

Model Silica Specifications

for Masonry Grinding, Cutting and Sawing



**Developed by the CPWR/NIOSH
Engineering Controls Work Group**



Co-chair: W. Gregory Lotz, Ph.D.
Captain, U.S. Public Health Service
Director, Division of Applied Research and Technology, NIOSH

Lead Researcher and Co-chair: Pam Susi, MSPH, CIH
CPWR – The Center for Construction Research and Training

June 2014

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Prepared for professionals responsible
for implementation or governmental oversight of
public health, worker safety and health, environmental
standards, and building codes, as well as builders
and their supervisory personnel

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AN INTRODUCTION:

How the Model Silica Specifications Were Developed

The following specifications are designed primarily to **protect workers from inhaling silica-containing dust** while grinding, cutting and sawing masonry, operations that are common in street and sidewalk repair, brick and block work, and replacing mortar in aging brick buildings. Research has proven that silica dust produces irreversible adverse health effects, including silicosis and lung cancer.

Implementation of these specifications – in particular the engineering control features – will also **protect the environment, property and public health** and assist construction users and contractors in complying with local fugitive dust emission standards.

A national advisory group of researchers, contractors, labor organizations and government with substantive experience with silica and engineering controls to reduce exposure, was tasked with developing these specifications in 2008. The group was drawn from the CPWR/NIOSH Engineering Controls Work Group, a joint effort begun in 1993 of CPWR – The Center for Construction Research and Training and The National Institute for Occupational Safety and Health (NIOSH), CDC. Silica Advisory Group members crafted specifications over a two-year period, distributed drafts widely for review and comment, and then finalized these model silica specifications in 2014.

The following silica specifications describe “best practices” that reflect state-of-the-art recommendations for protecting worker health.

They can be used in whole or in part, depending on the needs and concerns of the user. The heart of the specifications is Part IV, which contains language on using control technology to eliminate or reduce exposure to workers, the public and the environment. Part IV has been used by **The School District of Philadelphia to create a silica specifications section in their bid documents for construction.**



These silica specifications are meant primarily to serve as:

- a resource to **local agencies charged with specifying or permitting** masonry grinding, cutting and sawing,
- guidance for **construction users** responsible for specifying and overseeing construction work,
- a resource to **local agencies responsible for air pollution or environmental and/or worker health standards** relating to the release of dust generated during such work, i.e. building, transportation, public school, and environmental protection or public health departments, or
- guidance for **private building or project owners** when conducting renovations on, in or around their buildings and properties to minimize silica and dust exposure to workers, residents and the public.

The language of these specifications is typical for health-related specifications, such as those for lead and asbestos. In addition to contractor and onsite supervisory personnel, they are meant to be useful to professionals with responsibility for some aspect of their implementation or in governmental oversight of its mandates, such as **industrial hygienists, safety professionals, architects, engineers, and inspectors.**

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I. Purpose

The purpose of these specifications is to protect employees, the public, the environment and property from the detrimental effects of dust and silica generated during construction and restoration/maintenance operations that are conducted on masonry or concrete materials.

II. Scope and Application

These specifications apply to the use of powered tools or equipment that are used to cut, grind, core or drill masonry or concrete materials.

III. Definitions

- a) **Masonry Material** - For purposes of these specifications, "masonry material" includes, concrete block, brick, stones (natural and man-made), terra cotta tile, mortar and concrete made by mixing cement and water with sand, and aggregate such as gravel or crushed stone. Material that is apparently stone-like in appearance and texture shall be presumed to be concrete or masonry material, unless otherwise indicated by evidence presented by the employer that the mixture does not include cement, sand, gravel, stone, clay, or aggregate material containing silica.
- b) **NIOSH REL** - The National Institute of Occupational Safety and Health Recommended Exposure Limit. For silica this is 0.05 milligrams per cubic meter (mg/m^3) averaged over a 10-hour, time-weighted average.
- c) **OSHA PEL**¹ - the Occupational Safety and Health Administration's

Permissible Exposure Limit is expressed by the equations:

$$\text{PEL} = \frac{10 \text{ mg}/\text{m}^3}{\% \text{ silica} + 2}$$

(general industry)

$$\text{PEL} = \frac{250 \text{ mppcf}^2}{\% \text{ silica} + 5}$$

(construction industry)

The PEL derived from these formulas is compared to the respirable dust or particulate concentration measured to determine compliance.

¹ OSHA has proposed an 8-hour permissible exposure limit of 0.05 mg/m^3 of respirable silica (Federal Register, September 12, 2013)

² mppcf stands for millions of particles per cubic feet. A conversion factor of 1 $\text{mg}/\text{m}^3 = 10$ mppcf is used to convert sample results reported in mg/m^3 to mppcf

- d) **Powered tools or equipment** - Tools in which the motive force that disrupts concrete or masonry materials is provided by a source other than human energy. Powered tools and equipment include those powered by electrical, combustion, hydraulic, chemical, or pneumatic energy.
- e) **Dust reduction system** - Technology that utilizes the application of water or local exhaust ventilation to reduce airborne dust generated by the use of powered tools or equipment. Local exhaust ventilation may include vacuum systems, dust collection.

IV. Controls

In all cases, engineering controls that reduce dust at the source where it is being generated shall be the control of choice. In those instances where such controls cannot be used – even temporarily – employees shall be protected with respirators that are used as part of a respiratory protection program. Additionally, the contractor must document how they determined that controls could not be used.

a) Safety and Effectiveness of Dust Control Systems

- i) Procedures shall be implemented to ensure that dust reduction systems maintain their effectiveness for dust reduction throughout the work shift.
- ii) Dust reduction systems shall be installed, operated, and maintained in accordance with manufacturer recommendations when there are such.
- iii) When electrical tools are used with water as a dust reduction system, it shall be done in accordance with applicable requirements of electrical safety.

b) Dust Collection/Management

- i) Dust shall be contained and disposed of in bags that can effectively hold dust without breaking.
- ii) Work surfaces and clothing shall be cleaned with vacuums and not by dry sweeping or the use of compressed air.
- iii) Respirators shall be worn when changing out bags or handling dust.

V. Evaluating the Effectiveness of Controls

- a) The primary purpose of exposure monitoring and site inspections for the presence of dust are to ensure that engineering controls are effective in reducing silica dust generation. When personal air monitoring results are elevated or when there is visible dust, the contractor must intervene to determine the cause of the problem and fix it.
- b) As soon as possible after the beginning of cutting or grinding tasks, the contractor shall conduct personal air monitoring of workers performing the cutting/grinding tasks. An industrial hygienist shall perform the monitoring and must be consulted prior to the execution of work. If personal air

monitoring results indicate that the exposures are above the NIOSH Recommended Exposure Limits (REL) for silica, the contractor must ensure that the controls are functioning and being used properly. In all cases when the REL is not achieved, workers shall be provided with proper respiratory protection.

- c) Following modification of controls as described above, the contractor shall conduct personal air monitoring to verify the effectiveness of those modifications in reducing employee exposure to silica.
- d) If the contractor has done similar work in the past, has conducted exposure monitoring, and has records of this, the results can be used as a preliminary means to evaluate the effectiveness of controls. It is important that the previous jobs where the monitoring was conducted be similar to the current job, and that the control used be the same, including the manufacturer and model of the vacuum used.
- e) Periodic monitoring shall be performed to assure the effectiveness of controls over time.
- f) The contractor shall conduct daily visual inspections of the site for the presence of visible dust that appears during grinding and cutting tasks. The presence of such dust is a sign that the controls are not doing their job.

VI. Training

- a) **Employee training.** An employer whose operations include using powered tools or equipment to cut, grind, core, or drill concrete or masonry materials shall provide training on the following topics to all employees prior to their assignment to jobs or work areas where the employer will be conducting these operations that potentially expose them to silica-containing dusts:
 - i) The potential health hazards of overexposure to airborne dust generated from concrete and masonry materials, including silicosis, lung cancer, chronic obstructive lung disease (COPD) and decreased lung function.
 - ii) Methods used by the employer to control employee exposures to airborne dust from concrete and masonry materials, including wet cutting, local exhaust ventilation systems, and process isolation, as applicable.
 - iii) Proper use and maintenance of dust reduction systems, including the safe handling and disposal of waste materials collected in connection with their use.
 - iv) The importance of good personal hygiene and housekeeping practices when working in proximity to dust from concrete and masonry materials including: not smoking tobacco products; appropriate methods of cleaning up before eating, and appropriate methods of cleaning clothes.
 - v) OSHA requirements including permissible exposure limits, requirements for engineering controls, and respirator protection program requirements.

- b) Supervisor training.** Prior to supervision of employees who will be cutting, grinding, drilling, or coring concrete or masonry materials, supervisory employees shall be trained on the following topics:
 - i) The information required to be provided by subsection (VI)(1) above.
 - ii) Identification of tasks the employees will perform, which may result in employee exposure to concrete or masonry dust.
 - iii) Procedures for implementation of the measures used by the employer to reduce the exposure to concrete or masonry dust.
 - iv) Measures for verifying the effectiveness of controls.
- c) Periodic training.** On jobs that last more than one year, the employer shall conduct the training required by this section at least annually.

VII. Training Records

- a) General Requirements:** The contractor must maintain a record of all training required by this part within the preceding three (3) years for each person who performs or directly supervises this specific job function (Masonry Grinding, Cutting and Sawing). These training records must be maintained during the time that the person performs or supervises this job function (Masonry Grinding, Cutting and Sawing). These training records must be kept for direct employees of the contractor as well as independent contractors, subcontractors and any other person who performs or directly supervises these job functions for the contractor.
- b) Location of Records:** The contractor must retain the training records required by this part to include all initial and recurrent training received within the preceding three (3) years for all persons performing or directly supervising this job function (Masonry Grinding, Cutting and Sawing). Records may be maintained electronically or by other acceptable means. When the person ceases to perform or directly supervise this job function (Masonry Grinding, Cutting and Sawing), the contractor must retain the training records for an additional ninety (90) days.
- c) Contents of Records:** Each training record must contain the following:
 - i) The individual's name;
 - ii) The most recent training completion date;
 - iii) A description, copy or reference to training materials used to meet training requirements;
 - iv) The name of the person or organization providing the training.

VIII. Written Program

The contractor shall have a site-specific, written program that contains the following elements:

- a) **Introduction:** Project description, location, scope and schedule of work.
- b) **Personnel:** Project manager, person in charge of silica program.
- c) **Silica dust-emitting activities:** Tasks, equipment, materials, work crew.
- d) **Engineering and work-practice controls:** Type of control, use and maintenance procedures and how effectiveness will be verified including personal air monitoring data and schedules for air monitoring.
- e) **Respiratory Protection Program.**
- f) **Schedule:** Timetable for implementing compliance program.
- g) **Hygiene procedures:** Protective clothing (beside respirators) and equipment, housekeeping, hand washing stations.

Model Silica Specifications Contributors 2008–2010

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