*Project S E.N.S.O.R. News

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Proposed OSHA Rule on Occupational Exposure to Respirable Crystalline Silica

On September 12, 2013 Federal OSHA proposed a comprehensive standard for exposure to silica (1). Hearings on the proposal were held in Washington, DC for 14 days beginning March 18, 2014. Health groups supporting the proposed standard included the American Thoracic Society, the American College of Chest Physicians, the American College of Occupational and Environmental Medicine, the American Public Health Association, the Council of State and Territorial Epidemiologists and the Association of Occupational and Environmental Clinics.

The current standard promulgated in 1971 allows an eight hour time weighted average of 100 $\mu g/m^3$ in general industry and 250 to 500 $\mu g/m^3$ in construction and shipyards. There are no requirements in the current standard for medical surveillance, exposure assessment, education or respiratory protection. The proposed standard would lower the eight hour time weighted average in general industry, construction and shipyards to 50 $\mu g/m^3$ as a gravimetric measurement of respirable silica. This level would replace the current formula that includes the crystalline silica content of the dust sampled and for construction and shipyards a conversion from particle counts. NIOSH first proposed lowering the allowable silica level to 50 $\mu g/m^3$ in 1974 and OSHA published an Advanced Notice of Proposed Rulemaking in December 1974 but OSHA did not pursue further action at that time. Subsequently, there has been an extensive amount of medical research on silica including its recognition as a carcinogen, a renal toxin and a risk factor for COPD and connective tissue disease. OSHA has published a 483 page comprehensive review of the literature on the adverse effects of silica (2).

The full proposal published in the Federal Register is 232 pages, although the actual proposed standard is only 18 pages. The other two hundred or so pages cover background, regulatory history, benefits and economic impact. The Review of Health Effects Literature and Preliminary Quantitative Risk Assessment is another 483 pages, which includes 84 pages of references (2).

Table 1 summarizes the lifetime (to age 85) of excess deaths from silica exposure per 1,000 workers at the current general industry, current construction/shipyard levels and at the proposed PEL.

Table 1. Expected Excess Deaths from Silica Exposure Per 1,000 Workers (1)

	Current PEL		Proposed PEL
Fatal Health Outcome	General Industry 100 $\mu g/m^3$	Construction & Shipyard 250-500 $\mu g/m^3$	50 $\mu g/m^3$
Lung Cancer:			
10-cohort pooled analysis	22-29	27-38	18-26
Single cohort study-lowest estimate	13	37-95	6
Single cohort study-highest estimate	60	250-653	25
Silicosis	11	17-22	7
Non-Malignant Respiratory Disease (including Silicosis)	83	188-321	43
Renal Disease	39	52-63	32

Dose-response estimates for non-fatal health outcomes were only calculated for silicosis and not for the other conditions associated with silica exposure (i.e., kidney disease, COPD, TB and connective tissue disease) (Table 2).

Table 2. Risk of Non-Fatal Silicosis Per 1,000 Workers for 45 Years of Exposure (1)

	Current General Industry PEL 100 $\mu g/m^3$	Proposed PEL 50 $\mu g/m^3$
Silicosis		
Radiograph 1/0+*	60-773	20-170
Radiograph 2+	301	55

*Severity based on ILO scoring system ranging from 1 to 4, with 4 representing the most advanced severity.

Major provisions of the proposed standard include:

1) Exposure assessment of employees at or above an action level of 25 $\mu g/m^3$.
2) Regulated Areas and Demarcation - Areas greater than 50 $\mu g/m^3$ will have limited access, require respirators and protective clothing that is removed prior to the removal of the respirator.
3) Cleaning – Require high efficiency particulate air (HEPA) filter vacuuming or wet methods.
4) Bans rotating workers to achieve compliance with the permissible exposure limit (PEL).
5) Requires providing medical examinations for all employees with exposure to PEL for 30 or more days per year every three years or more frequently if recommended by the health care provider. Content of the exam:
    a) Medical and work history.
    b) Physical exam with emphasis on the respiratory system.
    c) Chest radiograph or equivalent diagnostic study such as a CT scan interpreted by a NIOSH certified "B" reader. If the chest radiograph is 1/0 or more per the International Labor Organization (ILO) system then the employer is required to refer the worker to a board certified pulmonologist.
    d) Spirometry.
    e) Testing for latent tuberculosis.
    f) Any other test deemed appropriate by the health care provider.
6) Requires inclusion of information on crystalline silica in the Hazard Communication Program.
7) Ensures that employers have specific knowledge regarding the hazards of silica.

As part of the proposal, regulatory alternatives are offered. One alternative is to keep the PEL at 100 $\mu g/m^3$; a second alternative is to lower the PEL even further to 25 $\mu g/m^3$. Other alternatives include requiring that medical surveillance be conducted more frequently, annually or requiring medical surveillance for workers exposed 30 or more days to the action level of 25 $\mu g/m^3$ rather than only for those exposed to the higher 50 $\mu g/m^3$ level.

OSHA is required to perform multiple economic analyses. As proposed, OSHA's economic analysis estimates the annual costs at the new silica standard to be $637 million and the annual benefits at $5.3 billion. Each alternative has different costs and benefit estimates.

Silica producers and users have objected to the cost of the standard, the feasibility of measuring silica at the lower proposed level and that better enforcement of the existing standard would eliminate the need for lowering the allowable silica levels in the air. Opposition by industry is not monolithic. For example, the National Industrial Sand Association supports a new comprehensive standard but not the need to lower the allowable silica levels in the air.

Michigan data proved useful in showing that the decrease in silicosis reported in Michigan and in the country can mainly be attributed to a decrease in the number of workers at risk rather than the adoption of the current OSHA standard in 1971. For example, the number of employees in Michigan foundries peaked in 1973 and decreased 75% by 1991. This decrease parallels the 83% decrease in new silicosis cases from 1993 to 2011 (factoring in a 20 year latency for silicosis development). Another example is the 71% decrease in the number of abrasive blasting companies that use silica as the abrasive rather than a safer alternative.

The remaining workers still exposed to silica will markedly benefit from adoption of the new proposed standard. Twenty-four of the 43 (55.8%) Michigan foundries inspected from 2007-2010 had silica air samples above the proposed PEL of 50 µg/m^3 (Table 3) and 43% of firms in Michigan doing abrasive blasting are still using silica. Workers in industries where sufficient time has not elapsed to develop silicosis such as highway repair (Figure 1) or oil and gas fracking (it takes 500 large trailer trucks of sand to drill one well) will also benefit from the new standard.

Regarding medical surveillance, very few companies perform periodic medical surveillance for silica exposed workers. The proposed requirement for medical surveillance will be useful to identify work situations where exposure control has been insufficient and to better identify the incidence of silicosis. Michigan abrasive blasting companies and construction companies are not providing medical surveillance to their employees and in foundries only one of 43 (2.3%) did periodic chest x-rays and used a "B" reader to interpret the radiographs (Table 3).

Table 3. Michigan OSHA Inspection of Foundries, Michigan (3)

	Companies	
	#	%
Air Sampling Performed: 2007-2010	43	
Above Current Enforceable Standard for Silica (100 µg/m^3)	15	34.9
Above Proposed Recommended Standard for Silica (50 µg/m^3)	24	55.8
Medical Surveillance Evaluated: 1985-2010	43	
Periodic Chest X-Rays with a "B" Reader	1	2.3
Periodic Chest X-Rays without a "B" Reader	2	4.7
Periodic Pulmonary Function Testing	8	18.6
Pre-Employment Testing Only	16	37.2
No Medical Surveillance	15	34.9

Silicosis is still occurring and physicians still need to be aware of the condition. Of the 786 individuals with confirmed silicosis who have died in Michigan over the last 25 years, only 14% have silicosis listed anywhere on the death certificate, although 50-60% have died from respiratory disease. Common respiratory conditions listed as the cause of death were lung cancer, COPD, pneumonia, unspecified interstitial fibrosis or respiratory failure.

Dr. Rosenman, one of the six physicians in the state certified by the federal government to interpret radiographs for pneumoconiosis, is available to assist in diagnosis and management issues related to silica. He can be reached at 1-800- 446 -7805 or Rosenman@msu.edu

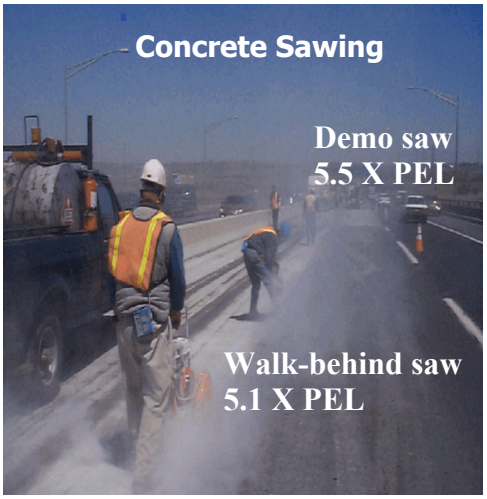

Figure 1. Highway Repair—Concrete Sawing

References

1) https://www.osha.gov/FedReg_osha_pdf/FED20130912.pdf
2) https://www.osha.gov/silica/Combined_Background.pdf
3) http://www.oem.msu.edu/userfiles/file/Annual%20Reports/Silica/2010SilicosisAnnualReport.pdf

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*PS *Remember to report all cases of occupational disease!*

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