must include housekeeping methods for dust control.

- Designate a competent person to implement the written exposure control plan in the workplace, with frequent and regular inspections to verify compliance. The competent person must be capable of identifying existing and foreseeable respirable crystalline silica hazards, and have authorization to take prompt corrective measures to eliminate or minimize them.
- Implement housekeeping methods to control and limit dust that may contain silica. This includes prohibiting any dry sweeping or brushing, and no cleaning of clothes or surfaces with compressed air. Wet sweeping or HEPA-filtered vacuuming are allowable options.
- Must offer medical exams including chest X-rays and lung function tests every 3 years for workers who are required to wear a respirator for 30 or more days a year. The medical exams must be conducted by a physician or other licensed health care professional (PLHCP) whose legally permitted scope of practice allows them to independently provide these medical evaluations. Employers must make an initial baseline medical exam available within 30 days after the initial assignment to the work covered by the rule. The PLHCP provides a written medical report to the employee within 30 days that includes: the results of the exam indicating any medical condition that would increase their risk after material exposure to silica; any recommended limitations on employee's use of respirators; recommended limits on the exposure to silica; and if there are concerns about the results of the chest X-ray where additional evaluation by a specialist is appropriate. The PLHCP must give the employer a report with much more limited information, including only the date of the exam, a statement that they have met the requirements of the OSHA rule, and any recommended limitations on the employee's use of respirators.
- Communicate to all workers potentially exposed to silica the health hazards associated with exposure to respirable crystalline silica, and identify all MSDS that include crystalline silica. The employer must communicate at least the potential hazards that result in cancer, lung effects, immune system effects, and kidney effects.
- Provide information and training sessions that identify: work operations that could produce silica exposure; specific measures the employer implemented to protect employees from exposure to silica; the identity of the competent person; and the purpose and description of the medical surveillance program. The contractor must further ensure that each employee can demonstrate knowledge and understanding of the training.
- Maintain accurate records for 30 years of:
 - All exposure measurements, including name, social security number (SSN), and job classification of all employees represented by the monitoring, and indication of those employees who were actually monitored.
 - Objective data including the crystalline-containing material, the source of the data, and the testing protocol with results of the testing.
 - Each employee covered by medical surveillance including name, SSN, all PLHCP reports, and information provided by employer to the PLHCP.

Summary

OSHA's new rule for control of exposure to crystalline silica is intended to protect workers on our jobsites. This is one of the most comprehensive rules OSHA has promulgated, and introduced extensive medical monitoring and recordkeeping requirements that will require a significant increase in the contractor's required duties that will certainly require more staffing to implement. In this article, most of the key points are introduced; however, extensive documentation leading to the new rule—along with FAQ and the text of the rule—are readily available at the OSHA website (www.osha.gov/silica).

There is a debate on whether the action level of $25 \mu\text{g}/\text{m}^3$ is able to be accurately and consistently measured. Also, many feel that some of the other provisions seem overly burdensome for the desired results. As a result, several groups involved in the construction industry, including the Construction Industry Safety Coalition, are mounting efforts to get the rule reviewed and revised to provide a more practical, yet still fully effective standard. ASA is monitoring these efforts to modify the new rule.

Unfortunately, no one can predict whether the OSHA rule will be modified before the June 23, 2017, date for compliance. Thus, one should certainly review all the provisions of the new rule, and determine what your company needs to do to meet the requirements.



Charles S. Hanskat is the current ASA Executive Director. He received his BS and MS in civil engineering from the University of Florida, Gainesville, FL. Hanskat is a licensed professional engineer in several states. He has been involved in the design, construction, and evaluation of environmental concrete and shotcrete structures for over 35 years. Hanskat is also a member of ACI Committees 301, Specifications for Structural Concrete; 350, Environmental Engineering Concrete Structures; 371, Elevated Tanks with Concrete Pedestals; 372, Tanks Wrapped with Wire or Strand; 376, Concrete Structures for Refrigerated Liquefied Gas Containment; 506, Shotcreting; and Joint ACI-ASCE Committee 334, Concrete Shell Design and Construction. Hanskat's service to the American Society of Civil Engineers (ASCE), the National Society of Professional Engineers (NSPE), and the Florida Engineering Society (FES) in over 50 committee and officer positions at the national, state, and local levels was highlighted when he served as State President of FES and then as National Director of NSPE. He served as a District Director of Tau Beta Pi from 1977 to 2002. He is a Fellow of ACI, ASCE, and FES and a member of ACI, NSPE, ASTM International, and ASCC.