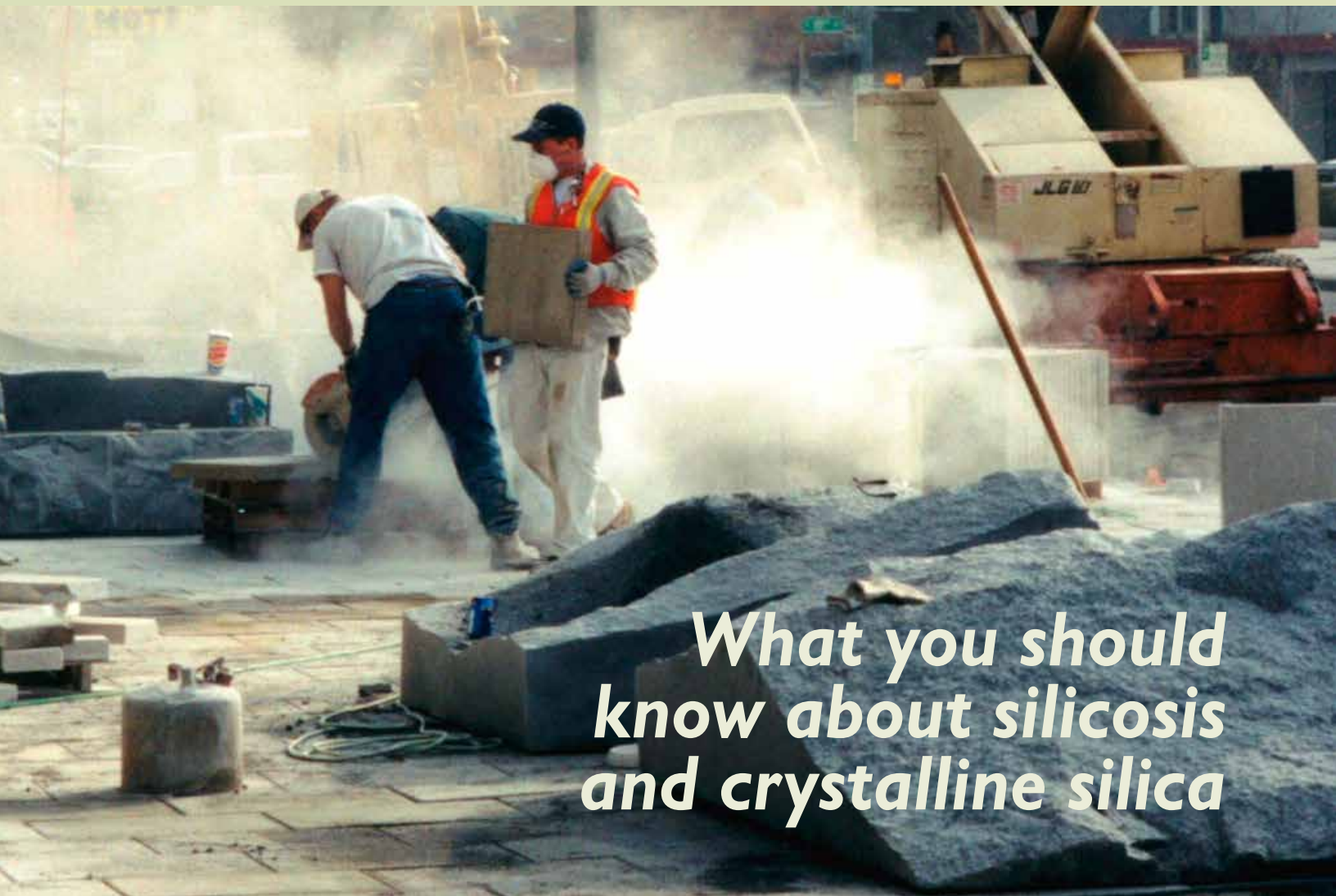


# IT'S NOT JUST DUST!



*What you should  
know about silicosis  
and crystalline silica*



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**Cover Photo:** Sampling showed this masonry contractor, working with concrete block, was overexposed. (**Photo:** Tim Capley, Oregon OSHA, Medford)

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## **Introduction**

**S**ilicosis is an occupational disease caused by exposure to dust containing crystalline silica, one of the most common minerals on our planet.

Silicosis isn't curable — sadly, workers still die from the disease — but it is preventable. The keys to prevention are straightforward: Identify workplace activities that produce crystalline silica dust and then eliminate the dust or control it so that workers aren't exposed.

You may be using products or materials that contain crystalline silica and not even know it. If your workplace is a dusty one or if you work with materials that produce dust, you should be concerned about silicosis and crystalline silica hazards.

We want to advance and improve workplace safety and health for all working Oregonians. One way to do that is to inform you about workplace hazards you can control — and crystalline silica is one of those hazards. This guide will help you learn about silicosis, what causes it, and how to prevent it.



## What is silicosis?

**S**ilicosis is a progressive, disabling lung disease caused by breathing dust containing 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 silica flour, which is finely ground quartz. And unwashed root vegetables like potatoes are coated with soil containing crystalline silica — a possible health hazard for those who harvest, sort, and bag them without appropriate exposure controls.

Keep in mind that crystalline silica can cause silicosis only when we breathe it into our lungs as dust or a fine powder. Here's what happens: The silica particles become trapped in the lungs and damage the tissue. As a result, the lung tissue scars and forms small, rounded masses called nodules. Over time, the nodules grow, making breathing increasingly difficult.

Though a person with silicosis may not have any symptoms at first, the victim eventually has trouble breathing and develops a severe cough. Other symptoms include fatigue, loss of appetite, chest pains, and fever. Only a complete work history, a chest

X-ray, and a lung-function test will determine whether or not a worker has the disease. Those who think they may have silicosis should see a medical doctor who specializes in occupational medicine.

### Chronic silicosis

Silicosis can affect you in three ways. Most workers who get silicosis don't show any symptoms for 10 or more years. That's because their exposures to crystalline silica are fairly low, but frequent. They develop a condition called chronic silicosis.

### Accelerated silicosis

As exposure levels increase, silicosis symptoms can appear much earlier. For example, those diagnosed with accelerated silicosis show symptoms within five to 10 years.

### Acute silicosis

Workers exposed to extremely high levels of crystalline silica dust may develop acute silicosis, a condition that can show symptoms within only a few weeks of an initial exposure. Acute silicosis is most common among sand blasters because of the high levels of silica dust they breathe.

## About crystalline silica

### What is it?

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.

### Forms of crystalline silica

Crystalline silica exists in several forms, including *quartz*, *cristobalite*, and *tridymite*. Tridymite is the most potent, but least common, form. Cristobalite, 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.)

### The cause of silicosis is linked to cancer

Crystalline silica causes silicosis, but it has also been linked to cancer. As a result, employees who use any products that contains more than 0.1 percent crystalline silica must follow the labeling, information, and training requirements of the *Hazard Communication Standard*.

## **Who should be concerned about silicosis?**

**A**ny worker exposed to dust containing crystalline silica — dust from crushed rock, soil, dirt, gravel, or sand, for example — should be concerned about silicosis. In fact, more than 100,000 workers in this country are exposed every year. The following table shows some of the activities that put

### **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

#### **Agriculture**

- Onion harvesting, topping, sorting, grading, and bagging
- Potato harvesting, sorting, grading, washing, and bagging
- Sand used in agriculture chemicals

them at risk.

Because crystalline silica is such a common mineral — so prominent in the products that we make and use — you should be concerned about working with any material that contains more than 0.1 percent crystalline silica.

## **How do you prevent silicosis?**

**T**he best way to prevent silicosis is to identify workplace activities that produce crystalline silica dust and then to eliminate or control the dust.

Oregon OSHA has established an permissible exposure limit (PEL) to silica of 0.1 milligrams per cubic meter of air ( $\text{mg}/\text{m}^3$ ) averaged over an 8-hour period. This limit is for the respirable fraction of the dust (particle sizes of 1 to 10 micrometers, or microns), and requires specialized collection equipment in order to accurately collect an air sample.

### **How to identify activities that produce crystalline silica dust**

Do you know what activities at your workplace expose workers to crystalline silica dust? Suspect any activity that produces dust from rock, soil, dirt, gravel, sand, or any product made from these materials.

#### **A key term**

*The permissible exposure limit (PEL) is the maximum amount of airborne crystalline silica dust that one can be exposed to during a full work shift.*

If you haven't done so, make a list of the suspect activities.

Then, determine which of those activities puts workers at risk. An industrial hygienist can help you make that determination by sampling

the air workers breathe.

### How to eliminate or control crystalline silica dust

Once you've identified activities that expose workers to hazardous levels of crystalline silica, you need to eliminate the exposure or control it so that it isn't hazardous. How can you eliminate or control crystalline silica exposures at your workplace? Here are some suggestions:

- **Use substitutes.** The best way to eliminate exposure is to use materials that don't contain crystalline silica. This is an "engineering" approach to hazard control. With an engineering approach, you eliminate hazards by selecting tools and equipment and by designing work processes that are hazard free. Materials that don't expose workers to crystalline silica include the
  - aluminum oxide
  - aluminum shot
  - ambient polycarbonate
  - apricot pits
  - corn cobs
  - cryogenic polycarbonate
  - emery
  - garnet
  - glass beads
  - melamine plastic
  - novaculite
  - polycarbonate
  - silicon carbide
  - stainless cast shot
  - stainless cut wire
  - steel grit
  - steel shot
  - urea plastic
  - walnut shells
  - wheat grain
  - white aluminum oxide
  - zircon

following:

- **Use dust-containment systems.** Other ways to eliminate exposure include installing dust-collection systems on machines that generate dust or using enclosed cabinets with gloved armholes to do hazardous tasks.
- **Work wet.** Use wet drilling or sawing to control dust. Remove dust and debris with a wet vacuum or hose it down, rather than blowing it around with compressed air or dry-sweeping it.
- **Ventilate.** Use local-exhaust ventilation systems to keep work areas dust free.
- **Use personal protective equipment when necessary.** Personal protective equipment can protect workers from hazards, but it doesn't eliminate hazards. If the equipment fails, or it's not appropriate for a particular task, a worker can still be exposed.

Respirators are a special type of personal protective equipment. When carefully selected, worn, and used, respirators will protect workers from inhaling crystalline silica dust. But you should use a respirator only if you can't eliminate or control the dust with any other method, and you need to understand the requirements for using respirators. Don't use a respirator as your only means

of protection!

- **Monitor the air and workers' health.** Air monitoring is a method of determining workers' exposures to silica dust. Air monitoring results can also help you decide the most appropriate methods for controlling crystalline silica dust.

Workers who may be exposed to crystalline silica dust should have regular medical exams. They should be examined before they begin their jobs and at least every three years thereafter. Examinations should include medical and work histories, chest X-rays, and tuberculosis evaluations. Medical examinations should supplement air monitoring and other control

methods — not replace them.

- **Practice good personal hygiene.** Those who work with materials containing crystalline silica should wash their hands before eating, drinking, or smoking. They should shower, if possible, and change into clean clothes before leaving the worksite. They should never eat, drink, or use tobacco in abrasive blasting areas.
- **Train.** Make sure workers know about silicosis, silica-dust hazards, and how to control their exposure. Their training should cover the following:
  - The health effects of exposure to crystalline silica.
  - The importance of effective controls, safe work practices, and personal hygiene.
  - How to use Safety Data Sheets – formerly known as “Material Safety Data Sheets” (MSDS) – for silica, masonry products, and abrasives.
  - The purpose of boundaries or signs that identify work areas containing crystalline silica dust.
  - How to safely handle, label, and store hazardous materials.
  - How to use and care for personal protective equipment.

### **Guidelines for preventing silicosis**

- Identify work areas, tasks, and equipment that expose workers to crystalline silica dust.
- Use materials that don't produce crystalline silica.
- Work wet and use dust-containment systems to control dust.
- Ventilate to keep work areas dust free.
- Use personal protective equipment when necessary. (See the respiratory protection standard for more information on using respirators properly.)
- Monitor the air to determine worker exposure levels.
- Give exposed workers regular medical exams.
- Practice good personal hygiene.
- Educate workers about silica-dust hazards and silicosis; train them how to control their exposure.
- Label products that contain crystalline silica.



- **Communicate.** Make sure any product that contains silica has a label that says so. Products that contain more than 0.1 percent crystalline silica must have Safety Data Sheets.
- **Post warning signs.** Put up signs that identify work areas, tasks, and equipment that may expose workers to crystalline silica. The signs should warn workers about crystalline-silica hazards and identify required personal protective equipment.

### **I'm an employer. What do I do if an employee is overexposed to crystalline silica?**

The first thing you should do is tell the employee. You should also make sure the employee gets a medical examination from an occupational medical doctor.

Then, eliminate the exposure. If you can't do that, you'll need to control it to prevent overexposure by doing one or more of the following:

- Use a silica substitute
- Use engineering controls
- Improve work practices
- Use personal protective equipment

Also, review *How do you prevent silicosis?* (Page 4).



## 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.
- **Information on the World Wide Web**

● National Institute for Occupational Safety and Health (NIOSH)	<a href="http://www.cdc.gov/niosh">www.cdc.gov/niosh</a>
● Occupational Safety and Health Administration (OSHA)	<a href="http://www.osha.gov">www.osha.gov</a>
● Mine Safety and Health Administration (MSHA)	<a href="http://www.msha.gov">www.msha.gov</a>
● The Center to Protect Workers' Rights (CPWR)	<a href="http://www.cpwr.com">www.cpwr.com</a>



## Key terms

<b>Accelerated silicosis</b>	A form of silicosis that shows symptoms within five to 10 years.
<b>Acute silicosis</b>	A form of silicosis that develops in workers exposed to very high levels of crystalline silica. Symptoms may appear within a few weeks of an initial exposure.
<b>Chronic silicosis</b>	The most common form of silicosis. Workers usually don't show symptoms for 10 years or more after an initial exposure.
<b>Cristobalite</b>	A form of crystalline silica that is stable at the highest temperature. It occurs naturally in volcanic rock.
<b>Crystalline</b>	Having a very structured molecular arrangement.
<b>Exposure control</b>	A means of eliminating or reducing workplace hazards. Examples include engineering, work-practice, and administrative controls.
<b>Free crystalline silica</b>	Pure crystalline silica that is chemically uncombined.
<b>Hazard Communication Standard</b>	Ensures that chemical hazards are properly evaluated and that employers and their employees understand the hazards. Requirements focus on proper labeling, Safety Data Sheets, and training.
<b>Industrial hygienist</b>	A health professional trained to recognize, evaluate, and develop controls for occupational health hazards.
<b>Mineral</b>	Naturally occurring crystalline solids, usually made from oxygen, silicon, sulfur, and any of six common metals or metal compounds.
<b>Permissible exposure limit (PEL)</b>	The maximum amount of airborne crystalline silica dust that one can be exposed to during a full work shift.
<b>Quartz</b>	The most common type of crystalline silica.
<b>Respirable dust</b>	Dust that contains particles small enough (about 3.5 microns) to enter the gas-exchange region of the human lung.
<b>Respiratory Protection Standard</b>	Identifies what employers must do to ensure their employees use respirators safely and responsibly.
<b>Safety Data Sheet (SDS)</b>	Printed material that describes a hazardous chemical in accordance with the Hazard Communication Standard. <i>Formerly known as Material Safety Data Sheet (MSDS).</i>
<b>Silicosis</b>	A disease that results from exposure to high levels of respirable silica dust and characterized by scarred lung tissue.
<b>Tridymite</b>	A form of crystalline silica found in volcanic rocks and in fired silica bricks.

## **Applicable rules:**

### **Air Contaminates:**

- General Industry 437-002-0382
- Construction 437-003-1000
- Agriculture 437-004-9000

### **Hazard Communication:**

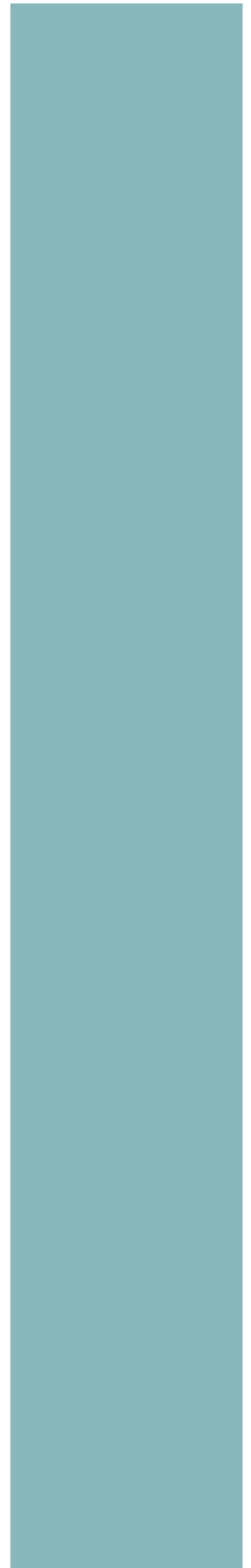
- General Industry 1910.1200
- Construction 1926.59
- Agriculture 437-004-9800

### **Respiratory Protection:**

- General Industry 1910.134
- Construction 1926.103
- Agriculture 437-004-1041



**Notes:**



# **OregonOSHA Services**

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

## **Appeals**

**503-947-7426; 800-922-2689; [admin.web@state.or.us](mailto:admin.web@state.or.us)**

- 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
- Discusses abatement dates and negotiates settlement agreements to resolve disputed citations.

## **Conferences**

**503-378-3272; 888-292-5247, Option 1; [oregon.conferences@state.or.us](mailto:oregon.conferences@state.or.us)**

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

## **Consultative Services**

**503-378-3272; 800-922-2689; [consult.web@state.or.us](mailto:consult.web@state.or.us)**

- 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).

## **Enforcement**

**503-378-3272; 800-922-2689; [enforce.web@state.or.us](mailto:enforce.web@state.or.us)**

- 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.

## **Public Education**

**503-947-7443; 888-292-5247, Option 2; [ed.web@state.or.us](mailto:ed.web@state.or.us)**

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

## **Standards and Technical Resources**

**503-378-3272; 800-922-2689; [tech.web@state.or.us](mailto:tech.web@state.or.us)**

- 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.

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**Need more information? Call your nearest Oregon OSHA office.**

### **Salem Central Office**

350 Winter St. NE, Rm. 430  
Salem, OR 97301-3882

**Phone:** 503-378-3272  
**Toll-free:** 800-922-2689  
**Fax:** 503-947-7461  
**en Español:** 800-843-8086  
**Web site:** [www.orosha.org](http://www.orosha.org)

### **Bend**

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

### **Pendleton**

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

### **Eugene**

1140 Willagillespie, Ste. 42  
Eugene, OR 97401-2101  
541-686-7562  
*Consultation:* 541-686-7913

### **Portland**

1750 NW Naito Parkway, Ste. 112  
Portland, OR 97209-2533  
503-229-5910  
*Consultation:* 503-229-6193

### **Medford**

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

### **Salem**

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

**Visit us at [www.orosha.org](http://www.orosha.org)**



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