

Hazard Assessment and Respiratory Protection Reference Guide (OSHA)

What is silica?

Silica is a toxic respirable dust. Crystalline silica or free silica is most often found in the form of quartz in granite, limestone, sandstone, feldspar, sand and some soils.

What is respirable dust?

Respirable dust is dust particles that are small enough to penetrate into the small air passages (bronchioli) and air sacs (alveoli) of the lungs. These particles must be smaller than 10 microns. Particles larger than 10 microns get trapped in the respiratory system before they penetrate these parts of the lungs. These larger particles get trapped in the nasal passages, throat, trachea, larynx and larger airways (bronchi) of the lungs. Once trapped, these large particles are picked up by the mucous transport system (mucociliary escalator) and removed from the respiratory tract, either as an expectorant or as swallowed material.

What is silicosis?

Silicosis is a respiratory disease or pneumoconiosis that results from breathing crystalline silica dust. The small silica dust particles irritate the lungs, which results in hardening, scarring and stiffening of the lungs. The severity of the disease depends on the amount and size of the dust particles inhaled and the length of time over which the exposure occurred.

What are the symptoms of silicosis?

There may not be any signs or symptoms in the early stages of the disease. The first symptom is usually shortness of breath during times of exertion or exercise. Once the disease begins to develop, it can progress even if the worker is no longer exposed to silica dust.

What are the stages of progression for the disease?

The stages of the disease are:

- Chronic silicosis is the most common form of the disease. It is caused by overexposure to dust containing small concentrations of quartz, usually 30 percent or less, over a long period of time (25-45 years).
- Accelerated silicosis is caused by overexposure to dust with a high concentration of silica. This form of the disease is detectable by x-ray after only one severe exposure. The disease develops five to ten years after the initial exposure.
- Acute silicosis is caused by overexposure to very high concentrations of silica. Symptoms develop within a few weeks to five years after initial exposure. This condition is rapidly fatal.

How can overexposure to respirable dust and silica be reduced?

- Use of engineering controls such as:
 - ✓ Enclosing existing equipment cabs or installing new ones.
 - ✓ Enclosing spouts in screening, mixing, bagging and other operations where cement, sand, rock or other dusty materials are dumped, where practical.
 - ✓ Installing water, mist or fog sprays to prevent dust from escaping at the source; such as roads, screening equipment, bagging equipment, mixing equipment and transfer points, where practical.
 - ✓ Installing dust collection systems to prevent dust from escaping at the source; such as screening equipment, bagging equipment, mixing equipment and transfer points, where practical.
 - ✓ Using ventilation devices.

When must respirators be used?

- When engineering controls are not feasible.
- During such times as engineering controls are being implemented, but are not complete.
- When working in posted areas where respirator use is mandatory.

What types of respirators may be used?

Respirators designed to provide protection against harmful respirable dust are classified as air-purifying respirators. Various types or styles of air-purifying respirators are available, depending on the intended use and the environment in which the respirator is to be used. Three common types or styles are:

- Filtering facepiece.



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- Elastomeric half facepiece.



- Elastomeric full facepiece.



There are three NIOSH-approved filter series for protection against harmful respirable dust. The three filter series are referred to as N, R and P. The levels of filter efficiency are 95 percent, 99 percent and 99.97 percent, against the most difficult size particle to filter.

- N-Series Filters – The “N” refers to “no oil in the air.” This filter may be used for solid or liquid particulate hazards that do not contain oil and where the hazard is only the particulate nature of the contaminant. Generally, these filters can be used and reused subject only to considerations of hygiene, damage and increased breathing resistance.
- R-Series Filters – The “R” refers to “oil resistant.” This filter provides some protection against air that is contaminated with some particulate and has some oil present; however, this filter is not the best alternative. This filter may be used for any solid or liquid airborne particulate hazard. If the atmosphere contains oil, this filter can only be used for a single shift or eight hours of continuous or intermittent use.
- P-Series Filters – The “P” refers to “oil proof.” This filter is intended for removal of any particulate, including oil-based liquid aerosols. This filter may be used for any solid or liquid particulate airborne hazard. Typical service life should not exceed 40 hours of continuous use or 30 days of intermittent use, unless hygiene or other reasons warrant earlier replacement. Where oil is suspected, but air samples have not been taken to determine its presence, a “P” series filter should be selected.

How do I don a filtering facepiece respirator?

- Place the filtering facepiece respirator over your nose and mouth, making sure the metal nose clip is on top. (On some models, you must pre-stretch the straps before wearing.)
- Pull the top strap over your head until the strap rests on the crown of your head and above your ears.
- Pull the bottom strap over your head until the strap rests just below your ears.

- Using both hands and starting at the top, mold the metal nose clip around your nose to achieve a secure seal.

How do I check the seal of a filtering facepiece respirator?

Each time you don a filtering facepiece respirator, one of the following seal checks must be made.

- Positive pressure user seal check for non-valved respirators.
 - ✓ Place both hands completely over the respirator and exhale.
 - ✓ The respirator should bulge slightly.
 - ✓ If air leaks between your face and the face seal of the respirator, reposition the respirator and readjust the nose clip to obtain a more secure seal.
 - ✓ Repeat the check procedure.
 - ✓ If a proper seal cannot be achieved, contact your supervisor before entering any area requiring the use of a respirator.
- Negative pressure user seal check for valved respirators.
 - ✓ Place both hands over the respirator and inhale sharply.
 - ✓ The respirator should collapse slightly.
 - ✓ If air leaks between your face and the face seal of the respirator, reposition the respirator and readjust the nose clip to obtain a more secure seal.
 - ✓ Repeat the check procedure.
 - ✓ If a proper seal cannot be achieved, contact your supervisor before entering any area requiring the use of a respirator.

How do I don an elastomeric half facepiece respirator?

- Place the half facepiece respirator over your nose and mouth, leaving the bottom straps unfastened.
- Pull the top strap over your head, placing the head cradle of the strap on the crown of your head.
- Fasten or hook the bottom straps together behind your neck.
- Adjust strap tension to achieve a secure fit.

How do I check the seal of a half facepiece respirator?

Each time you don a half facepiece respirator, one of the following seal checks must be made.

- Positive pressure user seal check.
 - ✓ Place the palm of your hand over the exhalation valve cover of the respirator and exhale gently.
 - ✓ The facepiece should bulge slightly.
 - ✓ If air leaks between the face and the face seal of the respirator, reposition the respirator and adjust the straps for a more secure fit.
 - ✓ Repeat the check procedure.
 - ✓ If a proper seal cannot be achieved, contact your supervisor before entering any area requiring the use of a respirator.
- Negative pressure user seal check.
 - ✓ If equipped with cartridges, place the palms of your hands over the cartridges to restrict airflow and inhale gently.
 - ✓ If equipped with filters, place your thumbs onto the center portion of the filters to restrict airflow and inhale gently.
 - ✓ The facepiece should collapse slightly.
 - ✓ If air leaks between your face and the face seal of the respirator, reposition the respirator and adjust the straps for a more secure fit.
 - ✓ Repeat the check procedure.
 - ✓ If a proper seal cannot be achieved, contact your supervisor before entering any area requiring the use of a respirator.

How do I don an elastomeric full facepiece respirator?

- Fully loosen all four head straps on the full facepiece respirator.
- Place the harness of the respirator at the back of your head and position the facepiece over your face.
- Starting with the neck straps and then the forehead straps, pull the ends of the four straps to adjust tightness and achieve a secure fit. Do not overtighten the straps.

How do I check the seal of a full facepiece respirator?

Each time you don a full facepiece respirator, one of the following seal checks must be made.

- Positive pressure user seal check.
 - ✓ Place the palm of your hand over the exhalation valve and exhale gently.
 - ✓ The facepiece should bulge slightly.
 - ✓ If air leaks between the face and the face seal of the respirator, reposition the respirator and adjust the straps for a more secure fit.
 - ✓ Repeat the check procedure.
 - ✓ If a proper seal cannot be achieved, contact your supervisor before entering any area requiring the use of a respirator.
- Negative pressure user seal check.
 - ✓ If equipped with cartridges, place the palms of your hands over the cartridges to restrict airflow and inhale gently.
 - ✓ If equipped with filters, place your thumbs onto the center portion of the filters to restrict airflow and inhale gently.
 - ✓ The facepiece should collapse slightly and be pulled closer to your face with no leaks.
 - ✓ If air leaks between your face and the face seal of the respirator, reposition the respirator and adjust the straps for a more secure fit.
 - ✓ Repeat the check procedure.
 - ✓ If a proper seal cannot be achieved, contact your supervisor before entering any area requiring the use of a respirator.