



It's not just dust!

What you should know about crystalline silica, silicosis, and Oregon OSHA silica rules.



DCBS | Consumer and
Business Services
Oregon OSHA

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About this guide

"It's not just dust! What you should know about crystalline silica, silicosis, and Oregon OSHA silica rules." is an Oregon OSHA Standards and Technical Resources Section publication.

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What is crystalline silica?

Crystalline silica is the scientific name for a group of minerals containing silicon and oxygen. *Crystalline* means that the oxygen and silicon atoms are arranged in a specific pattern. Crystalline silica is a common mineral found in naturally-occurring and man-made materials such as sand, stone, and engineered stone countertops.

Forms of crystalline silica

Crystalline silica exists in several forms, including *quartz*, *crystalite*, and *tridymite*. Tridymite is the most potent, but least common, form. Crystalite, which occurs naturally in volcanic rock, is often found with quartz in the Pacific Northwest. Of these forms, quartz is the most common; in fact, it's the second most common mineral on the planet. (Feldspar is most common.)

What is silicosis?

Silicosis is a lung disease caused by breathing dust that contains particles of crystalline silica — particles so small you can see them only with a microscope.

The cause of silicosis has been known for centuries — the earliest cases of silicosis were recorded before the first century — yet workers continue to die every year from the disease.

Crystalline silica exists almost everywhere in our natural environment. It's abundant in soil, sand, dust, quartz, and granite rock. Not surprisingly, crystalline silica also exists in products that we make or use every day at home and at work. For example, china tableware is made from materials containing finely ground quartz. And unwashed root vegetables such as potatoes are coated with soil containing crystalline silica — a possible health hazard for those who harvest, sort, and bag them without appropriate exposure controls.

It's important to remember that crystalline silica can cause silicosis only when it is inhaled as dust or a fine powder. When they are inhaled, the silica particles become trapped in the lungs and damage the tissue. The lung tissue scars and forms small rounded masses called nodules. Over time, the nodules grow, making breathing increasingly difficult.

Only a complete work history, a chest X-ray, and a lung-function test will determine whether a worker has the disease.

Most workers who get silicosis don't show any symptoms for 10 or more years. That's because their exposures are low, but frequent. They develop a condition called *chronic silicosis*.

As exposure levels increase, silicosis symptoms can appear much earlier — a condition called *accelerated silicosis*. Those diagnosed with accelerated silicosis often show symptoms within five to 10 years.

Workers exposed to extremely high levels of silica dust may develop *acute silicosis* and show symptoms within only a few weeks after an initial exposure.

The best way to prevent silicosis is to identify the work tasks that produce silica dust and then eliminate or control the dust.

Who should be concerned about silicosis?

Any worker exposed to dust that contains crystalline silica — from crushed rock, soil, dirt, gravel, or sand, for example — should be concerned about silicosis. Common exposure sources include cutting, sawing, drilling, and crushing concrete, brick, ceramic tiles, rock, and stone products.

Because it is so common in the products that we make and use, you should be cautious when you work with any material that contains more than 0.1 percent crystalline silica.



Activities that could put workers at risk:

Manufacturing

- ▶ Metal casting
- ▶ Glass products
- ▶ Ceramics, clay, and pottery
- ▶ Asphalt paving material
- ▶ Cut stone and stone products
- ▶ Abrasives
- ▶ Paint and rubber products
- ▶ Filtered foods and beverages

Construction

- ▶ Chipping, hammering, and drilling rock
- ▶ Crushing, loading, hauling, and dumping rock
- ▶ Abrasive blasting
- ▶ Sawing, hammering, drilling, grinding, and chipping masonry, concrete, or fiber-cement siding
- ▶ Demolition of concrete or masonry structures
- ▶ Dry sweeping or using pressurized air to blow concrete, rock, or sand dust

Oregon OSHA's silica rules

Oregon OSHA's silica rules (there are 13) were written to help employers control their employees' exposure to silica dust.

The rules apply to all work-related exposures in general industry and construction workplaces, with two exceptions:

1. The rules do not apply to the processing of sorptive clays. Sorptive clays are used in consumer products and industrial applications such as pet litter and sealants for landfills.
2. The rules do not apply to employee exposures that will never exceed 25 micrograms per cubic meter of air under any foreseeable circumstances. (Known as the *action level*.) This exception does not apply if engineering controls are used to maintain exposure levels below the action level. The failure of control measures are foreseeable circumstances.

These silica rules do not apply to agriculture or forest activities employers, although there are still exposure limits for these industries. You can refer to the limits in Table Z-3 of the applicable air contaminants rule.

A rule-by-rule summary of the key requirements

The exposure assessment (437-002-1056)

Your employees' exposures to silica dust must not exceed the *permissible exposure limit* (PEL), which is 50 micrograms per cubic meter of air averaged over an eight-hour day. This means that exposures can fluctuate over the eight-hour day, but the average exposure cannot exceed 50 micrograms per cubic meter of air.

This rule requires you to assess the eight-hour exposure level for each employee who may be exposed to silica dust. The purpose of the assessment is to help you:

- Identify where exposures are occurring
- Select appropriate exposure control methods and ensure those methods are effective
- Prevent employees from being exposed above the PEL
- Provide employees with information about their exposure levels
- Determine which employees need medical surveillance for silica exposures

Key term

Permissible exposure limit (PEL)

50 micrograms per cubic meter of air averaged over an eight-hour day.

The amount of silica it takes to reach the airborne permissible exposure limit (PEL)



There are two options for assessing employee exposures: The *performance option* and the *scheduled monitoring option*.

The performance option

The performance option allows you to determine an employee's exposure level based on any combination of *air monitoring data* or *objective data* that accurately describe the employee's exposure.

Objective data are based on other sources of information that accurately reflect your employees' exposure to silica dust. Objective data must reflect the tasks that expose your employees to silica dust. Examples of objective data include:

- Air monitoring data from industry surveys
- Calculations based on the amount of silica in a substance
- Historical records of air monitoring data for similar tasks at your workplace

If you choose the performance option, you must:

- Have the data available before employees begin their work for the first time
- Reassess exposures whenever there is a change in the workplace that could result in exposures above 25 micrograms per cubic meter of air (the *action level*)
- Be able to show that the data are accurate
- Ensure that the data reflect the exposures of employees on each shift, in each job classification, and in each work area

The performance option may be useful when measuring employee exposures is challenging – when tasks are performed only occasionally, for example – or when you need to determine exposure levels for a large group of employees who perform the same task.

The scheduled monitoring option

The scheduled monitoring option requires you to conduct one or more air monitoring tests to determine your employees' exposure levels.

How often air monitoring must be done – the schedule – depends on the results from *initial* air monitoring you do to determine employee exposure levels. For example:

- If initial monitoring shows that employee exposures are below the action level, no further monitoring is required for those employees.

- If initial exposure monitoring shows employee exposures at or above the action level but at or below the PEL, you must repeat monitoring within six months.
- If the most recent exposure monitoring shows employee exposures above the PEL, you must repeat monitoring within three months.

Exposure monitoring under the scheduled monitoring option must include one full-shift sample taken for each task, in each job classification, in each work area, and on each shift. You may not need to do exposure monitoring for each employee, however. You may be able to do *representative sampling*, which involves monitoring one employee or a group of employees who may have the highest exposure levels – for example, employees closest to an exposure source. The results of the representative sample then apply to the other employees in the same job classifications who perform the same tasks.

Notifying your employees about the exposure assessment

You must notify each affected employee about the results of the exposure assessment within 15 work days, or five working days if you are a construction employer and need to assess exposures outside of Table 1. *Affected* means any employee whose exposures were directly assessed or represented in the exposure assessment. This period starts when:

- You complete the exposure assessment under the *performance option*
- You receive the air monitoring results from the lab under the *scheduled monitoring option*.

You must notify each employee in writing or post the results in a location available to all employees. When the exposure assessment shows exposures above the PEL, the written notification must also describe the corrective action – including engineering and work practice controls – you are taking to ensure that employee exposures do not exceed the PEL.

Observing air monitoring

You must allow affected employees or their designated representatives to observe air monitoring. When observation requires entry into an area where protective clothing or respirators are necessary, you must ensure that they are used.



Regulated and restricted access areas (437-002-1058)

Only authorized employees may enter areas where they could be exposed to silica dust above the PEL. These areas are called *regulated areas* at fixed sites and *restricted areas* at construction sites.

Regulated areas

The purpose of a regulated area is to:

- Ensure that employees know that silica exposure levels in the regulated area are likely to exceed the PEL
- Minimize the number of employees who could be exposed to silica dust
- Ensure that anyone who enters the regulated area is protected with an appropriate respirator

Establishing regulated areas. Establish regulated areas where exposures to silica dust are, or could be, greater than the PEL. You can use any combination of air monitoring data or objective data to establish and mark regulated areas.

Marking regulated areas. You must mark off regulated areas from the rest of the workplace. Cones, stanchions, tape, barricades, lines, or textured flooring are some of the ways of marking the boundaries.

Posting danger signs. You must also post a sign at each entrance to the regulated areas that reads:

DANGER
RESPIRABLE CRYSTALLINE SILICA
MAY CAUSE CANCER
CAUSES DAMAGE TO LUNGS
WEAR RESPIRATORY
PROTECTION IN THIS AREA
AUTHORIZED PERSONNEL ONLY

The purpose of the sign is to warn employees that they are entering a regulated area, inform them of the hazards, and notify them that respirators are required.

Table 1 and specified exposure control methods (437-002-1057)

Table 1 lists 18 common construction tasks that create high levels of silica dust and describes the engineering controls, work practices, and respiratory protection necessary for each task. When your employees do construction work and follow the control methods in Table 1, you are not required to conduct an exposure assessment. A common misunderstanding about Table 1 is that respirators are always necessary to protect employees. Respirators are necessary for some Table 1 tasks, but only when engineering and work practice controls do not keep silica dust at acceptable levels.

Limiting access to regulated areas. Limit access to regulated areas to:

- Those who are required to work in the area or those who you authorize to enter
- Those who enter the area as a designated representative of employees to observe silica exposure monitoring
- Oregon OSHA compliance officers and Oregon OSHA consultants

Providing respirators to those who enter regulated areas

- Provide each employee and the employee's designated representative entering a regulated area with an appropriate respirator that meets the requirements of Oregon OSHA respiratory protection rules (see 1910.134)
- Require employees and designated representatives to use respirators while they are in the regulated area

Those who enter the regulated area must put respirators on before they enter and take them off after they leave.

Written procedures required for restricted access areas

At construction sites, you must have written procedures that restrict access to areas where workers could be exposed to silica dust above the PEL. If your employees are following one of the exposure control methods listed in Table 1, you must also restrict access to the areas where they are required to use respirators. A designated competent person must ensure that employees follow the procedures.

Methods of compliance (437-002-1059)

Engineering and work practice controls are required to minimize employee exposures to silica dust; respirators are permitted only when feasible engineering and work practice controls cannot reduce exposures to or below the PEL.

A written exposure control plan that describes how you will keep employee exposures at or below the PEL is also required.

Engineering and work practice controls

The most common engineering controls for silica dust are wet methods and local exhaust ventilation. Wet methods include water or foam used where the dust is created to prevent it from becoming airborne. Local exhaust ventilation removes dust by capturing it at or near the point where it is created.

Isolation is another type of engineering control. Isolation separates employees from the dust source; a properly ventilated control booth is an example.

Work practice controls modify a task so that it reduces the likelihood or levels of exposure. Work practice controls are often used with engineering controls to protect employees. Examples include:

- Inspecting and maintaining engineering controls to keep them working efficiently
- Ensuring that tools spray water where silica dust is created
- Positioning local exhaust hoods directly over the exposure source and not opening windows near the local exhaust source
- Wetting down silica dust before sweeping it up
- Scheduling work so that tasks that create high exposure levels are performed when no other employees are in the area

The written exposure control plan

The written exposure control plan describes exactly how you will keep your employees' exposures at or below the PEL.

At a minimum, the plan must include:

- A description of each task your employees perform that could expose them to silica dust
- A description of the engineering controls, work practices, and respiratory protection you use to limit employee exposure to silica dust for each task.
- A description of the housekeeping methods your employees use to clean up silica dust

Exposure control at construction sites: For construction activities, you must designate a competent person to implement the written exposure control plan and regularly inspect job sites, materials, and equipment. You can designate any of your employees to be a competent person if the person:

- Can identify silica dust hazards at the construction site
- Is authorized to promptly eliminate or minimize the hazards at the site
- Has the knowledge and ability to implement the written exposure control plan for the site

Yearly review of written exposure control plan: You must review and evaluate the effectiveness of the written exposure control plan at least once a year and update it as necessary to ensure the information is current.

Availability of the written exposure control plan: Allow the written exposure control plan to be viewed or copied by each employee covered by Oregon OSHA's silica rules and their designated representatives.

Abrasive blasting: If your employees do abrasive blasting that uses crystalline silica blasting agents you must follow all of the requirements for the written exposure control plan and the requirements in Oregon OSHA's ventilation rules (see 437-002-1910.94).

Respiratory protection (437-002-1060)

Employees exposed to silica dust must wear respirators when:

- Engineering controls are being installed or work practice controls implemented and their exposures exceed the PEL
- Engineering and work practice controls are not feasible and their exposures exceed the PEL
- Engineering and work practice controls are not sufficient to keep their exposures at or below the PEL
- They are working in a regulated or restricted access area

When respirators are required, you must also have a respiratory protection program that meets the requirements of Oregon OSHA's respiratory protection rules (see 1910.134).

Housekeeping (437-002-1061)

Cleaning methods such as dry sweeping, dry brushing, and using compressed air can cause silica dust to become airborne and inhaled. Other cleaning methods such as wet sweeping and HEPA-filtered vacuums, should be used whenever possible because they prevent silica dust from becoming airborne.

Employees are prohibited from cleaning up silica dust by:

- Dry brushing or dry sweeping, unless methods such as wet sweeping and HEPA-filtered vacuuming are not feasible
- Cleaning with compressed air, unless the compressed air is used with a ventilation system that captures the dust, or no other cleaning method is feasible

In a very few cases, wet sweeping or HEPA-filtered vacuums may not be safe or effective and should not be used. But there may be other safe options. For example, if wet sweeping is not feasible near electrical equipment, a HEPA-filtered vacuum could be used instead.

In those rare cases where your employees need to use cleaning methods such as dry sweeping, dry brushing, or compressed air, you must be able to show why these are the only feasible alternatives.

Sweeping compounds can be used to control dust if there are no feasible alternatives to dry sweeping. However, you still must do an exposure assessment to determine the employee exposure levels to silica.

Medical surveillance (437-002-1062)

The purpose of medical surveillance is to:

- Identify employees who may be developing silicosis and protect them from further overexposures
- Determine if employees have health conditions that might increase their risk for silica-related diseases
- Evaluate employees' ability to wear respirators

Medical surveillance includes medical exams, chest X-rays, and lung function tests. This rule also describes what information you must provide the physician or other licensed health care professional (PLHCP) who conducts the exams, and the information that you must ensure that the PLHCP provides to you and your employees.

Medical surveillance – including travel time and the time it takes for an exam – must be provided at no cost to employees and at a reasonable time and place.

Which employees must be offered medical surveillance?

Medical surveillance exams must be offered to employees:

- Who do construction work and use a respirator 30 or more days per year.
- Who do not do construction work and may be exposed to silica dust at or above the PEL for 30 or more days per year. (Note: After July 1, 2020, medical surveillance must be offered to employees exposed to silica dust above the action level for 30 or more days per year.)

Exams are required within 30 days of an employee's initial work assignment and every three years thereafter. A PLHCP might recommend more frequent medical examinations based on factors such as high exposure levels or a medical finding such as an X-ray that suggests silicosis.

What information do you give the PLHCP?

The examining PLHCP must have a copy of Oregon OSHA's silica rules, including Appendix B, and:

- A description of the tasks that expose the employee to silica dust
- The exposure levels that result from those tasks
- A description of the personal protective equipment that the employee uses

- Information from other employment-related medical examinations that are under your control

What information does the PLHCP give the employee?

The PLHCP must explain the results of the medical exam to the employee and give the employee a written medical report within 30 days of each exam. Only the employee receives the report.

What information does the PLHCP give you?

The PLHCP must give you a written opinion within 30 days of the medical exam that includes:

- The exam date
- A statement that the exam met the requirements of Oregon OSHA's silica rules
- Any restrictions on the employee's use of respirators

If the employee gives the PLHCP written approval, the opinion can also include:

- Any recommended limitations on the employee's exposure to crystalline silica
- Any recommended referrals that the PLHCP makes for the employee to see a specialist

The employee must also receive a copy of the written medical opinion within 30 days of each examination.

Hazard communication and employee training (437-002-1063)

Include crystalline silica on the list of hazardous substances in your hazard communication program. Silica-containing products also must have safety data sheets and employees must understand how silica dust can affect their lungs, kidneys, and immune systems, and can cause cancer.

Employees must also be trained so that they understand all the parts of your exposure control plan, including:

- The health hazards associated with exposure to silica dust
- Specific tasks that could result in exposure silica dust
- Specific measures that you have taken to protect your employees, including engineering controls, work practices, and respirators
- The purpose the medical surveillance program
- The name of the designated competent person (required for construction work)

When is employee training required?

Employees must be trained when they are first assigned to a task that could expose them to silica dust and as often as necessary to ensure they know about any new hazards involving crystalline silica.

Who can do the training?

Anyone who understands crystalline silica hazards and Oregon OSHA's silica rules can do the training. Classroom instruction, discussions during safety meetings, handouts, and written materials are all acceptable training methods as long as they are presented in a manner and language that employees understand.

Recordkeeping (437-002-1064)

Your records must include detailed information on all air monitoring data from your employees' exposure assessments, including objective data if you used it. You also need to keep an accurate record – in accordance with Oregon OSHA's "Access to employee exposure and medical records" requirements – for each employee covered by medical surveillance.

Air monitoring data

Air monitoring records must include:

- The measurement date for each sample
- The task sampled
- The sampling and analytical methods used
- The number of samples, their duration, and the sample results
- The name of the lab laboratory that analyzed the samples
- The type respirators used by employees (if they were wearing them)
- The name, social security number, and job classification of all employees represented by the monitoring, indicating which employees were actually monitored.

Objective data

If you use objective data, your records must include:

- The crystalline silica-containing material represented by the data
- The source of the data
- The testing protocol and results of testing
- The process, task, or activity on which the objective data were based.

Medical surveillance records

Records for each employee under medical surveillance must include:

- The employee's name and social security number
- The PLHCPs' and specialists' written opinions
- A copy of the information that you are required to provide to PLHCPs and specialists.

You'll also need to keep an accurate record – in accordance with Oregon OSHA's "Access to employee exposure and medical records" requirements – for each employee covered by medical surveillance.

Getting help

The following sources offer more information about how to protect yourself, your co-workers, and your employees from silicosis.

- ▶ Your insurance carrier offers on-site safety and health consultations including air sampling and air monitoring. Contact your carrier to request a consultation.
- ▶ Oregon OSHA offers no-charge, on-site workplace consultations, full-service safety and health training, a video-lending library, and information online. To contact us, see the back page of this publication.
- ▶ Other resources
 - National Institute for Occupational Safety and Health (NIOSH), www.cdc.gov/niosh
 - Occupational Safety and Health Administration (OSHA), www.osha.gov
 - Mine Safety and Health Administration (MSHA), www.msha.gov

Oregon OSHA Services

Oregon OSHA offers a wide variety of safety and health services to employers and employees:

Enforcement

- ▶ **503-378-3272; 800-922-2689; enforce.web@oregon.gov**
- Offers pre-job conferences for mobile employers in industries such as logging and construction.
- Inspects places of employment for occupational safety and health hazards and investigates workplace complaints and accidents.
- Provides abatement assistance to employers who have received citations and provides compliance and technical assistance by phone.

Consultative Services

- ▶ **503-378-3272; 800-922-2689; consult.web@oregon.gov**
- Offers no-cost, on-site safety and health assistance to help Oregon employers recognize and correct workplace safety and health problems.
- Provides consultations in the areas of safety, industrial hygiene, ergonomics, occupational safety and health programs, assistance to new businesses, the Safety and Health Achievement Recognition Program (SHARP), and the Voluntary Protection Program (VPP).

Standards and Technical Resources

- ▶ **503-378-3272; 800-922-2689; tech.web@oregon.gov**
- Develops, interprets, and gives technical advice on Oregon OSHA's safety and health rules.
- Publishes safe-practices guides, pamphlets, and other materials for employers and employees.
- Manages the Oregon OSHA Resource Center, which offers safety videos, books, periodicals, and research assistance for employers and employees.

Oregon OSHA Services *(continued)*

Appeals

▶ 503-947-7426; 800-922-2689; admin.web@oregon.gov

- Provides the opportunity for employers to hold informal meetings with Oregon OSHA on concerns about workplace safety and health.
- Discusses Oregon OSHA's requirements and clarifies workplace safety or health violations.
- Discusses abatement dates and negotiates settlement agreements to resolve disputed citations.

Conferences

▶ 503-378-3272; 888-292-5247, Option 1; oregon.conferences@oregon.gov

- Co-hosts conferences throughout Oregon that enable employees and employers to learn and share ideas with local and nationally recognized safety and health professionals.

Public Education

▶ 503-947-7443; 888-292-5247, Option 2; ed.web@oregon.gov

- Provides workshops and materials covering management of basic safety and health programs, safety committees, accident investigation, technical topics, and job safety analysis.

Need more information? Call your nearest Oregon OSHA office.

Salem Central Office

350 Winter St. NE
Salem, OR 97301-3882
Phone: 503-378-3272
Toll-free: 800-922-2689

Fax: 503-947-7461
en Español: 800-843-8086
Website: osha.oregon.gov

Bend

Red Oaks Square
1230 NE Third St., Suite A-115
Bend, OR 97701-4374
541-388-6066
Consultation: 541-388-6068

Eugene

1500 Valley River Drive, Suite 150
Eugene, OR 97401-4643
541-686-7562
Consultation: 541-686-7913

Medford

1840 Barnett Road, Suite D
Medford, OR 97504-8250
541-776-6030
Consultation: 541-776-6016

Pendleton

200 SE Hailey Ave.
Pendleton, OR 97801-3056
541-276-9175
Consultation: 541-276-2353

Portland

Durham Plaza
16760 SW Upper Boones
Ferry Road, Suite 200
Tigard, OR 97224-7696
503-229-5910
Consultation: 503-229-6193

Salem

1340 Tandem Ave. NE, Suite 160
Salem, OR 97301
503-378-3274
Consultation: 503-373-7819

Salem Central Office

350 Winter St. NE
Salem, OR 97301-3882

Phone: 503-378-3272

Toll-free: 800-922-2689

Fax: 503-947-7461

en Español: 800-843-8086

Website: osha.oregon.gov

