Washington State Department of
Labor & Industries

Respiratory Protection – Cartridge Respirators

Training for employees

September, 2021

All photos from Adobe Stock unless otherwise indicated

Introduction- why this training is required

We have areas where wearing respirators is required.

If you don’t know how to use a cartridge respirator properly, you can get a false sense of protection.

L & I requires training for anyone required to wear cartridge respirators.

When are respirators needed to protect you?

When there is not enough oxygen,

when amounts of dusts and chemicals in the air exceed safe limits,

in emergency or unknown situations of air contamination like a large chemical spill,

when required by a pesticide label.

Cartridge air-purifying respirators – 3 types

Half-face

Full-face

Powered air purifying respirator (PAPR)

Increasing protection →

How cartridge respirators work

Cartridge respirator parts

Air movement in and out is controlled by the rubber inhalation and exhalation valves.

If the valves are cracked, ripped or warped they must be replaced.

Straps must be snug, but not too tight for a good seal on the face.

Respirator parts from different brands are not interchangeable.

Types of cartridges and how they work

Particulate cartridges filter out dusts, mists and fumes only.

Chemical cartridges trap different types of chemicals, but not dust, mists or fumes.

Combination cartridges filter out both chemicals and dust, mists and fumes.

Cartridges are labeled and color-coded for the type of chemical or dust.

Particulate

Chemical

Combination

Types of particulate cartridges

N-95 cartridges filter out 95% of dust particles

photo by Gerson Co.

N-99 cartridges filter out 99% of dust particles

N-100 cartridges filter out 99.7% of dust particles

Photo by 3M

N-99 or N-100 masks are recommended for very fine dust or dangerous dusts such as asbestos or silica.

Respirator Cartridge Color Coding

- Dust/fumes/mists – teal
- Dust/fumes – pink (HEPA filter)
- Ammonia – green
- Organic vapors (solvents) – black
- Yellow – acid gases and organic vapors

These are some commonly used cartridges. They will filter out only the contaminants shown by the color.

Cartridge respirators have many limitation

Cartridge respirators won't protect you in the following situations:

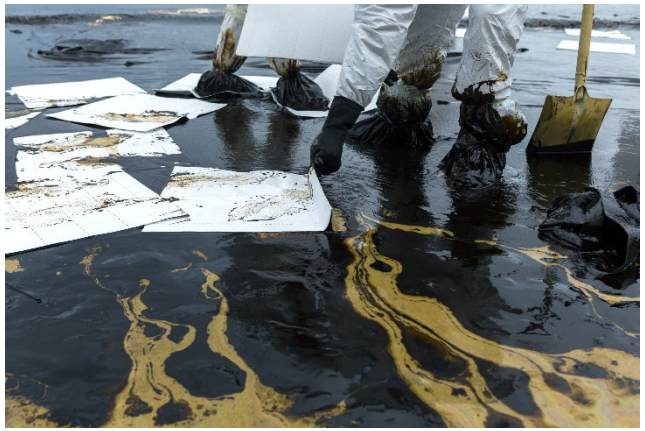
carbon monoxide in the air,

lack of oxygen,

high levels of toxic chemicals,

confined spaces,

major chemical spills, leaks or fires.



More limits of cartridges - breakthrough

Chemical cartridges can absorb only so much chemical.

When their capacity is reached, breakthrough will occur.

You can’t always tell if a respirator leaks by a chemical odor.

Some chemicals have no odor, or can only be smelled at high levels that could harm you.

Particulate cartridges will become more difficult to breathe through when they fill up with dust.

Cartridge respirator levels of protection vary

Half-face cartridge respirators provide protection to levels 10 times above the chemical or dust permissible exposure limit.

Full-face respirators provide protection to levels 50 times above the permissible exposure limit.

Half-face respirator protection up to 250 ppm of ammonia.

Full-face respirator protection up to 1250 ppm of ammonia.

Powered air purifying respirator protection factor

A powered air purifying respirator has a battery-powered blower that sucks air through a cartridge and blows it into the facepiece.

A powered air purifying respirator can provide protection from 25 to 1000 times above the permissible exposure limit.

The protection factor is unique to the manufacturer of the PAPR and how it is designed.

Optional slide if PAPRs are used

More limits of cartridge respirators

Most chemicals have listed high level limits where cartridge respirators are not adequate.

These limits are called “immediately dangerous to life or health” or “IDLH”.

A cartridge respirator is too prone to leaking to use at chemical levels in the air above IDLH.

The only alternative is a respirator that supplies clean breathing air from a tank or hose.

No IDLH protection

We use the following types of respirators in the following work areas or job duties

When it smells bad or you feel sick

Sometimes respirators don’t work even when levels of airborne chemicals are low.

If you notice an odor or feel ill, or you think your respirator leaks, leave the area and notify your supervisor.

Respirator fit-testing

Before any tight-fitting cartridge respirator can be worn, a fit-test must be done.

A fit-test is required to make sure the respirator does not leak around the edges.

Facial hair can prevent a proper fit of a tight-fitting respirator.

This man's respirator will leak

Our fit-testing procedures

Cartridge masks and facial hair

Cartridge masks must fit tightly on the face to prevent leaks around the edges. Facial hair that interferes with the edge of the mask is not allowed.

Respirator seal check

Inhalation check

Photos courtesy of U.S Army

Exhalation check

Cartridge respirators and physical fitness – medical evaluation

Medical evaluations are required for anyone who has to wear a respirator.

Breathing through a respirator is work for the body.

Respirators can be hazardous to people with heart or lung problems.

Medical questionnaire for respirator users

The first step of a medical evaluation is a confidential medical questionnaire.

A healthcare provider reviews the questionnaire and decides if you need a medical exam.

The results are only used to determine if you are fit to wear a dust mask.

Outline or describe your medical evaluation procedures here

Respirator cleaning and maintenance

Since cartridge respirators are used over and over, they can get dirty, and need to be cleaned regularly.

The thin respirator valves can split, dry out or warp, and need regular checking.

Take them apart and wash in warm soapy water (except the filters).

Respirator maintenance and storage

Cartridges must be replaced on a regular schedule.

Inspect your respirator daily for cleanliness, damage or deterioration.

Store your respirator in a clean dry place, not unprotected in the work area.

Don’t store them like this!

Cartridge change-out schedules

[Describe your cartridge change-out schedules here]

Cartridge change-out guide from OSHA

Blank slide for adding additional information as needed.