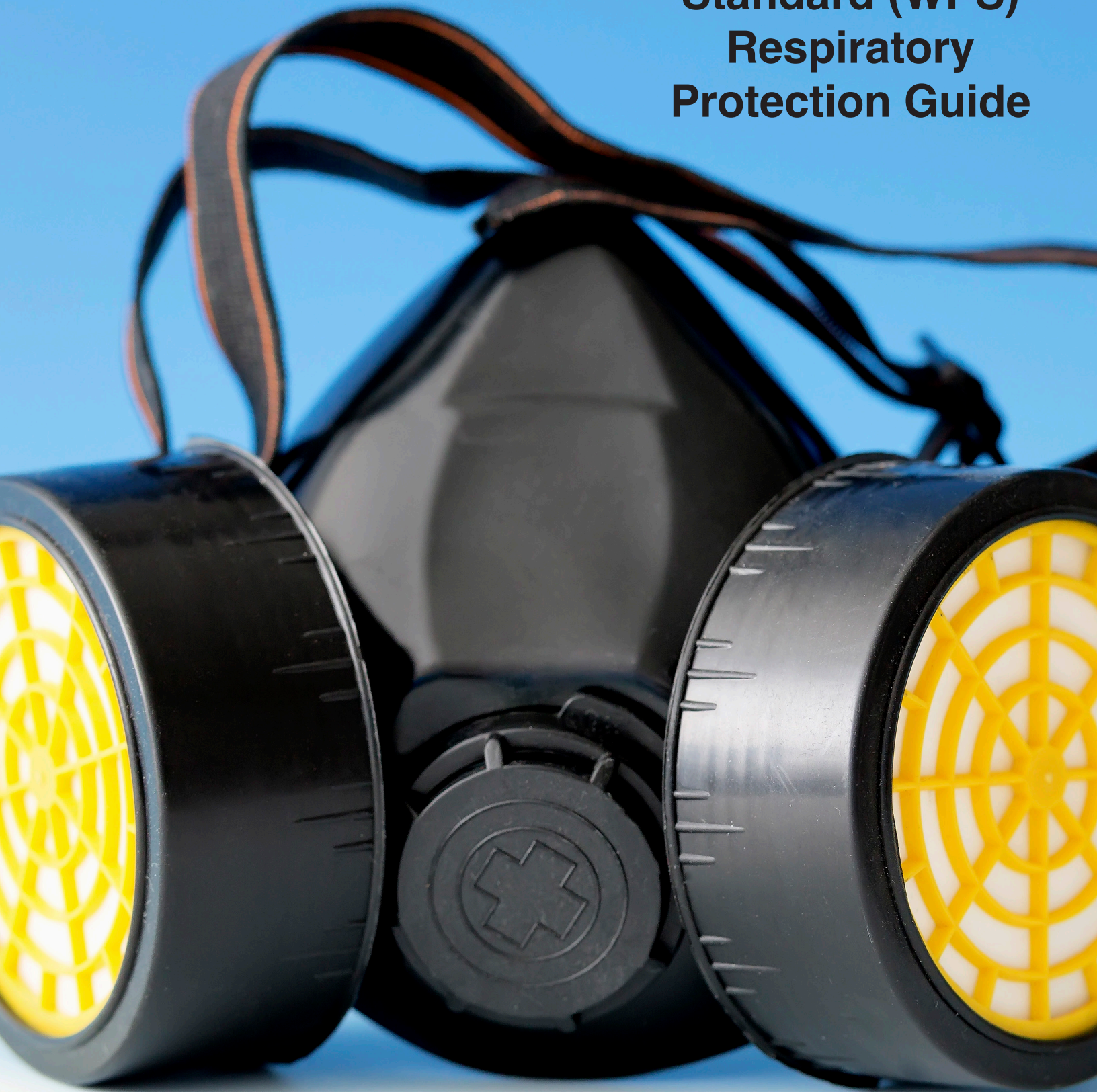


Worker Protection Standard (WPS) Respiratory Protection Guide



**Requirements for Employers of
Pesticide Handlers**

Cover image from Getty Images. Unless otherwise credited, images are courtesy of Oregon OSHA's The air you breathe (Respiratory protection guide for agricultural employers)

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Worker Protection Standard (WPS) Respiratory Protection Guide
Requirements for Employers of Pesticide Handlers

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INTRODUCTION

Working in agriculture can result in exposures to many types of respiratory hazards — including pesticides, irritating dusts, and toxic gasses (like those in silos or near manure pits).

Over time, repeated exposures to toxins and irritants can weaken healthy lungs by breaking down natural protective mechanisms of the respiratory system.

At first, the subtle signs and symptoms of lung damage — maybe a loss of energy or appetite, a tight feeling in the chest, shortness of breath, or a persistent cough — may go unnoticed until potentially serious, irreversible damage is done. That is the reason why preventing exposures to harmful air contaminants is important. Respiratory protection can be accomplished through the correct use of the protective equipment (respirator) required by the pesticide product labeling.

The 2015 revised Worker Protection Standard (WPS) defines specific requirements for the use of respirators when using WPS-labeled pesticide products. This document focuses on what pesticide handlers and employers of handlers (as defined by the WPS) must do to be in compliance with the WPS and to protect themselves from the respiratory hazards of pesticide exposures.



Photo credit: Danny Hart, US EPA

This guide explains:

- ✓ **How to understand the respirator information on the pesticide product labeling — the main source of guidance for choosing the right respirator to use and when to use it;**
- ✓ **The specific steps employers must take to meet the requirements to protect handlers who wear respirators;**
- ✓ **How to set up a system for keeping respiratory protection records to meet the WPS requirements; AND**
- ✓ **Other handler employer responsibilities related to respirator use.**

The guidance provided in this document fulfills the requirements for respiratory protection as required by the WPS. The information provided will NOT meet the requirements of an OSHA Respiratory Protection Program as required by some states, which is more protective and has additional requirements. If you are unsure about whether or not your state has additional requirements, you are advised to contact the pesticide regulatory agency or OSHA enforcement agency for your location.

WPS DEFINITIONS TO KNOW

All of the respiratory protection requirements in the 2015 revised WPS apply to handlers and employers of handlers when they are required to wear a respirator by WPS-pesticide product labeling.

Agricultural establishment is any farm, forest operation, or nursery engaged in the outdoor or enclosed space production of agricultural plants. An establishment that is not primarily agricultural is an agricultural establishment if it produces agricultural plants for transplant or use (in part or their entirety) in another location instead of purchasing the agricultural plants

Agricultural employer is any person who is an owner of, or is responsible for the management or condition of an agricultural establishment, and who employs any worker or handler

Commercial pesticide handler employer is any person, other than an agricultural employer, who employs any handler to perform handler activities on an agricultural establishment. A labor contractor who does not provide pesticide application services or supervise the performance of handler activities, but merely employs laborers who perform handler activities at the direction of an agricultural or handler employer, is not a commercial pesticide handler employer.

Commercial pesticide handling establishment is an enterprise, other than an agricultural establishment, that provides pesticide handler or crop advising services to agricultural establishments. In other words, this is usually a custom pesticide application business that is hired by a farm, forest, nursery or enclosed space agricultural production facility to apply pesticides or to provide crop-consulting services.



WHO ARE HANDLERS AND HANDLER EMPLOYERS?

Handler means any person who is employed (including self-employed) in exchange for a salary, wages, or other monetary compensation by an agricultural establishment or a commercial pesticide handling establishment that uses pesticides in the production of agricultural plants, and who performs any of the following activities:

1. Mixes, loads, transfers or applies pesticides.
2. Disposes of pesticides.
3. Handles opened containers of pesticides — including emptying, triple-rinsing, or cleaning pesticide containers or disposing of pesticide containers that have not been cleaned.*
4. Acts as a flagger during a pesticide application.
5. Cleans, adjusts, handles, or repairs the parts of mixing, loading, or application equipment that may contain pesticide residues.
6. Assists with the application of pesticides.
7. Enters an enclosed space after the application of a pesticide — before the inhalation exposure level listed on the labeling has been reached or before one of the ventilation criteria established in the WPS or on the product labeling has been met — to operate ventilation equipment, monitor air pesticide concentration levels, or adjust or remove coverings, such as tarps used in fumigation.
8. Enters a treated area outdoors after application of any soil fumigant to adjust or remove soil coverings (such as tarps).
9. Performs tasks as a crop advisor during any pesticide application or restricted-entry interval, or before the inhalation exposure level listed on the pesticide product labeling has been reached or one of the ventilation criteria established in the WPS or on the pesticide product labeling has been met.

(*Employees are NOT considered to be "handlers" if they only handle unopened pesticide containers or pesticide containers that have been emptied and cleaned according to pesticide product labeling instructions.)

Handler employer means any person who:

- √ Is self-employed as a handler.
- √ Employs others who perform any of the activities defined above that would make them a handler.
- √ The term "handler employer" includes both **commercial pesticide handler employers** and **agricultural employers** who employ at least one handler.

WHAT ARE THE REQUIREMENTS FOR RESPIRATORY PROTECTION IN THE 2015 REVISED WORKER PROTECTION STANDARD?

On the effective date, handler employers must provide the following protections for handlers **when using agricultural pesticide products that require the use of a respirator**:

- √ The handler employer must ensure the requirements of this section* are met before the handler performs any handling activity where a respirator is required to be worn.

** This section of the WPS [40 CFR 170.507 Personal Protective Equipment (b)(10)(i) through (iii)] incorporates some of OSHA's Respiratory Protection Standard [29 CFR 1910.134] by reference.*

This guide explains the handler employer's responsibility to provide:

1. **A medical evaluation by a physician or other licensed health care professional** that conforms to the provisions of 29 CFR 1910.134(e) for each handler — to ensure the handler's physical ability to safely wear the respirator specified on the pesticide product labeling.
2. **Annual fit-test for each type of respirator required by the pesticide product(s) label** that the handler will be using. The fit-testing must be done in a manner that conforms to the provisions of 29 CFR 1910.134, including Appendix A.
3. **Annual training on how to properly use the respirator(s)** specified on the labeling of the pesticide products the handler will be using. The training must conform to the provisions of 29 CFR 1910.134(k)(1)(i) through (vi).

The handler employer must maintain records that document the completion of the requirements in the WPS — for at least two years from the dates conducted.

IMMEDIATE FAMILY EXEMPTION

When an agricultural establishment is majority-owned by one family, the WPS exempts owners and members of their immediate family from **many** of the WPS requirements.

However, owners of agricultural establishments must do the following things for themselves and/or employed handlers who are immediate family members:

- Wear a respirator if required by the pesticide product label.
- Provide a respirator that is clean and in good working condition.
- Provide a medical evaluation before wearing a respirator.
- Provide fit-testing.
- Provide respirator training.
- Maintain records of medical evaluation, fit-testing, and/or respirator training.

Owners of agricultural establishments and their immediate family members are **not required** to do the following:

- Ensure that respirators are used correctly, maintained, and/or cleaned according to manufacturer's instructions.
- Ensure that damaged respirators are rendered unusable.
- Provide a place to store and put on PPE that is away from stored pesticides.

However, these are good practices to reduce risks on the establishment. See Section 5 to learn more.

"Majority-owned" means more than 50% of the equity in the establishment is owned by one or more members of the same immediate family. "Immediate family" includes parents, children, grandparents/grandchildren, cousins, in-laws, step-and foster-relatives.

If the handler does not receive any compensation (wages, goods, etc.) for their work, they are not subject to the Worker Protection Standard, regardless of family relationship.



Photo credit: Eric Vance, US EPA

MANAGING YOUR WPS RESPIRATORY PROTECTION RESPONSIBILITIES

This guide is presented in five sections. Each section provides detailed information on requirements the pesticide handler employer must comply with to meet the WPS regulations on respirator use.

1. **Selecting a respirator:** Making the correct respirator selection based on the product label requirements of the pesticide(s) the handler will use, interpreting NIOSH terminology, and understanding label references to ensure the correct respirator is used.
2. **Conducting medical evaluations:** Handler employers must provide a medical evaluation to each handler required to use a respirator before the handler uses the respirator. This section explains what steps to take, the medical questionnaire that is usually provided, confidentiality of information, who to partner with, and how to record the information.
3. **Fit-testing:** Handler employers must provide each handler who will use tight-fitting respirator(s) with a fit-test before the handler uses the respirator. This section provides steps on how to conduct a "fit-test," how often to do a fit-test, the difference between a fit-test and a seal check, and what information must be recorded to document a fit-test.
4. **Training:** Handler employers must provide effective respirator training to each handler required to use a respirator prior to the handler using the respirator. This section covers what training topics must be covered, how often training is to be conducted, and keeping training records.
5. **Additional pesticide handler employer responsibilities:** Handler employers must comply with other WPS respirator requirements, including respirator-related recordkeeping; providing, using, cleaning, and maintaining respirators and other PPE; preventing heat illness; and following respirator change-out schedules.

SECTION 1: SELECTING A RESPIRATOR

The employer must select the type of respirator based on the labeling requirements of the pesticide product used.

- √ One way to begin is to make a list of all the pesticide products you or your employees will be using for the next year or the next growing season. Use the product's EPA registration number to identify the exact product you will use.
- √ Find the part of each product's labeling that specifies the type of respiratory protection that must be used by the handler of that product. Sometimes there are different respirator requirements for different activities (i.e., mixing/loading vs. application of product).

Selecting the right type of respirator based on the pesticide product labeling sounds simple enough, right? But, more questions soon come up, such as:

- √ The pesticide labels specify the types of respirators using "NIOSH TC numbers." What are TC numbers and what do those types of respirators look like?
- √ Is it possible to have one type of respirator that can be used with different cartridges/canisters/filters for different products?
- √ When it comes to respirators, why are pesticide labels so confusing?

Personal protective equipment (PPE) statements must appear in the **PRECAUTIONARY STATEMENTS** section of the labeling in the "**HAZARDS TO HUMANS (AND DOMESTIC ANIMALS)**" section of the pesticide product labeling. This section includes any respirator(s) that may be required. Respirators are required for all pesticide products classified as toxicity category I or II for acute inhalation.

What are the three federal agencies that deal with respirators?

- ❖ The National Institute for Occupational Health and Safety (NIOSH) tests, certifies, and provides a test and certification (TC) number for approved respirators.
- ❖ The Occupational Health and Safety Administration (OSHA) regulates the use of respirators in the workplace.
- ❖ The United States Environmental Protection Agency (EPA) regulates pesticides and pesticide labels. They require that pesticide labels specify the type of respirator needed to protect human health.

EXAMPLE OF PESTICIDE PRODUCT LABEL LANGUAGE

PRECAUTIONARY STATEMENTS

Hazards to Humans and Domestic Animals

CAUTION: Causes moderate eye irritation. Harmful if swallowed or absorbed through the skin. Avoid contact with skin, eyes, or clothing.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Some materials that are chemical-resistant to this product are made out of any waterproof material.

All pilots and flaggers must wear: Long-sleeved shirt and long pants, shoes plus socks. In addition to the PPE above, groundboom applicators must also wear chemical-resistant gloves.

All mixers, loaders, other applicators, and other handlers must wear: Long-sleeved shirt and long pants, shoes plus socks, chemical-resistant gloves and chemical-resistant apron when mixing, loading, or cleaning equipment or spills, **and a NIOSH-approved particulate filtering respirator equipped with any N, R, or P class filter media. The respirator should have a NIOSH approval number prefix TC-84A.**

Labels can be confusing because respirator terminology has been changed by NIOSH. In 1995, NIOSH took over full responsibility for respirator certifications from the Mine Safety and Health Administration (MSHA). Some pesticide labels continue to use the old terms.

Translation key to 1995 revised NIOSH respirator certification standards and pesticide labeling-related changes in respirator terms:

| Outdated respirator terms used on labels | | Current NIOSH respirator terms used on labels |
|--|---|---|
| NIOSH/MSHA | → | NIOSH |
| Dust/Mist | → | Particulate |
| Pre-filter approved for pesticides | → | N, R, or P filter, to be used in combination with a chemical cartridge |
| Canister approved for pesticides | → | Canister [contaminant specific] |
| N, R, P or HE filters | | N, R or P (HE filters can only be used on Powered Air-Purifying Respirators (PAPRs)) |

WHAT DO RESPIRATORS WITH DIFFERENT "NIOSH TC NUMBERS" LOOK LIKE AND HOW DO THEY WORK?

There are two main types of respirators that work in different ways:

- **Atmosphere-supplying respirators** provide clean, breathable air from a safe source — other than the ambient air; and
- **Air-purifying respirators (APRs)** remove contaminants from the ambient (surrounding) air.

When properly selected and used, respirators protect handlers from certain hazards. It is important to remember that respirators do not eliminate the hazards. If the respirator fails or is not the right type for a particular hazard, the user can still be exposed to air contaminants and potentially be harmed.

Using a respirator can also stress a handler's heart and lungs. Breathing through a tight-fitting, air-purifying respirator for example, is harder than breathing ambient air. Also, an atmosphere-supplying **self-contained breathing apparatus (SCBA)** can increase the user's heart rate because of its weight.

Whether air-purifying or atmosphere-supplying, respirators have some common features.

The part of a respirator that forms a protective barrier between the user's respiratory system and the contaminants in the air is commonly called a mask, facepiece, hood or a helmet. So, based on the type of protective barrier, most respirators are also classified as either **tight-fitting** or **loose-fitting**:

- ❖ A **tight-fitting** facepiece or mask forms a complete seal on the user's face. The facepiece is usually made of a molded flexible elastomer — an elastic substance that resembles rubber — and is available in half-face, and full-face masks. Even the filtering facepiece respirators are considered tight-fitting.
- ❖ A **loose-fitting** protective barrier typically covers the user's head and may extend over the shoulders; usually, a flexible tube supplies filtered or other clean, breathable air to the space inside the hood. Loose-fitting coverings can only be used with atmosphere-supplying respirators or powered air-purifying respirators (PAPRs).

Where can I buy respirators?

You can find most types of respirators at safety supply stores. Also check farm supply stores, agricultural chemical suppliers, online, or mail-order safety supply companies.

Remember that everyone's face is different. You must provide an assortment of sizes — and perhaps more than one brand or model — of the tight-fitting types so handlers can choose one for comfort and achieve a proper fit.

Employers must provide only NIOSH approved respirators.

Can I put parts from one brand onto another brand of respirator?

Absolutely not!

A respirator is approved by NIOSH with all the associated parts and carries a "TC number." Using any part of a respirator that was not part of the initial, approved assembly, means the respirator is no longer "NIOSH-approved."

LEVELS OF RESPIRATORY PROTECTION

– Most protective from top to bottom



NIOSH Approval #TC-13F Self-Contained Breathing Apparatus (SCBA)
Air supplied from a pressurized tank to a full-face mask.



NIOSH Approval #TC-19C Supplied Air Respirator* (SAR)
Air supplied through an air hose from a source such as an air compressor.



NIOSH Approval #TC-14G Air Purifying full-face respirator with a canister specified for a type of chemical contaminant such as organic vapors (OV) (gas mask).



NIOSH Approval #TC-84A Air Purifying full-face respirator with combination OV cartridge and N-type particulate filter.



NIOSH Approval #TC-23C Powered Air Purifying Respirator (PAPR) with OV and combination HE filters.



NIOSH Approval #TC-21C Powered Air Purifying Respirator (PAPR) with particulate HE filter.



NIOSH Approval #TC-84A Air purifying half-face (elastomeric) respirator with combination OV cartridge and N-type particulate filters.



NIOSH Approval #TC-84A Air purifying half-face (elastomeric) respirator with P-100 (magenta) particulate filters.



NIOSH Approval #TC-84A Filtering face-piece respirator (May be an N-, R-, or P-type particulate filter.) This is also known as a 'disposable' respirator because none of its parts are replaceable.

*Upper right image courtesy of Honeywell Industrial Safety

The label will most likely require the use of an atmosphere-supplying respirator in the following conditions:

- 1) When insufficient oxygen is in the ambient air.
- 2) When the product is highly toxic and it will be used in an enclosed space.
- 3) When air-purifying respirators are insufficient because it's not possible to purify the air by filtering out every type of air contaminant.
- 4) When the active ingredient of the pesticide is categorized as Immediately Dangerous to Life & Health (IDLH) at a very low concentration.

There is no substitute for reading the pesticide product label when selecting a respirator. The SCBA respirators (TC-13F) and SAR type respirators (TC-19C) are not interchangeable.

ATMOSPHERE-SUPPLYING RESPIRATORS

An atmosphere-supplying respirator provides the user with clean, breathable air from a source other than the ambient air, so cartridges or filters are not necessary. All atmosphere-supplying respirators protect users from toxic particulates, gases and vapors, and also oxygen-deficient atmospheres.

There are two main types of **atmosphere-supplying respirators**:

Self-contained breathing apparatus (SCBA). As its name implies, the user carries the source of their breathable air supply with them, typically in a tank on their back. Like the SAR, air is supplied to an "inlet" facepiece, such as a full-face respirator. **(NIOSH #TC-13F)**

Supplied-air respirator (SAR). The supplied-air respirator supplies breathable air from a stationary source, such as a compressor, separated from the user. Breathable air is supplied to the facepiece of the respirator through a flexible hose. **(NIOSH #TC-19C)**

AIR-PURIFYING RESPIRATORS (APR)

The air-purifying respirator has a filter, cartridge, or canister that captures or removes types of air contaminants such as particulates, or specific gases or vapors from the air that moves through the filtering unit.

Air-purifying respirators are available in non-powered and powered types.

- A non-powered type "operates" as the user breathes air through the filter. **(NIOSH #TC-84A or #TC-14G)**
- A powered air-purifying respirator (PAPR) has a battery-powered blower that forces ambient air — through one or more filters — into a helmet or hood for the user to breathe. **(NIOSH #TC-21C or #TC-23C)**

Both non-powered and powered air-purifying respirators can remove particles, gas and vapor, or both, depending on the type of filters used. Be sure to use the appropriate type of filter, cartridge, or canister that is specified on the pesticide product label. No one type of filter protects against all contaminants.

The powered type (PAPR) is easier for the user than the non-powered type. Another positive feature is that loose-fitting hoods/helmets do not require fit-testing so handlers with beards can wear them. However, it is important to remember that PAPR filtration only works as long as the charged batteries are pulling air through the filtering unit.

Is there one filter/cartridge that's good for all contaminants?

No! While there are "multi-gas" cartridges, they are only approved for exposure to one gaseous chemical at a time.

Emergency first responders have "CBRN" canisters available to them which are capable of filtering out Chemical, Biological, Radiological and Nuclear agents. These can also be used for other industrial chemicals — including pesticides such as phosphine, chloropicrin, and sulfur dioxide. CBRN canisters have a shelf-life/expiration date and tend to be expensive.

FREQUENTLY ASKED QUESTIONS

What are the differences between N-, R- and P-filters?

N – is **Not** resistant to oils. (Oil can be from the pesticide formulation or in one of the spray adjuvants.)

R – is **Resistant** to oils but has a limit on the amount of time it can be relied on.

P – is strongly resistant to oil or oil-**Proof**.

What do the numbers 95, 99, and 100 mean?

95 means a filter can remove at least 95% of airborne particles.

99 means the filter removes at least 99% of airborne particles.

100 means the filter removes at least 99.97% (essentially 100%) of airborne particles.

What do the letters HE mean?

HE means high efficiency and is a type of particulate filter used only on powered air-purifying respirators (PAPRs).

What is the difference between an organic vapor cartridge and a particulate filter?

- ❖ An organic vapor cartridge contains activated charcoal — a chemical substance that adheres to carbon-containing chemical gases (organic vapors). Air is drawn through the cartridge and helps to prevent these types of contaminants from entering the lungs.
- ❖ A particulate filter physically traps solid or liquid particles like dust or mist from air drawn through the filter.

Why do regular particulate respirators and organic vapor respirators with a particulate filter both have the same NIOSH Approval number (TC-84A)?

That designation is based on the **particulate** association. If the filter is strictly for particulates, or if the cartridge combination has a particulate filter attached to it, then they are designated as "TC-84A." Always check the product label to make sure you are using the cartridge specified on the pesticide product labeling.

What is the difference between a cartridge and a canister?

The difference is the NIOSH approval process. If the filtering element is a canister it has a respirator approval number of 14G. This is a "gas mask" when attached to a full face respirator.

SECTION 2: MEDICAL EVALUATIONS

Handler employers must provide a medical evaluation to each handler who will be required by a pesticide product label to use a respirator.

How do I find a PLHCP to do the respirator medical evaluations?

Look up “Occupational Physicians/ Clinics” **OR** search online for “occupational physicians” or “occupational health clinics” plus your city or area. Medical evaluations can be conducted by any health care professional whose licensing permits this activity. However, not all health care professionals receive training in occupational medicine and may not be familiar with workplace rule requirements.

Each handler must be medically evaluated — by a Physician or other Licensed Health-Care Professional (PLHCP) — to make sure they can use a respirator without putting their health at risk. The medical evaluation must be done before the handler uses the respirator and before the fit test is conducted. Any employee refusing a medical evaluation must not be permitted to work with pesticide products that require respirators. The medical examination must be done at no cost to the employee.

The health care provider may perform the medical evaluation in person or by questionnaire. Sample questionnaires are available online. Occupational health clinics may also have medical evaluation forms on file. They typically include one section for the employer to complete, listing the type of respirator to be used, duration, and types of anticipated activities. Another section asks the employee questions about his or her health status. To protect medical privacy, this section should not be reviewed by the employer. A third section allows the PLHCP to make recommendations and approve or disapprove the use of respirators by the individual.

It is very important that each handler understands the questions and answers them honestly. When using a questionnaire, make sure that employees can read and understand the terms. If there is uncertainty about that, the employee should get help from someone other than the employer, such as a trusted friend, family member, or medical staff.

When should handlers be re-evaluated?

A medical evaluation is required one time unless another medical evaluation is required for any of the following reasons:

- If the PLHCP requires another evaluation within a specified period of time.
- If the employee reports signs such as shortness of breath, dizziness, chest pains, or wheezing related to respirator use.
- If the employer, a supervisor, or the PLHCP notices a problem; or if observations made by anyone during use or fit-testing indicates a need for re-evaluation.
- If a change occurs in working conditions that may result in an increased physiological burden on the employee.

Sample medical evaluation forms are available:

English: <https://www.osha.gov/Publications/OSHA3789info.pdf>

Spanish: https://www.osha.gov/SLTC/respiratoryprotection/medicalevaluation_sp.html

Can I use a web-based health care provider for the medical evaluations?

Yes. Employers can use online providers to review a handler's medical questionnaire. Depending on the information provided, the online provider may need additional information from a medical exam and/or tests before clearing the handler to wear the respirator.

The PLHCP may sometimes ask to speak with or examine the handler in order to further evaluate the handler's written responses. He or she may also require limits or restrictions for the employee when using a respirator. The handler has the right to discuss the questionnaire and the results of their evaluation with the PLHCP.

**The information revealed during the medical evaluation is confidential!
Only the handler and the PLHCP may see this information.**

DOCUMENTATION

The PLHCP will send the handler employer and the handler a written medical determination (medical release) of the medical evaluation results. A handler cannot use a respirator until this written medical determination is received allowing such use. The determination will include the following information:

- Whether the employee is medically able to use the specified respirator,
- Any restrictions on the employee's use of the respirator,
- The need for follow-up medical evaluations, and
- Verification the PLHCP has given the employee a copy of the written medical determination.

RECORDKEEPING

Handler employers must maintain a copy of the written medical determination (medical release) for at least two years.

A medical evaluation is required before using a respirator. However, the need to be re-evaluated, or the length of time between evaluations, depend on several factors. If your employee does not need a medical evaluation for more than two years, it is **HIGHLY RECOMMENDED** to keep the original medical evaluation on file to document that the employee was adequately evaluated.

SECTION 3: FIT-TESTING

Fit-test each handler who will use a tight-fitting respirator.

Human faces vary in size and shape and so do respirator masks/facepieces. In order to protect the handler, a tight-fitting facepiece must fit so that the face-to-facepiece seal does not leak air. If it does not fit, unfiltered, contaminated air can come around the edges of the facepiece.

Two types of **fit-test** methods are available to determine the correct fit for most tight-fitting facepieces.

Qualitative Fit-test (QLFT). These relatively inexpensive, easy-to perform tests rely on the respirator user's ability to detect a test substance such as banana oil (isoamyl acetate), Bitrex™, or irritant smoke. If the user can taste, smell, or detect the substance during the test while wearing the respirator, the facepiece is leaking air and the test fails. A user who is not able to get a seal with one facepiece must use the guidelines to select another size, or make/model of facepiece and repeat the test. Anyone who has the proper equipment and who can follow the test protocols can conduct a qualitative fit test.



Three qualitative fit-testing procedures are summarized in Appendix A (pages 33-44).

Quantitative Fit-test (QNFT). An instrument samples the concentration of a test agent in the ambient atmosphere and inside the user's facepiece. This method relies on chemical measurements, rather than the handler's response. The QNFT is also more expensive because it requires special equipment, and a specially-trained person to conduct the test.

Can I perform a fit-test for myself?

While there is no regulation prohibiting the practice, it would be very difficult to accurately follow the test protocol if you were administering the fit-test to yourself.

All handlers who use respirators with tight-fitting facepieces must be fit-tested with a respirator of the same make, model, style, and size they will be using for handling activities. They must be fit-tested at least annually; and whenever they change facepiece models, styles, or sizes; or, if they have physiological changes that could affect the way the facepiece seals on their face (for example, significant weight loss or gain/loss of teeth.)

Those who fail a fit-test or report their respirators don't fit properly must be allowed to select another tight-fitting facepiece. The replacement must be successfully fit-tested.

Videos and other resources are available from the AgriSafe Network:
<http://www.agrisafe.org/respirator-fit-testing>

See the Appendices for ***OSHA's guidelines and general instructions for fit-testing respirators*** including a link to the approved protocol for qualitative and quantitative tests that must be followed.

HOW OFTEN MUST FIT-TESTING BE DONE?

Fit-testing must be conducted annually and whenever there is a change in the respirator facepiece make, model, style, or size, or if the handler has a physiological change that affects the seal between the respirator's facepiece and the user's face. If a handler uses different types of respirators, the handler must be fit-tested for each type of respirator.

RECORDKEEPING

A written record of the fit test must be maintained for two years from the date conducted and must contain the following information at a minimum:

- Name of handler tested,
- Type of fit-test performed,
- Make, model, and size of the respirator tested,
- Date of the fit-test, and
- Results of the fit-test:
 - Pass/fail for qualitative fit-test.
 - Fit factor determined, strip chart recording or other record of the test results for a quantitative fit-test.

SECTION 4: TRAINING

A handler employer must provide effective respirator training for each handler who is required to use a respirator by a pesticide product label.

Handlers must be provided with training in the use of a respirator specified on the pesticide product labeling before use. The training format must be effective, provided in a manner (language or format) they can understand, and the handler(s) must be able to demonstrate knowledge of each of the following:

- Why a respirator is necessary and how improper fit, usage, or maintenance can compromise the protective effect of the respirator.
- The capabilities and limitations of the respirator(s).
- How to select cartridges and canisters and know the schedule for changing.
- How to use the respirator(s) in emergencies and how to respond if a respirator malfunctions.
- How to properly put on, take off, and check the seals of tight-fitting facepieces. Seal check procedures are covered on page 23.
- How to inspect, maintain, and store respirator(s).
- How to recognize medical symptoms, such as dizziness or shortness of breath, that may indicate a problem and may limit or prevent effective use of a respirator.

Retraining on these points is required at least annually or more often if the type of respiratory hazard changes, if handlers switch to another type of respirator, or if inadequacies in the employee's knowledge or use indicate the need to retrain. Handlers must show they know how to use and properly care for their respirators or they must be retrained.

New handler employees who have been trained on respirators within the past 12 months — by a former employer, for example — and who can demonstrate their knowledge of the above topics are not required to be re-trained until 12 months have passed.

The employer must make sure that clean and sanitary respirators are provided. Handlers must either be trained about how to clean and maintain their own equipment or know how to get the cleaning done if the employer provides that service. See OSHA's guidelines for respirator cleaning in the Appendices. You can also follow the manufacturer's cleaning instructions.



Can I train myself, as a self-employed person?

As a handler, you must be able to demonstrate that you know how to use and properly care for your respirator. It is your responsibility to ensure that is the case for every type of respirator used, and to keep records of your self-training efforts.

ADDITIONAL GUIDELINES

- Filtering facepiece (disposable) respirators are intended to be used by a single person.
- Any respirator shared with a co-worker must be cleaned and disinfected before the co-worker uses the respirator.
- A respirator must be inspected for damage before it is used and when it is cleaned.
- All parts must be in good working order. Defective respirators must be discarded or repaired.
- Handlers must store their respirators in a clean, dry place protected from sunlight and extreme temperatures. Facepieces and valves should be placed with care so they are not deformed.
- If you intend to continue using canisters, cartridges, and filters, store them in plastic bags separate from the clean respirator.

RECORDKEEPING

A written record of the respirator training must be maintained for two years. OSHA does not require recordkeeping for training, and the WPS does not specify the exact information to be recorded. It is recommended that the records contain:

- Name and signature of handler trained,
- Date of training,
- Trainer's name, and
- Training topics.



Photo credit: Eric Vance, US EPA

SEAL-CHECK PROCEDURES

A seal-check is to be conducted each and every time a tight-fitting respirator is put on. These procedures should be included in the annual respirator training provided by the employer.

Put on the respirator as you normally do.

Two ways to check the seal of a tight-fitting respirator:

Positive-pressure check:

1. Block the exhalation valve cover with the palm of your hand.
2. Exhale gently into the facepiece, creating a slight positive pressure.
3. If you can feel air leaking under the facepiece, reposition it and repeat steps 1 and 2 until you have an effective seal.



Remember that a seal check is not the same as a fit-test. A fit-test is a once-a-year method for choosing a particular respirator by making sure that it fits the user correctly. The seal check confirms the facepiece is still working as it should.

Negative-pressure check:

1. Cover the inlet openings of the cartridges or canisters with the palms of your hands and inhale gently so that the facepiece collapses.
2. Hold your breath for about 10 seconds. The seal is effective if the facepiece stays collapsed.
3. If the facepiece expands or you can feel air leaking under the facepiece, reposition it and repeat steps 1 and 2.



Avoid conditions that could cause a tight-fitting facepiece to leak air around the edges

- ❖ Handlers with facial hair — or any other condition — that interferes with the seal of the surface of the mask to the user's face — must not be allowed to use a tight-fitting respirator.
- ❖ Handlers should always perform a **seal check** — to determine if the respirator has an effective face-to-mask seal — each time they put on a tight-fitting respirator. They should follow the OSHA procedure (summarized above) or the respirator manufacturer's instructions.
- ❖ **Remember that a seal check is not the same as a fit-test.** A fit-test is a once-a-year method for choosing a particular respirator by making sure that it fits the user correctly. The seal check confirms the facepiece is still working as it should.

SECTION 5: ADDITIONAL PESTICIDE HANDLER EMPLOYER RESPONSIBILITIES

RECORDKEEPING SUMMARY

Handler employers must maintain the following records for EACH handler employee who uses a respirator required by a pesticide product label. They must keep all WPS respirator-related records for at least two years.

Handlers should be allowed to review only their own medical determination forms and fit-test records.

- Medical determination form for respirator use
 - After a PLHCP performs each handler/employee's medical evaluation, they must provide a written determination to the handler employer. Keep that record to document that each handler/employee has been medically determined to be able to use the types of respirators necessary for pesticide handling at your workplace.
- Documentation of fit-testing
 - The record must identify the handler/employee tested, the fit-test method used, the make, model, and size of each respirator that was successfully fit-tested, and the date of the test.
- Documentation of respirator training
 - The record should include information documenting the training, such as the name and signature of the handlers trained; the date of training, the trainer's name and the training topics.

Keep all WPS-related records on the agricultural establishment or commercial pesticide handling establishment for at least two years.

USE, CLEANING, AND MAINTENANCE OF PPE INCLUDING RESPIRATORS

To provide protections to handlers in the use, cleaning, and maintenance of all PPE, including respirators, the handler employer must ensure that:

- PPE is used correctly for its intended purpose and is used according to the manufacturer's instructions.
- All PPE is inspected for leaks, holes, tears, or worn places before each day of use. Any damaged equipment must be repaired or discarded.
- All PPE is cleaned according to the manufacturer's instructions or pesticide product labeling instructions before each day of reuse. In the absence of any such instructions, PPE must be washed thoroughly in detergent and hot water.
- All washed PPE is dried thoroughly before being stored or reused.
- All clean PPE is stored separately from personal clothing and apart from pesticide-contaminated areas.
- Contaminated PPE is made unusable as clothing or unavailable for any use by anyone, if the PPE cannot or will not be cleaned properly.
- Any coveralls or other absorbent materials that have been drenched or heavily contaminated with a pesticide that has the signal word "DANGER" or "WARNING" on the pesticide label are not reused and are disposed of in accordance with any applicable laws or regulations.
- Any person who handles contaminated PPE must wear the gloves specified on the pesticide product labeling for mixing and loading the product(s) of the contaminant(s).
- Contaminated PPE is kept separately from non-contaminated PPE, other clothing or laundry, and washed separately from any other clothing or laundry.
- Any person who cleans or launders PPE is informed of all the following:
 - That such equipment may be contaminated with pesticides and there are potentially harmful effects from exposure to pesticides.
 - The correct way(s) to clean PPE and how to protect themselves when handling such equipment.
 - Proper decontamination procedures that should be followed after handling contaminated PPE.
- Handlers have a place(s) away from pesticide storage and pesticide use areas where they may:
 - Store personal clothing not worn during handling activities.
 - Put on PPE at the start of any exposure period.
 - Remove PPE at the end of any exposure period.
- Handlers are not allowed or directed to wear home or to take home employer-provided PPE contaminated with pesticides.

HEAT-RELATED ILLNESS

When a WPS-labeled pesticide product requires the use of PPE for a handler activity, appropriate measures must be taken to prevent heat-related illness. This may include knowing the heat and humidity work conditions, altering time of work hours to avoid or limit working in the hottest/most humid situations, providing adequate water breaks and cool-down periods, and allowing removal of PPE when not required, etc.

RESPIRATOR CHANGE-OUT SCHEDULES

When particulate filtering respirators are used, the filters or the filtering facepiece itself must be replaced before further respirator use when one of the following conditions is met:

- When breathing resistance becomes excessive.
- When the filter element has physical damage or tears.
- According to manufacturer's recommendations or pesticide product labeling, whichever is more frequent.
- In the absence of any other instructions or indications of service life, at the end of eight hours of cumulative use.

When gas or vapor removing respirators are used, the gas or vapor removing canisters or cartridges are to be replaced before further respirator use when one of the following conditions is met, if there is no end-of-service-life indicator on the cartridge or canister:

- At the first indication of odor, taste, or irritation.
- When breathing resistance becomes excessive.
- When required according to manufacturer's recommendations or pesticide product labeling instructions, whichever is more frequent.
- If the employer has an OSHA respiratory protection program that specifies a maximum use time, then replace when that time is reached.
- In the absence of any other instructions or indications of service life, at the end of eight hours of cumulative use.

WHO IS RESPONSIBLE?

The ultimate responsibility for ensuring compliance with all but one of the respirator requirements of the WPS falls to the handler employer, which could be the handler (if self-employed). The exception is that handlers must wear any PPE required by the label. Handler employers must ensure all other respirator requirements are followed by their handler employees that are subject to the WPS.

Although not required by the WPS, experience has shown that it is beneficial to assign a particular person to be responsible for coordinating compliance with respiratory requirements. It makes keeping track of the responsibilities and records easier and more effective. This "responsible person" should be a supervisor or a trusted handler who has the knowledge, experience, and authority to make sure the requirements are being met and that respirators are being used and maintained properly.

Owners and agricultural employers are liable for a penalty if anyone employed by, or acting for them, fails to comply with any WPS requirements. This includes labor contractors, farm managers, and/or other supervisors in both employment and contractual relationships.

Family-owned establishments:

When a respirator is required by a pesticide product label, owners of agricultural establishments must provide handlers (including themselves and immediate family members) with a medical evaluation, fit-testing, and respirator training. They must keep records of those activities for two years. Owners of agricultural establishments must also provide handlers with a clean respirator in proper operating condition. However, owners of agricultural establishments do not have to comply with the specific PPE cleaning and maintenance requirements, or the requirement to prevent heat illness.

ADDITIONAL RESOURCES

Occupational Safety & Health Administration (OSHA)

1. General guidance on respiratory protection, training videos, Spanish resources, and more
<https://www.osha.gov/SLTC/respiratoryprotection/>
2. Medical Evaluation Questionnaire (English)
<https://www.osha.gov/Publications/OSHA3789info.pdf>
3. Medical Evaluation Questionnaire (Spanish)
https://www.osha.gov/SLTC/respiratoryprotection/medicalevaluation_sp.html

Pesticide Educational Resources Collaborative (PERC)

1. WPS training materials, fact sheets, checklists, and other resources
<http://pesticideresources.org>

AgriSafe Network

1. Respiratory protection resources, videos, and other guidance
<http://www.agrisafe.org/lungs-for-life>

National Pesticide Information Center

1. Search for pesticide product labels online
<http://npic.orst.edu/NPRO>

APPENDICES

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GUIDELINES FOR FIT-TESTING EACH HANDLER WHO WILL USE TIGHT-FITTING RESPIRATORS

After determining each of your handlers are medically able to use the required respirator(s), fit-testing must be done for any tight-fitting respirator. This must happen before the respirator is used in the workplace. It must be done again at least annually thereafter, as long as that handler is required to use respirators.

The following are requirements:

- Provide a sufficient number of respirator models and sizes so that the handler may select a respirator that fits correctly. Fit-testing must be done with the same make, model, style, and size of respirator that will be used in the workplace. Make sure that handlers use only NIOSH-certified respirators.
- Persons performing fit-tests must follow one of the appropriate fit-test protocols detailed in [Appendix A to 1910.134](#) Fit-Testing Procedures (Mandatory). Some of those protocols are described in this section.
- Ensure that the person administering fit-testing protocols is able to prepare test solutions, calibrate equipment and perform tests properly, recognize invalid tests, and ensure test equipment is in proper working order.
- Ensure that fit-test equipment is kept clean and well-maintained so that it operates within its manufacturer's design parameters.
- Make sure handlers use only the respirator(s) for which they have been fit-tested.

General instructions for fit-testing:

- Prior to selecting a respirator, the handler must be shown how to put a respirator on, how to position it on the face, how to set strap tension, and how to decide if it has an acceptable fit.
- A mirror must be available to help the handler in evaluating the fit and positioning of the respirator.
- The handler must be instructed to hold each chosen facepiece up to their face and eliminate those that obviously will not give an acceptable fit.
- Inform the handler that he/she is being asked to select the respirator that provides the most acceptable fit from among the different sizes and shapes in order to provide adequate protection.

Do not conduct the test if there is any hair growth between the skin and the facepiece sealing surface, such as stubble beard growth, beard, mustache or sideburns which cross the respirator sealing surface, or that interferes with the valve mechanism of the respirator.

Allow the handler to see themselves in the mirror to evaluate the fit:

- Respirator of proper size to span distance from nose to chin?
- Cups the chin; not too far back or too far forward?
- Proper fit across bridge (top) of the nose?
- Comfortable position of the mask on face and cheeks?
- Tendency of respirator to slip out of proper position when the head is moved?
- Strap tension adequate, but not overly tightened in order to achieve seal?

If the test subject is not familiar with using a particular respirator, direct them to put on the facepiece several times and to adjust the straps each time to become adept at setting proper tension on the straps. To assess the comfort of the respirator facepiece, give the handler adequate time to consider the following points:

- Room for eye protection?
- Room for other protective gear, such as chemical-resistant head covering (if required)?
- Room to talk?

Instruct the handler to seat the facepiece on the face by moving the head from side-to-side and up and down slowly while taking in a few slow deep breaths. Then, the handler must conduct a user seal check, as described on page 23, or those recommended by the respirator-manufacturer. Seal checks are described in more detail in [Appendix B-1 to 1910.134](#). If the test subject fails the seal check tests, another facepiece must be selected and re-tested.

Any type of apparel that interferes with a satisfactory fit must be adjusted or removed. However, the fit-test must be performed while the handler is wearing the typical safety equipment, such as protective eyewear, that will be required during actual respirator use. This could interfere with respirator fit. Respirator straps go UNDER a hoodie or head-covering, never OVER it.

Next, it should be removed, and one of the following procedures performed:

1. Isoamyl acetate (banana oil) protocol (pages 33-36)
2. Bitrex (denatonium benzoate) aerosol protocol (pages 37-40)
3. Saccharin solution aerosol protocol (pages 41-44)
4. Irritant smoke protocol – Not described in this document. See the [e-CFR 29 1910.134 Part I, B \(5\)](#).
5. Quantitative fit-test protocol – Not described in this document. See the [e-CFR 29 1910.134 Part I, C](#).

The step-by-step instructions in this appendix were paraphrased from the regulation (Appendix A in 1910.134). The authors/editors have made every effort to be complete and clear, and expert reviewers reviewed our work. However, the responsibility lies with the handler employer to ensure these procedures are followed according to Appendix A in 1910.134, which can be accessed online.

Respirator Fit-testing: Isoamyl acetate (banana oil) protocol

This qualitative fit-test protocol is not appropriate for particulate respirators without an organic vapor filter. Isoamyl acetate (IAA) is also known as isopentyl acetate or “banana oil.” Fit-testing kits with IAA and plastic enclosures are available for purchase from a wide variety of vendors.

The employer shall:

- Ensure that the fit-testing equipment is clean and well-maintained.
- Ensure that the person administering the fit-test is able to prepare test solutions, calibrate equipment, perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.



Photo credit: Mschel (public domain), Wikipedia commons

The person administering the fit-test shall:

1. **Explain the testing procedure** to the test subject before screening begins.
2. **Prepare three rooms:**
 - One room will be used for odor/taste/sensitivity testing. This room must be well-ventilated.
 - One room will be used by handlers to put on their respirators, make appropriate adjustments, and perform a seal check.
 - One room will be used for respirator fit-testing. This room must be well-ventilated. Prepare a plastic chamber about the size of a 55-gallon drum liner, suspended upside down over a two-foot-diameter frame. If a 55-gallon drum-liner is not available, use plastic sheeting to make a similar chamber. The top of the chamber should be about 6 inches above the test subject’s head. A hook should be attached to the center-top of the enclosure. If using a prepared statement to assess the respirators while handlers are talking (i.e., the Rainbow Passage), attach a copy of the passage to the inside of the enclosure.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Leyenda del Arco Iris

Quando los rayos del sol chocan contra las gotas de lluvia suspendidas en el aire, éstas actúan como un prisma y forman un arco iris. El arco iris es la división de luz blanca en muchos bellos colores. Éstos toman la forma de un largo arco, con una trayectoria que es muy alta, y sus dos extremos aparentemente más allá del horizonte. Existe, de acuerdo a la leyenda, una vasija llena de oro en uno de sus extremos. La gente la busca, pero nadie la encuentra. Cuando el hombre busca algo que está más allá de su alcance, sus amigos dicen que está buscando la vasija llena de oro que está al final del arco iris.

3. **Odor threshold screening.** The handler does NOT use a respirator for this task.
 - a. Prepare the following solutions in clean 1-liter jars with lids. Prepare solutions in a well-ventilated area where the tests will **not** be performed.
 - i. Stock solution: Add 1 ml of pure isoamyl acetate (IAA) to 800 ml of odor-free water. Shake for 30 seconds. Label this jar. Replace this solution at least weekly.
 - ii. Odor test solution: Add 0.4 ml of the stock solution to 500 ml of odor-free water using a clean dropper or pipette. Shake for 30 seconds, and allow to stand for 2-3 minutes. Label this jar with a symbol unknown to the handlers. Replace this solution daily.
 - iii. Test-blank solution: Add 500 ml of odor-free water. Label this jar with a symbol unknown to the handlers.
 - b. In the odor threshold screening room, put the two jars (odor test solution and test-blank solution) on a table with a card/paper that states: "The purpose of this test is to determine if you can smell banana oil at a low concentration. The two jars in front of you contain water. One of these jars also contains a small amount of banana oil. Be sure the covers are on tight, then shake each jar for two seconds. Unscrew the lid of each jar, one at a time, and sniff at the mouth of the jar. Indicate to the test conductor which bottle contains banana oil."
 - c. Bring the handler into the room and ask them to follow the printed procedure. Provide the above instructions verbally, if needed, in a manner the handler can understand.
 - d. If the handler is not able to identify the jar containing the odor test solution, select another test protocol (i.e., Bitrex™ or saccharine) and start with threshold screening. If you plan to try again with banana oil, the handler should wait for five minutes outside the odor threshold screening room to avoid odor fatigue.
 - e. If the handler identifies the odor test solution correctly, proceed to the second room.
4. **Putting on the respirator**
 - a. Ask the handler to put on his or her selected respirator and adjust any straps.
 - b. Ask the handler to perform seal checks, also known as positive and negative pressure checks. Handlers should know how to perform seal checks. If not, see section 4 on page 23.
 - c. Once the respirator is comfortable and the seal checks are successfully completed, direct the handler to the separate fit-testing room.

5. Fit-testing with a respirator

- a. In the fit-testing room, ask the handler to step into the plastic enclosure. Adjust the height of the enclosure so that the top is about 6 inches from the handler's head.
- b. Give the handler a 6-inch by 5-inch piece of paper towel, folded in half, and wetted with 0.75 ml of pure IAA. Ask them to attach it to the hook at the top of the enclosure. Wait two minutes for the concentration to stabilize.
- c. During those two minutes, explain the purpose of the test, and importance of their honest and full cooperation. If their respirators are not effective, their health will be at risk.
- d. Ask the handler not to adjust the respirator now that the fit-test exercises have begun. Any adjustment voids the test. If this happens, the fit-test must be repeated.
- e. Ask the handler to speak up immediately if he or she can smell the banana oil. This will indicate a failed test. If this happens, the handler should quickly return to the respirator selection/donning room to adjust the respirator or select a different respirator.
- f. Ask the handler to perform **each of the following exercises for at least one minute**.
 - Normal breathing: When standing, without talking, the handler shall breathe normally.
 - Deep breathing: When standing, the handler shall breathe slowly and deeply, taking caution to avoid hyperventilation.
 - Turning the head: Standing in place, the handler shall slowly turn his or her head from extreme right to extreme left continuously, inhaling and exhaling in each extreme position, and while turning the head.
 - Lifting and lowering the head: Standing in place, the handler shall slowly move his or head up and down continuously, inhaling and exhaling in each extreme position, and while lifting/towering the head.
 - Talking: The handler shall talk out loud slowly and loudly enough to be heard clearly. The handler may count to 100, recite a poem, or tell a story. Often, fit-testing professionals will ask handlers to recite the "Rainbow Passage."
 - Bending over: The handler shall bend at the waist reaching for his or her toes. If the test equipment doesn't allow the handler to bend at the waist, he or she may jog in place instead.
 - Normal breathing: When standing, without talking, the handler shall breathe normally.

Rather than a paper towel, you may use any similar porous, absorbent, single-ply material. Some vendors also sell IAA swabs or ampules. They can be used if they have been demonstrated to generate an IAA test atmosphere with a concentration equivalent to that generated by the paper towel method.

- g. If the handler still cannot smell banana oil, ask the handler to take off the respirator, inside the enclosure, and take a breath. He or she should be able to smell the banana oil. If not, the handler may be experiencing odor fatigue, and the test should be repeated after a five-minute break and repeated odor threshold sensitivity testing.
 - h. As the subject leaves the enclosure, ask them to remove the saturated towel and return it to the fit-test conductor. It should be placed in a self-sealing plastic bag and/or removed from the room to prevent the test area from being contaminated.
 - i. Ask the handler questions regarding the comfort of the respirator upon completion. If it has become unacceptable, try another respirator.
6. **Complete a record of the fit-testing procedure** and provide it to the handler employer. It must include:
- i. The handler's name.
 - ii. The type of fit-test performed: Qualitative fit-test with IAA.
 - iii. The specific make, model, style and size of respirator used.
 - iv. The date of the test.
 - v. The results of the test.
 - vi. The fit-test conductor's name (optional).

If the handler will be using another type of respirator, wait at least five minutes to prevent odor fatigue, repeat the odor threshold screening procedure, then repeat the fit-testing procedure with each additional respirator.



Photo credit: Getty Images

Respirator Fit-testing: Bitrex™ (denatonium benzoate) solution aerosol protocol

Using this protocol, the handler will use 'taste' to detect any leaks in the facial seal of the respirator. There is a similar taste-driven fit-test that uses a sweet (saccharin) taste. Bitrex is bitter. Bitrex is often used in household liquids, such as cleaning agents, to deter children from drinking them. Fit-testing kits with Bitrex and testing enclosures are available for purchase from a wide variety of vendors. This qualitative fit-test protocol is appropriate for disposable respirators and half masks fitted with particulate or combination gas/vapor and particulate filters.

The employer shall:

- Ensure that the fit-testing equipment is clean and well-maintained.
- Ensure that the person administering the fit-test is able to prepare test solutions, calibrate equipment, perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

The person administering the fit-test shall:

1. **Explain the testing procedure** to the test subject before screening begins. Handlers may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.
2. **Prepare the equipment:**
 - a. Assemble or buy an enclosure that will be worn about the head and shoulders, approximately 12 inches in diameter by 14 inches tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when the respirator is worn. The enclosure should have a 3/4 inch hole in front of the handler's nose and mouth area to accommodate the nebulizer nozzle. An enclosure substantially similar to the 3M hood assembly, parts #FT14 and #FT15 combined, is adequate.
 - b. Acquire two DeVilbiss Model 40 Inhalation Medication Nebulizers or equivalent.
 - c. Prepare the threshold test solution by adding 13.5 mg of Bitrex to 100 ml of 5% salt (NaCl) solution in distilled water. Add the solution to a nebulizer and clearly label it "threshold test solution" or similar.
 - d. Prepare the fit-test solution by adding 337.5 mg of Bitrex to 200 ml of a 5% salt (NaCl) solution in distilled water. Add the solution to a separate nebulizer and clearly label it "fit-test solution" or similar.
 - e. Prepare a printed copy of the Rainbow Passage in the appropriate language, using a large font size.
 - f. Each nebulizer should be well-rinsed with water, shaken dry, and refilled at least every four hours.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Leyenda del Arco Iris

Cuando los rayos del sol chocan contra las gotas de lluvia suspendidas en el aire, éstas actúan como un prisma y forman un arco iris. El arco iris es la división de luz blanca en muchos bellos colores. Éstos toman la forma de un largo arco, con una trayectoria que es muy alta, y sus dos extremos aparentemente más allá del horizonte. Existe, de acuerdo a la leyenda, una vasija llena de oro en uno de sus extremos. La gente la busca, pero nadie la encuentra. Cuando el hombre busca algo que está más allá de su alcance, sus amigos dicen que está buscando la vasija llena de oro que está al final del arco iris.

3. **Taste threshold screening.** The handler does NOT use a respirator for this task.
 - a. Explain the test procedures to the handler.
 - b. Tell the handler to put the enclosure on his or her head/shoulders, and breathe through the mouth (slightly open) with tongue extended.
 - c. Tell the handler to speak up immediately if a bitter taste is detected.
 - d. Place the nebulizer with 'threshold check solution' against the hole near the handler's nose/mouth area. Direct the nozzle away from the handler's nose/mouth.
 - e. Squeeze the bulb firmly and release, allowing the bulb to fully expand. Squeeze the bulb this way ten times quickly, or stop when the handler detects a bitter taste.
 - f. If the handler detected the taste with ten squeezes or less, document '10' as the taste threshold. The taste threshold screening is complete.
 - g. If the handler does not detect the taste after ten squeezes, squeeze the nebulizer bulb ten more times in rapid succession. Again, stop the test when the bitter taste is detected. If the handler detects the taste with 11-20 squeezes, document '20' as the taste threshold.
 - h. If the handler does not detect the taste after twenty squeezes, squeeze the nebulizer bulb ten more times in rapid succession. Again, stop the test when the bitter taste is detected. If the handler detects the taste with 21-30 squeezes, document '30' as the taste threshold.
 - i. If the handler does not detect the taste after thirty squeezes, the handler is unable to taste Bitrex, and a different fit-test method is needed.
 - j. Be sure to rinse, dry, and refill the nebulizer at least every four hours when performing several fit-tests in one day.

4. Putting on the respirator

- a. Ask the handler to put on his or her selected respirator and adjust any straps.
- b. Ask the handler to make sure the respirator is properly adjusted and equipped with any type of particulate filter(s) needed.
- c. Ask the handler to perform seal checks, also known as positive and negative pressure checks. Handlers should know how to perform seal checks. If not, see page 23.
- d. If the test is failed and the handler wishes to try again after making an adjustment, the next attempt should be delayed at least five minutes, and the handler should drink water to clear any bitter taste from the mouth.

5. Fit-testing with a respirator

- a. Tell the handler to put the enclosure on his or her head/shoulders, and breathe through the mouth (slightly open) with tongue extended.
- b. Tell the handler to speak up immediately if a bitter taste is detected. This will indicate a failed test. If this happens, the handler should return to the respirator selection/donning area to adjust the respirator or select a different respirator.
- c. Place the nebulizer with 'fit-test solution' against the hole near the handler's nose/mouth area.
- d. Squeeze the bulb firmly and release, allowing the bulb to fully expand. Squeeze the bulb this way ten, twenty, or thirty times quickly, or stop when the handler detects a bitter taste. Use the number of squeezes that you noted in the taste threshold procedure for this handler, using this respirator.
- e. Ask the handler to perform **each of the following exercises for at least one minute**. While he or she is performing these tasks, refresh the aerosol in the hood **every 30 seconds** by squeezing the nebulizer bulb with half the number of squeezes used initially (5, 10, or 15 squeezes). Check the nebulizer periodically to make sure it hasn't clogged.
 - Normal breathing: When standing, without talking, the handler shall breathe normally.
 - Deep breathing: When standing, the handler shall breathe slowly and deeply, taking caution to avoid hyperventilation.
 - Turning the head: Standing in place, the handler shall slowly turn his or her head from extreme right to extreme left continuously, inhaling and exhaling in each extreme position, and while turning the head.
 - Lifting and lowering the head: Standing in place, the handler shall slowly move his or head up and down continuously, inhaling and exhaling in each extreme position, and while lifting/towering the head.
 - Talking: The handler shall talk out loud slowly and loudly enough to be heard clearly. The handler may count to 100, recite a poem, or tell a story. Often, fit-testing professionals will ask handlers to recite the "Rainbow Passage."

- Bending over: The handler shall bend at the waist reaching for his or her toes. If the test equipment doesn't allow the handler to bend at the waist, he or she may jog in place instead.
 - Normal breathing: When standing, without talking, the handler shall breathe normally.
- f. Check the nebulizer to make sure it hasn't clogged. If it has, the test is invalid.
 - g. If the handler still cannot taste the Bitrex, the test is passed.
 - h. If the taste of Bitrex is detected, the respirator does not fit well enough to pass the fit-test. Adjustments or a different respirator may be needed.
 - i. Ask the handler questions regarding the comfort of the respirator upon completion. If it has become unacceptable, try another respirator.
6. **Complete a record of the fit-testing procedure** and provide it to the handler employer. It must include:
- i. The handler's name.
 - ii. The type of fit-test performed: Qualitative fit-test with Bitrex.
 - iii. The specific make, model, style and size of respirator used.
 - iv. The date of the test.
 - v. The results of the test.
 - vi. The fit-test conductor's name (optional).

If the handler will be using another type of respirator, wait at least five minutes, ask the handler to drink some water, repeat the taste threshold screening procedure, then repeat the fit-testing procedure with each additional respirator.

Respirator Fit-testing: Saccharin solution aerosol protocol

Using this protocol, the handler will use 'taste' to detect any leaks in the facial seal of the respirator. There is a similar taste-driven fit-test that uses a bitter taste (Bitrex™ containing denatonium benzoate). By contrast, saccharin tastes sweet. Fit-testing kits with saccharin and testing enclosures are available for purchase from a wide variety of vendors. This qualitative fit-test protocol is appropriate for any respirator with a particulate filter (or combination of particulate filter and gas/vapor cartridge), including 'disposable' respirators.



Photo credit: Rillke
(CC BY-SA 3.0), Wikipedia commons

The employer shall:

- Ensure that the fit-testing equipment is clean and well-maintained.
- Ensure that the person administering the fit-test is able to prepare test solutions, calibrate equipment, perform tests properly, recognize invalid tests, and ensure that test equipment is in proper working order.

The person administering the fit-test shall:

1. **Explain the testing procedure** to the test subject before screening begins. Handlers may not eat, drink (except plain water), smoke, or chew gum for 15 minutes before the test.
2. **Prepare the equipment:**
 - a. Assemble or buy an enclosure that will be worn about the head and shoulders, approximately 12 inches in diameter by 14 inches tall. The front portion of the enclosure shall be clear from the respirator and allow free movement of the head when the respirator is worn. The enclosure should have a 3/4 inch hole in front of the handler's nose and mouth area to accommodate the nebulizer nozzle. An enclosure substantially similar to the 3M hood assembly, parts #FT14 and #FT15 combined, is adequate.
 - b. Acquire two DeVilbiss Model 40 Inhalation Medication Nebulizers or equivalent.
 - c. Prepare the threshold test solution by adding 0.83 gram of sodium saccharin USP in 100 ml of warm water. Add the solution to a nebulizer and clearly label it "threshold test solution" or similar.
 - d. Prepare the fit-test solution by adding 83 grams of sodium saccharin to 100 ml of warm water. Add the solution to a separate nebulizer and clearly label it "fit-test solution" or similar.
 - e. Prepare a printed copy of the Rainbow Passage in the appropriate language, using a large font size.
 - f. Each nebulizer should be well-rinsed with water, shaken dry, and refilled at least every four hours.

Rainbow Passage

When the sunlight strikes raindrops in the air, they act like a prism and form a rainbow. The rainbow is a division of white light into many beautiful colors. These take the shape of a long round arch, with its path high above, and its two ends apparently beyond the horizon. There is, according to legend, a boiling pot of gold at one end. People look, but no one ever finds it. When a man looks for something beyond reach, his friends say he is looking for the pot of gold at the end of the rainbow.

Leyenda del Arco Iris

Cuando los rayos del sol chocan contra las gotas de lluvia suspendidas en el aire, éstas actúan como un prisma y forman un arco iris. El arco iris es la división de luz blanca en muchos bellos colores. Éstos toman la forma de un largo arco, con una trayectoria que es muy alta, y sus dos extremos aparentemente más allá del horizonte. Existe, de acuerdo a la leyenda, una vasija llena de oro en uno de sus extremos. La gente la busca, pero nadie la encuentra. Cuando el hombre busca algo que está más allá de su alcance, sus amigos dicen que está buscando la vasija llena de oro que está al final del arco iris.

3. **Taste threshold screening.** The handler does NOT use a respirator for this task.
 - a. Explain the test procedures to the handler.
 - b. Tell the handler to put the enclosure on his or her head/shoulders, and breathe through the mouth (slightly open) with tongue extended.
 - c. Tell the handler to speak up immediately if a sweet taste is detected.
 - d. Place the nebulizer with 'threshold check solution' against the hole near the handler's nose/mouth area. Direct the nozzle away from the handler's nose/mouth.
 - e. Squeeze the bulb firmly so that it collapses completely, then release, allowing the bulb to fully expand. Squeeze the bulb this way ten times quickly, or stop when the handler detects a sweet taste.
 - f. If the handler detected the taste with ten squeezes or less, document '10' as the taste threshold. The taste threshold screening is complete.
 - g. If the handler does not detect the taste after ten squeezes, squeeze the nebulizer bulb ten more times in rapid succession. Again, stop the test when the sweet taste is detected. If the handler detects the taste with 11-20 squeezes, document '20' as the taste threshold.
 - h. If the handler does not detect the taste after twenty squeezes, squeeze the nebulizer bulb ten more times in rapid succession. Again, stop the test when the sweet taste is detected. If the handler detects the taste with 21-30 squeezes, document '30' as the taste threshold.
 - i. If the handler does not detect the taste after thirty squeezes, the handler is unable to taste sweetness, and a different fit-test method is needed.
 - j. Be sure to rinse, dry and refill the nebulizer at least every four hours when performing several fit-tests in one day.

4. Putting on the respirator

- a. Ask the handler to put on his or her selected respirator and adjust any straps.
- b. Ask the handler to make sure the respirator is properly adjusted and equipped with any type of particulate filter(s) needed.
- c. Ask the handler to perform seal checks, also known as positive and negative pressure checks. Handlers should know how to perform seal checks. If not, see page 23.
- d. If the test is failed and the handler wishes to try again after making an adjustment, the next attempt should be delayed at least five minutes, and the handler should drink water to clear any sweet taste from the mouth.

5. Fit-testing with a respirator

- a. Tell the handler to put the enclosure on his or her head/shoulders, and breathe through the mouth (slightly open) with tongue extended.
- b. Tell the handler to speak up immediately if a sweet taste is detected. This will indicate a failed test. If this happens, the handler should return to the respirator selection/donning area to adjust the respirator or select a different respirator.
- c. Place the nebulizer with 'fit-test solution' against the hole near the handler's nose/mouth area.
- d. Squeeze the bulb firmly so that it collapses completely, then release, allowing the bulb to fully expand. Squeeze the bulb this way ten, twenty, or thirty times quickly, or stop when the handler detects a sweet taste. Use the number of squeezes that you noted in the taste threshold procedure for this handler, using this respirator.
- e. Ask the handler to perform **each of the following exercises for at least one minute**. While he or she is performing these tasks, refresh the aerosol in the hood **every 30 seconds** by squeezing the nebulizer bulb with half the number of squeezes used initially (5, 10, or 15 squeezes). Check the nebulizer periodically to make sure it hasn't clogged.
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 - Turning the head: Standing in place, the handler shall slowly turn his or her head from extreme right to extreme left continuously, inhaling and exhaling in each extreme position, and while turning the head.
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- Bending over: The handler shall bend at the waist reaching for his or her toes. If the test equipment doesn't allow the handler to bend at the waist, he or she may jog in place instead.
 - Normal breathing: When standing, without talking, the handler shall breathe normally.
- f. Check the nebulizer to make sure it hasn't clogged. If it has, the test is invalid.
 - g. If the handler still cannot taste the sweet aerosol, the test is passed.
 - h. If the sweet taste is detected, the respirator does not fit well enough to pass the fit-test. Adjustments or a different respirator may be needed.
 - i. Ask the handler questions regarding the comfort of the respirator upon completion. If it has become unacceptable, try another respirator.
6. **Complete a record of the fit-testing procedure** and provide it to the handler employer. It must include:
- i. The handler's name.
 - ii. The type of fit-test performed: Qualitative fit-test with saccharin.
 - iii. The specific make, model, style and size of respirator used.
 - iv. The date of the test.
 - v. The results of the test.
 - vi. The fit-test conductor's name (optional).

If the handler will be using another type of respirator, wait at least five minutes, ask the handler to drink some water, repeat the taste threshold screening procedure, then repeat the fit-testing procedure with each additional respirator.



Photo credit: Getty Images

GUIDELINES FOR RESPIRATOR CLEANING

From Appendix B-2 of 29 CFR 1910.134: Respirator Cleaning Procedures (Mandatory)

These are general cleaning procedures. The employer may, as an alternative, use the cleaning recommendations provided by the manufacturer of the respirator used by their handlers, provided that these procedures clean and disinfect in a way that prevents damage to the respirator and does not cause harm to the user.

Procedures for cleaning respirators:

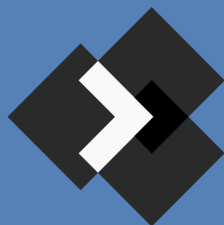
- Remove the filters, cartridges, or canisters.
- Disassemble the facepiece by removing the speaking diaphragms, demand- and pressure-demand valve assemblies, hoses, and any other components recommended by the manufacturer.
- Discard or repair any defective parts, replace discarded parts with the exact parts approved for that make and model respirator.
- Wash the washable components in warm water with a mild detergent or with a cleaner recommended by the manufacturer. A stiff bristle brush (not wire) may be used to facilitate the removal of dirt.
- Rinse components thoroughly in clean, warm, preferably running water. Drain.
- When the cleaner used does not contain a disinfecting agent, respirator components should be immersed for two minutes in **one** of the following:
 - Hypochlorite solution (50 ppm of chlorine) made by adding approximately one milliliter of laundry bleach to one liter of warm water; **or**,
 - Aqueous solution of iodine (50 ppm iodine) made by adding approximately 0.8 milliliters of tincture of iodine (6-8 grams ammonium and/or potassium iodide/100 cc of 45% alcohol) to one liter of warm water; **or**,
 - Other commercially available cleansers of equivalent disinfectant quality when used as directed, if their use is recommended or approved by the respirator manufacturer.
- Rinse components thoroughly in clean, warm, preferably running water. Drain.

“Warm water” is a maximum of 110 degrees F (43 deg. C).

Thorough rinsing is very important. Detergents or disinfectants that dry on facepieces may cause skin irritation. Also, some disinfectants may cause deterioration of rubber or corrosion of metal parts if not completely removed.

- Hand-dry components with a clean lint-free cloth or air-dry.
- Reassemble facepiece, replacing filters, cartridges, and canisters where necessary.
- Test the respirator to ensure that all components work properly.
- When storing the respirator, always store the re-usable cartridges, filters and canisters separately from the respirator, such as in a separate, closed plastic bag.

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