MCAA
Mechanical Contractors Association of America

Guide to Silica Safety

MSCA
Mechanical Service Contractors of America

PCA
Plumbing Contractors of America

Guide to Silica Safety

Provided as a service of MCAA's Safety Excellence Initiative

MCAA first published the *Guide to Silica Safety* in October 2013, almost three years before OSHA promulged a standard to protect workers from overexposure to respirable crystalline silica. This revision incorporates provisions in the new standard. To comply with the standard, employers must either implement the applicable exposure control methods from Table 1 or apply the alternative exposure control methods established in the standard. An executive summary of the key compliance requirements follows. For a complete summary of OSHA's Respirable Crystalline Silica Standard, see Appendix A.

Executive Summary

Table 1 – If you choose to use the standard's Table 1 exposure control methods:

You must:

- Follow established respiratory protection requirements when applicable;
- Follow established housekeeping requirements;
- Establish a written exposure control plan;
- Provide medical surveillance;
- Provide proper hazard communication/silica safety training for workers; and
- Provide adequate recordkeeping.

You are not required to:

- Ensure that no worker is exposed above the Permissible Exposure Limit (PEL);
- Perform exposure assessments for workers who could be exposed at/above the Action Level (AL);
- Perform initial exposure determination air monitoring; or
- Use existing objective data.

Alternative Exposure Control Methods – If you are unable to use Table 1, or choose not to do so, you must use the alternative exposure control methods:

You must:

- Ensure that no worker is exposed above the Permissible Exposure Limit (PEL);
- Perform exposure assessments for workers who could be exposed at/above the Action Level (AL);
- Perform initial exposure determination air monitoring or utilize existing objective data;
- Follow established respiratory protection requirements;
- Follow established housekeeping requirements;
- Establish a written exposure control plan;
- Provide medical surveillance;

- Provide proper hazard communication training for workers; and
- Provide adequate recordkeeping.

You are not required to:

- Follow any part of Table 1.

Foreword

Silica exists just about everywhere on and off construction sites. It's the second most abundant mineral in the earth's crust, and it's contained in sand, brick, block, concrete, tile and other building materials. The good news is that what you *do see* can't hurt you. It's what you *can't see* that may be harmful. If workers inhale a large enough concentration of respirable crystalline silica (particles that are 1/100th the size of a single grain of sand) over a long enough period, it can lead to silicosis, lung cancer and other health problems. For these reasons, mechanical construction employers must help their fitters, plumbers, and other affected workers protect themselves from overexposure to respirable crystalline silica.

This guide provides mechanical construction employers with the information they need to help their workers:

- Understand the potential hazards associated with overexposure to respirable crystalline silica;
- Identify the most common mechanical construction activities that can produce it;
- Identify common activities performed by other trades that can produce it;
- Implement the best available safe work practices to prevent overexposure; and
- Comply with OSHA's Respirable Crystalline Silica Standard.

Disclaimer

This guide is intended to provide the user with basic information on helping mechanical construction workers protect themselves from overexposure to respirable crystalline silica. It is not intended to provide exhaustive treatment on safely working with and/or around crystalline silica, and it should never be used as a substitute for reading, interpreting and complying with the most current, applicable federal, state and local standards and regulations. Further, it is not intended to provide legal advice. Employers must make independent determinations regarding the need for legal assistance.

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Introduction

Mechanical construction workers frequently engage in activities that produce respirable silica. Whether or not the dust containing silica becomes harmful depends on many factors, including:

- The type of silica;
- The size of the particles;
- The concentration of silica being inhaled; and
- The duration of the exposure.

Any time an activity involves pulverizing concrete or any other material containing silica, respirable silica may become an issue. Respirable silica generated by other trades can be hazardous too. For example, if fitters are hanging pipe in an area being used by masons to cut brick and block, there is the potential for overexposure to the masons, the fitters, and other trades in that work area. Affected workers need to know where the exposures can occur, and how to protect themselves from overexposure. Workers can use several different exposure control methods, including engineering controls, safe work practices, and/or respiratory protection, if necessary.

Crystalline Silica

The primary concern is with a group of minerals referred to as crystalline silica. These minerals are compounds made up of the elements silicon and oxygen. The word crystalline refers to a repeating, three-dimensional arrangement of the atoms that make up crystalline silica. Quartz is the most abundant form of crystalline silica. Cristobalite and tridymite are two of six other forms that you may hear or read about. However, most exposures are generated from quartz.

Exposure Limits

Exposure limits are based on an eight (8)-hour time-weighted average (TWA) which, in this case, is the average concentration of respirable crystalline silica to which nearly all workers could be repeatedly exposed over an eight (8)-hour workday without adverse health effects. The permissible exposure limit (PEL) for respirable crystalline silica in construction is 50 micrograms per cubic meter of air space (50 ug/m^3). Any exposure over this limit is considered harmful. The good news is that mechanical construction workers don't drill, cut, or bore into concrete all day every day. Therefore, it's highly unlikely, for example, that a fitter installing a few pipe hangers would be exposed anywhere near the PEL unless there was some other respirable crystalline silica producing activity being performed in the work area. However, there are situations where mechanical construction workers could be overexposed to respirable crystalline silica without proper protective measures.

Potential Health Hazards

Larger silica dust particles do not pose a health hazard because, even if they are inhaled, they are expelled while exhaling. It's the microscopic particles that are about 1/100th the size of a single grain of sand that stay in the lungs and cause damage over time. Silica related disease can appear within a year if exposure is intense, but it usually takes 10 to 15 years of exposure before symptoms appear. When the particles are

small enough to get into the lungs and stay there, they can cause silicosis, lung cancer, chronic obstructive pulmonary disease (COPD) and kidney and immune system disease.

- **Silicosis** – Silicosis is a pneumoconiosis (lung disease) caused by the inhalation of respirable crystalline silica dust. The dust results in abrasions and ultimately scarring in the parts of the lungs that provide oxygen to the blood.
- **Lung Cancer** – Lung cancer is the uncontrolled growth of abnormal cells in the lungs. These cells divide rapidly and develop into tumors, which affect the lungs' ability to efficiently and effectively provide oxygen to the bloodstream. Tumors that become malignant spread to other parts of the body as well.
- **Chronic Obstructive Pulmonary Disease (COPD)** – COPD is a lung disease that makes breathing difficult. There are two main types of the disease, chronic bronchitis and emphysema. Chronic bronchitis results in a persistent cough and emphysema results in permanent damage to the lungs. Most people who have COPD have both types of the disease.
- **Kidney and Immune System Disease** – Kidney disease is any disease that reduces the functioning of the kidneys. The immune system protects the body from foreign substances and organisms by producing the body's immune response. Kidney disease and other diseases can result from failure of the immune system to protect the body (immune system disease).

Respirable Silica Dust-Producing Construction Activities

In the mechanical construction industry, the most common silica dust-generating tasks include drilling holes in concrete ceilings to install pipe and duct hangers, and cutting or boring holes into concrete floors, walls and ceilings to run pipe and duct. However, it's important that mechanical construction workers are familiar with all the activities that could generate respirable silica dust, even if they are not performing the activities themselves. That way they can prevent overexposure to respirable crystalline silica generated by other trades. The construction activities that are most capable of generating respirable crystalline silica when performed on silica-containing materials are those that result in cutting, pounding, scraping, grinding or otherwise pulverizing material that contains crystalline silica.

Measuring Respirable Silica Dust

Measuring respirable silica requires industrial hygiene work. Breathing zone air samples are taken using carefully calibrated air sampling pumps. The pumps' air flow is controlled, monitored, and timed so that an eight (8)-hour time weighted averaged (TWA) can be calculated once the samples have been evaluated.

The samples are collected in filters, which are sent to qualified laboratories for analysis. The samples are observed through microscopes to ascertain the type and concentration of respirable silica, which then become part of exposure limit calculations. An established air sampling protocol must be used to ensure accurate and consistent results (see Appendix D for information on how to access the protocol). Once the sampling has been completed, the samples need to be sent to a qualified laboratory for analysis following the prescribed chain of custody (see Appendix C for information on laboratory selection). Mechanical construction firms/employers that are not using the exposure control methods established in Table 1 of OSHA's Respirable Crystalline Silica Standard are required to ensure, and must be able to prove, that their

workers are not exposed above the permissible exposure limit (PEL). When Table 1 can't be used, or the firm/employer chooses not to use it, there are two options for meeting this requirement. Either Initial Exposure Determination Air Monitoring or Objective Data may be used.

- **Initial Exposure Determination Air Monitoring** – When employers are unaware of respirable silica dust exposure levels, air monitoring is performed to determine the exposure levels. While the air monitoring is being performed, affected workers must be protected from overexposure. Monitoring has to be performed on each respirable silica dust-generating activity to accurately determine the exposure levels because certain types of concrete contain more silica than others. The different types of drills, saws, boring equipment, bits, blades, etc., also can generate varying amounts of respirable silica dust, even when used on the same type of concrete.
- **Objective Data** – Employers who have access to objective data that shows that their workers are not exposed to respirable silica dust above the permissible exposure limit (PEL) can use that data in lieu of performing expensive and time-consuming initial exposure determination air monitoring. However, the activity that generated that data must be "substantially" similar to the activity that will be performed. Making this determination can be tricky and somewhat subjective. Therefore, it's a good idea to ensure that the forthcoming activity for which you will use the objective data (1) is practically identical to the activity that generated the objective data (2).

  For example, the concrete from (1) should be the same type as the concrete from (2)—the same hardness, the same type of silica, the same concentration of silica, etc. Many other factors need to be the same too. For example, if (2) was an indoor sample and (1) was an outdoor sample, they would not be considered "substantially similar," and therefore would not pass for use as objective data. Many other factors also may need to be considered, such as temperature, humidity and ventilation at the time of sampling.

Safe Work Practices

Safe work practices are about controlling respirable crystalline silica exposures and include engineering and work practice controls. Presently, the emphasis for controlling exposures is on the use of vacuum dust collection systems, the wet method, dust barriers, ventilation, and respiratory protection when needed. However, it's important to remember that there are, at times, significant problems with each of these methods. Therefore, you may have to make adjustments to ensure safe work practices.

- **Wet Method** – When respirable crystalline silica is wetted it becomes heavier than air and is pulled to the ground by gravity. It is no longer potentially harmful when it falls away from the breathing zone and can't be inhaled. Wet methods can be helpful in controlling dust. Many types of masonry boring and cutting tools use water to cool their cutting attachments, which can help keep some dust out of the breathing zone. For example, some types of masonry saws have built-in blade cooling systems where water is directed to the blade to keep it from overheating. These systems may not knock down all the dust generated by the process, but they can help considerably. However, the wet method is not always suitable. For example, if the temperature is below freezing this method will create icy conditions, introducing a new hazard. And, if the work is near energized electrical conductors, which become hazardous in wet conditions, the wet method should not be used.

- **Vacuum Dust Collection Systems** – These dust collection systems are built into certain types of drilling, cutting, jackhammering, and chipping equipment. They include shrouds or cowlings to collect dust particles during the activity. The duct collector must provide air flow recommended by its manufacturer or greater. These systems also must be equipped with high-efficiency particulate air (HEPA) filters with 99% or greater efficiency. Respirable crystalline silica particles are small enough to get through other types of filters. These systems, when used properly, will significantly reduce exposures.
- **Ventilation** – A point-of-operation ventilation system could work well to reduce exposure to respirable silica dust, but for the most part, these systems are extremely impractical for mechanical construction. Fans can be helpful under the right conditions, but they can also increase exposure if they are not set up and used properly. Ventilation booths work well to reduce exposure, but they would rarely be helpful for mechanical construction work. However, masons using a properly constructed ventilation booth for cutting brick and block inside a building under construction would work well to protect other trades in the same work area.
- **Respiratory Protection** – Respiratory protection is sometimes required to reduce exposure levels below the PEL. In most cases, workers can use air purifying respirators for this purpose. Be aware that workers who have to wear respirators must receive medical evaluations, be fit-tested, and receive extensive training on respirator selection, use, maintenance and storage before starting work while wearing one (see Appendix B for information on respiratory protection training requirements for affected workers).

Unsafe Work Practices

Some practices are unsafe because they stir up respirable silica dust into workers' breathing zones. These unsafe work practices include the use of compressed air for cleaning, dry sweeping and the use of improperly placed fans.

- **Use of Compressed Air for Cleaning** – Using compressed air to clean surfaces or blow dust off clothing can generate airborne concentrations of respirable silica dust. A vacuum equipped with a HEPA filter should be used in lieu of compressed air.
- **Dry Sweeping** – Dry sweeping can also generate respirable silica dust. A HEPA-filtered vacuum is recommended in place of dry sweeping.
- **Improperly Used Fans** – Fans used by themselves as the primary method for dust control are not effective. Fans that are positioned in a way that will blow air towards workers also can increase exposure to respirable silica dust.

Suggested Safe Work Practices for Some of the Most Common Mechanical Construction Activities that Can Produce Respirable Silica Dust

The following safe work practices are from Table 1 of OSHA's Standard on Respirable Crystalline Silica.

Where respiratory protection is required, reference is made to an Assigned Protection Factor (APF). APF is the level of protection a respirator can be expected to provide when it is functioning properly, and the user is wearing it correctly. The APF number refers to the type of respiratory protection/respirator needed.

Activity	Safe Work Practices
Drilling – (Hand Held and Stand-Mounted Drills, Including Impact and Rotary Hammer Drills)	- Commercially available shroud or cowling with dust collection system - Dust collector airflow must be greater than or equal to that recommended by the manufacturer, and have a filter with a 99% or greater efficiency rating - Careful observance of manufacturer's tool and equipment instructions to minimize dust emissions
Coring – (Rig Mounted Core Saws or Drills)	- Use a tool with an integrated water delivery system delivering water directly to the cutting surface - Operate and maintain the tool in accordance with the manufacturer's instructions to minimize dust emissions
Cutting – (Handheld Power Saws)	- Use a tool with an integrated water delivery system delivering water directly to the cutting surface - Operate and maintain the tool in accordance with the manufacturer's instructions to minimize dust emissions - Use respiratory protection (APF 10) when cutting indoors
Cutting – Walk-Behind Saws	- Use a tool with an integrated water delivery system delivering water directly to the cutting surface - Operate and maintain the tool in accordance with the manufacturer's instructions to minimize dust emissions - Use respiratory protection (APF 10) when cutting indoors

Common Activities Performed by Other Trades that Can Produce Harmful Concentrations of Respirable Silica Dust

The following applications, when performed in or near your workers' work areas, could be harmful to them if enough respirable silica dust is generated, and they are exposed to it for a long enough period. Your workers should be educated about the potential hazards associated with respirable silica dust, and the construction activities that can generate overexposure (see Appendix B for worker training guidance). When workers aren't sure whether adjacent activities could potentially generate respirable silica dust, they should inform their supervisor immediately. The following activities, when performed on materials that contain silica, could generate harmful concentrations of respirable crystalline silica.

- Operating stationary masonry saws
- Operating hand operated grinders
- Tuckpointing
- Operating jackhammers
- Operating vehicle-mounted drilling rigs (concrete or rock)
- Operating milling machines
- Operating drivable masonry saws
- Rock crushing
- Operating earth moving equipment
- Finishing drywall
- Drilling
- Impact drilling
- Core drilling
- Cutting with handheld masonry saws
- Cutting with walk-behind masonry saws

Appendix A – Summary of OSHA's Respirable Crystalline Silica Standard

The following summary of OSHA's Respirable Crystalline Silica Standard is provided so that you can obtain a cursory understanding of what will be required to comply with the new standard. Some important details have been omitted from the summary. Please be sure to read the actual standard in its entirety when developing your company's respirable crystalline silica policies, procedures, exposure control plans, training programs, and materials.

29 CFR 1926.1153 Respirable Crystalline Silica

Specified Exposure Control Methods

- Affected employers will have to control worker exposure to silica by implementing the engineering controls established in Table 1 of the standard (a copy of Table 1 is included in this appendix), or by using the alternative exposure control methods described in the standard.
- When using Table 1 – For indoor or enclosed areas, employers must provide a means of exhaust to minimize the accumulation of visible airborne dust.
- When using Table 1 – For wet methods, employers must ensure that water flow rates are sufficient to minimize release of visible dust.
- When using Table 1 – When a worker performs more than one Table 1 task during a shift, those tasks together exceed four hours, and respiratory protection is required, the employer must ensure that the affected worker uses the level of respiratory protection that is specified for more than four hours per shift.

Alternative Exposure Control Methods

- When tasks are not listed in Table 1 or when the requirements in Table 1 can't be met, employers must use alternative exposure control methods for worker protection.
- Employers must ensure that no worker is exposed to an airborne concentration of respirable crystalline silica that exceeds 50 ug/m^3 (50 micrograms of respirable crystalline silica per cubic meter of air space (PEL) based on an 8-hour time weighted average (TWA).
- Employers must perform exposure assessments for each employee who could reasonably be expected to be exposed to respirable crystalline silica at or above 25 ug/m^3 (25 micrograms of respirable crystalline silica per cubic meter of air space (AL) based on an 8-hour time weighted average (TWA) using either:
    - Any combination of air monitoring and objective data that would accurately characterize worker exposure to respirable crystalline silica; or
    - Initial monitoring to assess the 8-hour TWA based on one or more breathing zone air samples.
- When initial monitoring indicates that worker exposure is below the AL, employers may discontinue monitoring.

- When initial monitoring indicates that workers are exposed above the AL, but below the PEL, employers must repeat monitoring within 6 months of the most recent monitoring.
- When initial monitoring indicates that workers are exposed above the PEL, employers must repeat monitoring within 3 months of the most recent monitoring.
- When the most recent monitoring (not initial monitoring) indicates that worker exposure is below the AL, employers must repeat the monitoring every 6 months until two consecutive measurements taken seven or more days apart are below the AL.
    - When both measurements are below the AL, employers may discontinue that monitoring.
- Employers must reassess worker exposure whenever a change in production, process, control equipment, personnel, work practices, or any other reason that becomes apparent could change exposures to measure at or above the AL.
- Employers must ensure that all samples taken to satisfy monitoring requirements are evaluated by a qualified laboratory that performs the analyses in accordance with the procedures specified in Appendix A of the standard.
- Within five work days after the exposure assessment, employers must notify each affected worker about the results of the assessment either individually in writing, or by posting a notice.
    - When exposure assessment results show that workers are exposed above the PEL, employers must include in the written results a description of the action being taken to reduce exposures below the PEL.
- Employers must provide affected workers or their designated representatives an opportunity to observe any monitoring.
    - When observation requires use of protective clothing or equipment, employers must provide the clothing and/or equipment and ensure its use.
- Unless the controls are infeasible, employers must establish engineering and work practice controls to reduce and maintain exposures at or below the PEL.
    - When the controls are feasible, but inefficient, employers must continue to use them to reduce exposure, and also implement the use of suitable respiratory protection.

Respiratory Protection

- When respiratory protection is required, employers must provide affected workers with an appropriate respirator and ensure compliance with all applicable parts of OSHA standard *29 CFR 1910.134 (Respiratory Protection)*.
- Respiratory protection is required as specified in Table 1.
- Respiratory protection is required for tasks not listed in Table 1, and where affected employers do not fully and properly implement engineering controls, work practices, and respiratory protection described in Table 1 as follows:
    - Where exposure exceeds the PEL during the establishment of engineering and work practice controls;

- Where exposure exceeds the PEL during maintenance or repair tasks performed where engineering and work practice controls are not feasible; and
- When engineering and work practice controls are insufficient to reduce exposures to at or below the PEL.

Housekeeping

- Employers must not allow dry sweeping or dry brushing where it could contribute to worker exposures, unless other methods that minimize the likelihood of exposure are not feasible.
- Employers must not allow the use of compressed air to clean clothing or surfaces where it could contribute to worker exposures, unless a ventilation system that effectively captures the dust cloud is used, or no alternative method is feasible.

Written Exposure Control Plan

- Employers must establish a written exposure control plan that includes at least the following:
  - A description of the tasks in the workplace that involve respirable crystalline silica;
  - A description of engineering controls, work practice controls, and respiratory protection used to limit worker exposure for each task;
  - A description of the housekeeping measures used to limit worker exposure; and
  - A description of the procedures used to restrict access to work areas when necessary to minimize the number of workers exposed and their level of exposure, including exposures generated by others on the jobsite.
- Employers must review and evaluate the effectiveness of written exposure control plans at least annually and update them as necessary.
- Employers must make the written plan readily accessible upon request to each affected worker and their designated representatives.
- Employers must designate a competent person to make frequent and regular inspections of jobsites, materials, and equipment to implement the plan.

Medical Surveillance

- Employers must make medical surveillance available at no cost to each affected worker who will be required to use a respirator for more than 30 days per year.
- Employers must ensure that medical examinations are performed by a suitable physician or other licensed health care professional.
- Employers must make an initial baseline medical examination available within 30 days after initial assignment, unless the affected worker has received a suitable medical examination within the past 3 years.
- The baseline medical examination must include:
  - Medical and work history emphasizing past, present, and anticipated exposure to respirable crystalline silica, dust, and other agents affecting the respiratory system;

  - History of respiratory system dysfunction, including signs and symptoms of respiratory disease;
  - History of tuberculosis;
  - History of smoking/current smoking status;
  - A physical examination with special emphasis on the respiratory system;
  - A suitable chest X-ray that meets the specifications described in the standard;
  - A pulmonary function test that meets the specifications described in the standard;
  - Testing for latent tuberculosis infection; and
  - Any other tests deemed appropriate by the physician or licensed healthcare professional.
- Employers must make periodic medical examinations available to affected workers at least every 3 years, or more frequently if recommended by the physician or licensed health care professional.
- Employers must ensure that the examining physician or licensed health care professional has a copy of the standard, and must provide that person with the following:
  - A description of the affected worker's former, current, and anticipated duties pertaining to occupational exposure to respirable crystalline silica;
  - The affected worker's former, current, and anticipated levels of occupational exposure to respirable crystalline silica;
  - A description of any personal protective equipment used or to be used by the affected worker, including when and how long the worker has used or will use that equipment; and
  - Information from records of employment-related medical examinations previously provided to the worker and currently within the control of the employer.
- Employers must ensure that the physician or licensed health care provider explains the results of the medical examination to the affected worker and provides the worker with a written medical report within 30 days of each medical examination.
- The written medical report must include:
  - A statement indicating the results of the medical examination, including any medical conditions that would place the worker at increased risk of material impairment to health from exposure to respirable crystalline silica;
  - A statement indicating any medical conditions that require further evaluation or treatment;
  - Any recommended limitations on the worker's use of respirators;
  - Any recommended limitations on the worker's exposure to respirable crystalline silica; and
  - A statement that the worker should be examined by a specialist if the results of the chest X-ray make it necessary, or if the physician or licensed health care professional deems it appropriate.
- Employers must obtain a written medical opinion from the physician or licensed health care professional within 30 days of the medical examination.
- The written medical opinion must include:
  - The date of the examination;
  - A statement that the examination has met the requirements of the standard; and

  - Any recommended limitations on the worker's use of respirators.
- If the affected worker provides written authorization, the written medical opinion must also include:
  - Any recommended limitations on the worker's exposure to respirable crystalline silica;
  - A statement that the worker should be examined by a specialist if the results of the chest X-ray make it necessary, or if the physician or licensed health care professional deems it appropriate.
- Employers must ensure that each affected worker receives a copy of the written medical opinion within 30 days of each medical examination.
- Where the physician or licensed health care professional's written medical opinion indicates that a worker should be examined by a specialist, the employer must make the examination available within 30 days of receiving the written medical opinion.
- Each affected employer must ensure that the specialist is provided with the same information that affected employers are required to provide to the original physician or licensed health care professional.
- Each affected employer must ensure that the specialist explains the results of the medical examination to the affected worker and provides the worker with a written medical report within 30 days of the examination.
- The written medical report must include:
  - A statement indicating the results of the medical examination, including any medical conditions that would place the worker at increased risk of material impairment to health from exposure to respirable crystalline silica;
  - A statement indicating any medical conditions that require further evaluation or treatment;
  - Any recommended limitations on the worker's use of respirators; and
  - Any recommended limitations on the worker's exposure to respirable crystalline silica.
- Employers must obtain a written medical opinion from the specialist within 30 days of the medical examination.
- The written medical opinion must include:
  - The date of the examination; and
  - Any recommended limitations on the worker's use of respirators.
- If the affected worker provides written authorization, the written medical opinion must also include any recommended limitations on the worker's exposure to respirable crystalline silica.

Communication of Respirable Crystalline Silica Hazards to Workers

- Employers must include respirable crystalline silica in their written hazard communication program required by 29 CFR 1910.1200 (*Hazard Communication*).
- Affected employers must ensure that the following hazards are addressed in the program:
  - Cancer;
  - Lung effects;

  - Immune system effects; and
  - Kidney effects.
- Employers must ensure that affected workers can demonstrate knowledge and understanding of the following:
  - Health hazards associated with exposure to respirable crystalline silica;
  - Specific tasks in the workplace that could result in exposure to respirable crystalline silica;
  - Specific measures implemented by the employer to protect workers from exposure to respirable crystalline silica, including engineering controls, work practices, and respirators to be used;
  - The contents of the standard;
  - The identity of the designated competent person; and
  - The purpose and description of the medical surveillance program.
- Employers must make a copy of the standard available to each affected worker without cost.

Recordkeeping

- Employers must create and maintain a record of all exposure assessments. The record must include:
  - Date of measurement for each sample taken;
  - Task monitored;
  - Sampling and analytical methods used;
  - Number, duration, and results of samples taken;
  - Identity of the laboratory that performed the analysis;
  - Types of personal protective equipment, such as respirators worn by the affected workers who were monitored; and
  - Name, social security number, and job classification of all workers represented by the monitoring, indicating which workers were monitored.
- Employers must ensure that exposure records are maintained and made available as required by 29 CFR 1910.1020 (*Access to Employee Exposure and Medical Records*).
- Employers must create and maintain a record of all objective data relied upon to comply with the standard. The record must include the following:
  - Crystalline silica containing material in question;
  - Source of the objective data;
  - Testing protocol and results of testing;
  - Description of the process, task, activity, or exposures on which the objective data were based; and
  - Any other relevant data regarding the process, task, activity, or exposures on which the objective data were based.
- Employers must ensure that objective data are maintained and made available as required by 29 CFR 1910.1020 (*Access to Employee Exposure and Medical Records)*.

- Employers must create and maintain a record of each affected worker covered by the medical surveillance requirements. The record must include:
  - Name and social security number of affected worker;
  - A copy of the physician's or licensed health care professional's written medical opinion; and
  - A copy of the information provided to the original physician or licensed health care professional and, if applicable, the specialist.
- Employers must ensure that medical records are maintained and made available as required by 29 CFR 1910.1020 (*Access to Employee Exposure and Medical Records)*.

Addendum – Table 1 of 29 CFR 1926.1153 Respirable Crystalline Silica

Table 1 provides exposure control methods for several specified tasks/pieces of equipment that could produce respirable crystalline silica. When properly used, Table 1 can replace the more traditional methods of exposure control identified through initial exposure determination air monitoring.

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/shift	> 4 hours/shift
(i) Stationary masonry saws	- Use saws equipped with an integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions.	None	None

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(ii) Handheld power saws (any blade diameter)	- Use saws equipped with an integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions. – When used outdoors. – When used indoors or in an enclosed area.	None APF 10	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: - Use saws equipped with commercially available dust collection systems. - Operate and maintain tools in accordance with the 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.	None	None

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(iv) Walk-behind saws	- Use saws equipped with an integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions. – When used outdoors. – When used indoors or in an enclosed area.	None APF 10	None APF 10
(v) Drivable saws	For tasks performed outdoors only: - Use saws equipped with an integrated water delivery system that continuously feeds water to the blade. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions.	None	None
(vi) Rig-mounted core saws or drills	- Use tools equipped with an integrated water delivery system that supplies water to the cutting surface. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions.	None	None

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(vii) Handheld and stand-mounted drills (including impact and rotary hammer drills)	- Use drills equipped with commercially available shrouds or cowlings with dust collection systems. - Operate and maintain tools in accordance with the 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.	None	None
(viii) Dowel drilling rigs for concrete	For tasks performed outdoors only: - Use shrouds around drill bits 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.	APF 10	APF 10

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(ix) Vehicle-mounted drilling rigs for rock and concrete	- Use dust collection systems with close capture hood or shroud around the drill bit with a low-flow water spray to wet the dust at the discharge point from the dust collector. OR - Operate from within an enclosed cab and use water for dust suppression on the drill bit.	None None	None None
(x) Jackhammers and handheld powered chipping tools	- Use tools with a water delivery system that supplies a continuous stream or spray of water at the point of impact. – When used outdoors. – When used indoors or in an enclosed area. OR - Use tools equipped with a commercially available shroud and dust collection system. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions.	None APF 10	APF 10 APF 10

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(x) Jackhammers and handheld powered chipping tools *(continued from previous page)*	- 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. – When used indoors or in an enclosed area.	None APF 10	APF 10 APF 10
(xi) Handheld grinders for mortar removal (i.e., tuckpointing)	- Use grinders equipped with a commercially available shroud and dust collection system. - Operate and maintain tools in accordance with the 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.	APF 10	APF 25

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xii) Handheld grinders for uses other than mortar removal	For tasks performed outdoors only: - Use grinders equipped with an integrated water delivery system that continuously feeds water to the grinding surface. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions. OR - Use grinders equipped with a commercially available shroud and dust collection system. - Operate and maintain tools in accordance with the 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.		
	– When used outdoors.	None	None
	– When used indoors or in an enclosed area.	None	APF 10

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xiii) Walk-behind milling machines and floor grinders	- Use machines equipped with an integrated water delivery system that continuously feeds water to the cutting surface. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions. OR	None	None
	- Use machines equipped with a dust collection system recommended by the manufacturer. - Operate and maintain tools in accordance with the manufacturer's instructions to minimize dust emissions. - Dust collector must provide the air flow recommended by the manufacturer, or greater, and have a filter with 99% or greater efficiency and a filter-cleaning mechanism. - When used indoors or in an enclosed area, use a HEPA-filtered vacuum to remove loose dust in between passes.	None	None

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours/shift	> 4 hours/shift
(xiv) Small drivable milling machines (less than half-lane)	- Use machines equipped with supplemental water sprays designed to suppress dust. Water must be combined with a surfactant. - Operate and maintain machines to minimize dust emissions.	None	None
(xv) Large drivable milling machines (half-lane and larger)	For cuts of any depth on asphalt only: - Use machines equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. - Operate and maintain machines to minimize dust emissions. For cuts of four inches in depth or less on any substrate: - Use machines equipped with exhaust ventilation on drum enclosure and supplemental water sprays designed to suppress dust. - Operate and maintain machines to minimize dust emissions. OR - Use machines equipped with supplemental water spray designed to suppress dust. Water must be combined with a surfactant. - Operate and maintain machines to minimize dust emissions.	None None None	None None None

Equipment/Task	Engineering and Work Practice Control Methods	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
		≤ 4 hours /shift	> 4 hours /shift
(xvi) Crushing machines	- Use equipment designed to deliver water spray or mist for dust suppression at crusher and other points where dust is generated (e.g., hoppers, conveyors, sieves/sizing or vibrating components, and discharge points). - Operate and maintain machines in accordance with the manufacturer's instructions to minimize dust emissions. - Use a ventilated booth that provides fresh, climate-controlled air to the operator or a remote-control station.	None	None
(xvii) Heavy equipment and utility vehicles used to abrade or fracture silica-containing materials (e.g., hoe-ramming, rock ripping) or used during demolition activities involving silica-containing materials	- Operate equipment from within an enclosed cab. - When employees outside of the cab are engaged in the task, apply water and/or dust suppressants as necessary to minimize dust emissions.	None None	None None
(xviii) Heavy equipment and utility vehicles for tasks such as grading and excavating but not including: demolishing, abrading, or fracturing silica-containing materials	- Apply water and/or dust suppressants as necessary to minimize dust emissions. OR - When the equipment operator is the only employee engaged in the task, operate equipment from within an enclosed cab.	None None	None None

Appendix B – Worker Training Guidance

Make sure that all affected workers receive training on silica safety. This training can be included as part of your hazard communication training. This guide contains most of the information you need for silica safety training. Make sure to cover the following topics at a minimum.

- What silica is;
- Differences between larger silica particles and respirable silica dust;
- Mechanical construction activities that can generate respirable silica dust;
- Other construction trade activities that can generate respirable silica dust;
- The hazards associated with overexposure to respirable silica dust;
- Methods workers can use to protect themselves from overexposure;
    - High Efficiency Particulate Air (HEPA)-filtered dust collection systems
    - Wet method
    - High Efficiency Particulate Air (HEPA)-filtered vacuum systems
    - Ventilation, when appropriate
    - Respiratory protection, when needed
    - Good versus bad housekeeping practices
- Where workers can find the tools and protective equipment they need; and
- Who workers should contact with questions and concerns related to silica.

Any affected workers who will be required to wear respirators will need additional training based on the requirements in OSHA's respiratory protection standard. The minimum training topics for respiratory protection include the following.

- Your company's written respiratory protection program contents;
- Your workers' responsibilities under the program;
- OSHA's Respiratory Protection Standard;
- The silica-related respiratory hazards identified at the jobsite;
- Proper selection of a respirator for the specific jobsite application;
- Proper use of that respirator;
- Limitations of that respirator;
- How to properly put on the respirator;

- How to perform positive and negative pressure checks;
- The fit testing process;
- Emergency procedures;
- Maintenance and storage; and
- Medical signs/symptoms limiting the effective use of respirators.

Additional Resources from MCAA

MCAA also offers the following resources to assist you in tailoring a safety plan or program that is specific to your company. You can find these, and all of MCAA's educational resources, in our online Resource Center.

- **Model Silica Exposure Control Plan for Mechanical Construction**
  - For Table 1 Applications - Download
  - For Alternative Exposure Control Methods - Download
- **Model Respiratory Protection Program**
  - Download

Appendix C –
Laboratory Selection Guidance

When you send air monitoring samples to a laboratory, you want accurate, credible, and carefully documented results. Following are several questions to consider when choosing a laboratory to analyze your samples:

- Is the laboratory accredited? Refer to the Industrial Hygiene Laboratory Accreditation Program (IHLAP).
- Does the laboratory perform silica analysis using X-ray diffraction? There are other methods of analyzing silica, but this one appears to be the best at present.
- Has the laboratory established internal quality control procedures?
- Is the laboratory a recognized, credible entity?

Appendix D –
Air Sampling Protocol

OSHA has an established protocol for personal air sampling. Personal air sampling means that one or more workers will wear sampling pumps, and the samples will be taken from those workers' breathing zones. The protocol is one part of the OSHA Technical Manual (OTM), Section II, Chapter 1.

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