

CHAPTER 6

PERSONAL PROTECTIVE EQUIPMENT

LEARNING OBJECTIVES

After studying this chapter, you should be able to:

- Identify where on the label to find the minimum clothing and personal protective equipment (PPE) required to handle a given pesticide product.
- State the criteria to properly select skin, eye, and respiratory protection required by the pesticide label based upon your expected use and exposure.
- List three work practices each for correct use of gloves, footwear, and eyewear that minimize pesticide exposure and contamination.
- List the signs of wear and tear, damage, or other PPE failures that may expose you to pesticides.
- Explain the importance of wearing respiratory protection devices approved by the National Institute for Occupational Safety and Health.
- Tell when to replace particulate filters and chemical cartridges or canisters on your respirator.
- Distinguish between a fit test and a seal check for tight-fitting respirators.
- Describe how to clean and maintain pesticide-contaminated work clothes and PPE.
- Describe how to dispose of PPE when necessary.



PERSONAL PROTECTIVE EQUIPMENT

The pesticide label prescribes handling precautions, personal protective equipment (PPE), and other safety measures to minimize your exposure while handling pesticides. PPE comprises the clothing and devices you wear to protect

your body from contact with pesticides. Wearing PPE can reduce exposure (dermal, inhalation, ocular, or oral) and thereby lower the chances of pesticide injury, illness, or poisoning. Basic protective work clothing consists of a

long-sleeved shirt, long pants, closed-toed shoes, and socks. PPE, as defined by the U.S. Environmental Protection Agency (EPA), includes coveralls, apron, gloves, footwear, headgear, eyewear, and respirators.

It is important that all pesticide applicators and handlers understand

the protections and limitations of PPE. Although PPE may reduce your exposure to pesticides, it does not necessarily eliminate it. Proper PPE selection, use, and care are essential. The following are some good work practices that you should always follow when using pesticides.

GOOD WORK PRACTICES

It is important to take basic steps to reduce exposure when you handle pesticides or work in pesticide-treated areas. Remember to use common sense—no guidelines cover all situations.

Prevent oral exposure

- Never eat, drink, chew gum, use tobacco products, or handle cellphones while working with pesticides. Contaminated hands are a source of oral exposure to pesticides.

Prevent dermal exposure

- Wash your hands before using the toilet—the groin area readily absorbs pesticide.
- Wear a minimum of a long-sleeved shirt, long pants, and closed-toed shoes.
- Do not wipe contaminated gloves on your clothing—the pesticide may seep through.

Prevent ocular exposure

- Wear protective eyewear to protect from splashes, sprays, mists, fogs and aerosols.

Prevent inhalation exposure

- Avoid breathing in dusts, spray droplets, or vapors.
- Wear a respirator when needed, even if the label does not require it.

Decontaminate yourself and your PPE

- Wash your gloves with soap and water before you take them off. Remove them and wash your hands and face.
- Immediately wash off any pesticide that gets directly on you. Remove and replace damaged or contaminated clothing or PPE. Have spare clothing available. At the end of the day, wash or replace contaminated PPE.
- Shower at the end of the workday. Wash your hair and scalp and under your fingernails. Put on a complete change of clothing after you shower.
- Launder your work clothes separately from non-work and other clothes at the end of each workday.

PROTECT YOURSELF FROM PESTICIDES

A pesticide label lists the minimum PPE that an applicator, handler, and early-entry worker must wear. Wearing anything less is illegal and dangerous. All pesticide handlers (e.g., applicators, mixers and loaders, and flaggers) are responsible for following the pesticide label, including wearing PPE.

PPE requirements are typically listed under the “Precautionary Statements” section of the pesticide label. If you work in or on a farm, forest, nursery, or greenhouse, look for additional PPE requirements listed in the “Agricultural Use Requirements” box on the label. Also, always check to see

if state regulations are more restrictive than label requirements. For example, a label may allow you to wear less PPE when engineering controls (e.g., enclosed cab) are used, but the state, tribal, or territorial pesticide regulatory agency may prohibit this practice. Additionally, some states have more restrictive occupational health and safety regulations specific to pesticide applicators or to protect commercial sector workers, such as landscapers or pest management professionals. When a state, tribal, or local regulation is more restrictive than federal pesticide laws, it **must** be followed.

Under EPA's Worker Protection Standard (WPS; 40 CFR Part 170), agricultural employers are legally required to provide PPE that is in good working order. They also must train pesticide handlers on the use proper use and maintenance of label-required PPE.

PPE label requirements vary, depending upon the toxicity, formu-

lation, dilution, and route of exposure of the pesticide product and activity. For example, a single label may have one set of PPE requirements for applicators and a different set for agricultural early-entry workers going into areas during the restricted-entry interval. Even very low hazard pesticides require a long-sleeved shirt, long pants, shoes, and socks.

Consider all work situations where using PPE may be hazardous. Be careful around moving equipment parts (such as a power takeoff unit) that can catch apron strings. Protective clothing can restrict evaporation of sweat, thus impeding the body's natural cooling system and causing heat-related illnesses, including heat stress (see Chapter 5, Pesticide Hazards and First Aid, for more information).



Posted field during the restricted-entry interval.

EXAMPLE PPE STATEMENTS ON A LABEL

Personal Protective Equipment

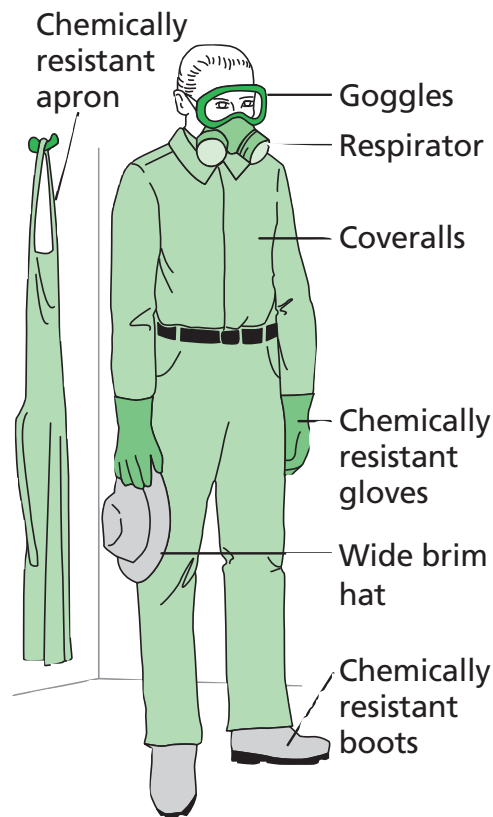
All mixers, loaders, applicators, and other handlers must wear:

- Long-sleeved shirt and long pants.
- Shoes and socks.
- Nitrile rubber, butyl rubber, barrier laminate, or Viton® gloves.
- Protective eyewear (goggles or face shield).
- Chemical-resistant apron when mixing or loading, cleaning up spills or equipment, or otherwise exposed to the concentrate.

Agricultural Use Requirements

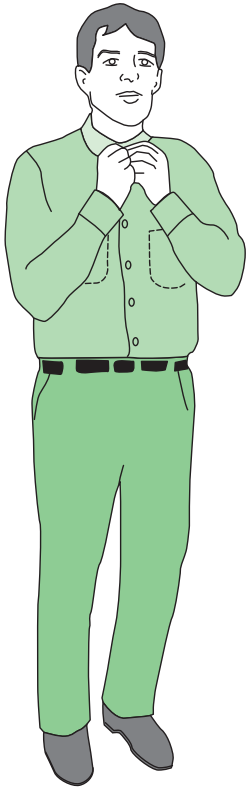
PPE required for early entry to treated areas as permitted under the Worker Protection Standard and that involves contact with anything that has been treated (such as plants, soil, or water) includes:

- Coveralls over short-sleeved shirt and short pants.
- Nitrile rubber, butyl rubber, barrier laminate, or Viton® gloves.
- Shoes plus socks.
- Protective eyewear.



Wearing appropriate types of personal protective equipment (PPE) can greatly reduce the risk of pesticide exposure.

PROTECT YOUR BODY



At a minimum wear a long-sleeved shirt, long pants, shoes, and socks when working around pesticides.

Different types of clothing, aprons, hats, boots, and gloves are not equally protective against all pesticides and under all conditions. For PPE to be protective, it must:

- Shield your skin (head, face, neck, trunk, arms, legs, and feet) from exposure throughout the pesticide-handling activity.
- Be durable and resist punctures and tears during normal use.
- Be comfortable enough without restricting your movement so you will wear it.

To protect your skin, your normal work clothing must cover most of your body. Depending on the product's toxicity and use, other PPE (such as coveralls, apron, hat, boots, and gloves) may also be required. Protective clothing, gloves, and boots must provide a barrier for the duration of the task when you are exposed to a pesticide. Labels may require waterproof gloves or boots. Additionally, chemical-resistant gloves, aprons, hats, boots, or suits are required on some labels. EPA defines “chemical resistant” as preventing any measurable amount of material from moving through (breaking through) the fabric or material. Things that can affect the extent of **break-through** are contact time, concentration, temperature, and the product itself. When selected correctly, protective clothing reduces the risk of dermal exposure but does not eliminate it.

Work Clothing

Your work clothes provide a basic barrier to minimize pesticide contact with your skin. Always wear—at a minimum—a long-sleeved shirt, long pants, closed-toed shoes, and socks whenever you handle pesticides or work around pesticide residues. Select work

clothes made of tightly woven fabrics to reduce pesticide penetration. Make sure they are free of holes and tears. Fasten the shirt collar completely to protect the lower part of your neck.

Do not use these work clothes for anything other than handling pesticides. Store and launder fabric work clothing separately from all other clothing after each day's use. See “Maintaining Clothing and Personal Protective Equipment” at the end of this chapter for details on cleaning and disposing of pesticide-soiled work clothes.

Good work practices—basic work clothes

- Always wear at a minimum a long-sleeved shirt and long pants.
- Make sure work clothes are sufficiently durable.
- Wash work clothes at the end of the day, separate from other clothing.

Coveralls

Some pesticide labels require coveralls (a second layer of clothing) over work clothes. According to regulations, coveralls must be loose-fitting, one- or two-piece garments that cover the entire body except head, hands, and feet. A coverall can be made of woven (like cotton or twill) or nonwoven fabrics. It should be either easy to clean and sturdy enough for laundering and repeated use or disposable. Wearing a disposable coverall reduces decontamination time and lowers the risk of contaminating yourself, your application equipment, and your vehicle. Disposable coveralls differ in their level of protection. Most importantly, wearing coveralls lessens the chance that you will take pesticides home. Handle disposable coveralls carefully so as to not contaminate other people.

Very few pesticides require a chemical-resistant coverall. If one is required, work with your PPE supplier to find a coverall that provides the necessary level of protection based on the tasks



A well-designed coverall makes it hard for pesticides to get through to your inner clothing or skin.

you perform, the product formulation, and exposure.

Good work practices—coveralls

- Make sure coverall is durable and does not rip, tear, or puncture easily.
- Wash before reuse; do not wash with other laundry.
- Protect from excess heat (conditioning, hydration, and cooling) when wearing additional layers of clothing.

Apron for Mixing

Some pesticide labels require you to wear a chemical-resistant apron when mixing or loading a pesticide, or when cleaning application equipment. Select aprons that cover the front of your body from the middle of the chest to the knees.

Good work practices—apron for mixing

- Select aprons that cover the front of your body from the middle of the chest to the knees.



Jack Kelly Clark, University of California Statewide IPM Program

Choose a chemical-resistant apron that extends from your neck to at least your knees.

Headgear for Overhead Applications

If an overhead application may result in exposure, a pesticide label may require chemical-resistant headgear. This headgear must protect against sprays so that no liquid breaks through

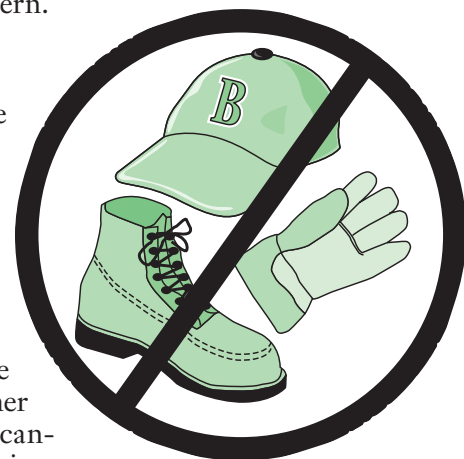
the hat or hood. You may use either a chemical-resistant hat with a wide brim or a hood. Hoods attached to jackets or suits protect your neck and back from pesticide sprays that might otherwise run down your back. Wash headgear at the end of the day. When making overhead applications, do not use headgear made of absorbent material, such as cotton, leather, or straw.

Good work practices—headgear for overhead exposures

- Cotton ball caps absorb pesticides. Do not wear them if overhead exposure is a concern.

Footwear

Many pesticide labels require you to wear shoes and socks. Make sure the shoes have closed toes. However, some product labels require you to wear chemical-resistant footwear. A heavy-duty pair of unlined rubber boots or shoe covers provides protection from pesticides. Wash them inside and out at the end of the day. Leather and canvas absorb pesticides and cannot be decontaminated. Regulations allow you to substitute leather for chemical-resistant boots only when the chemical-resistant footwear required by the pesticide label is not durable enough for use in rough terrain. Do not use these boots for other purposes.



Clothes made of cotton, leather, or canvas are not chemically resistant, even to dry formulations.

Good work practices—footwear

- Never wear open-toed shoes or sandals when applying pesticides.
- Wear heavy-duty rubber boots that extend past your ankle and at least halfway up to your knee if you will enter or walk through treated areas before spray has dried.
- Put your pant legs outside your boots to prevent pesticides from running down your legs and becoming trapped in your footwear.
- Do not use footwear used for applying pesticides for anything else.
- Do not wear work footwear home.

**FOLLOW
THE LABEL
CAREFULLY**

Know which particular gloves are required. For most products, a waterproof glove is sufficient. However, if the label requires a specific glove type and you wear the wrong one, the glove may degrade quickly from the solvents in the formulated product.

Gloves

Pesticide handlers get by far the most exposure from pesticides on their hands and forearms. Research has shown that workers mixing pesticides received 85% of the total exposure on their hands and 13% on their forearms (see Figure 6.1). The same study showed that wearing protective gloves reduced exposure by 99%. Protective gloves are essential to dermal protection.

Pesticide labels often require waterproof gloves or one of the following glove types: nitrile rubber, butyl rubber, neoprene rubber, barrier laminate, and Viton®. Each glove type varies significantly in how well it protects from the different solvents in formulated products. For this

reason, it is important to read each label to determine which glove type is appropriate. The glove type varies from product to product, even those with similar active ingredients.

The solvent in a pesticide formulation determines the protective glove type. Pesticide labels require either waterproof gloves (for solid or water-based formulations) or chemical-resistant gloves for the various solvents (e.g., alcohols, ketones, and petroleum distillates) used in different formulations. For liquid products with a solvent other than water, EPA requires the label to specify particular glove materials that provide protection. Note that labels that have not been recently updated may still refer to a solvent category (A through H) in the EPA Chemical Resistance Category Selection Chart for Gloves.

Read the label carefully to make sure you have the correct protective glove material. Explain to your supplier which glove types you need.

Some pesticide labels specify both the glove material and its thickness. As a general rule, the thicker the glove (of the same material under identical conditions), the longer the breakthrough time. A pesticide label's specification of glove type is generally based upon a thickness of 14 mils, except for polyethylene and barrier laminate gloves. Use the 14 mils thickness as a rule of thumb when selecting glove materials that appear on the pesticide label.

Glove durability is another important consideration. Select a glove that is protective, does not tear or puncture easily, and protects you for the duration

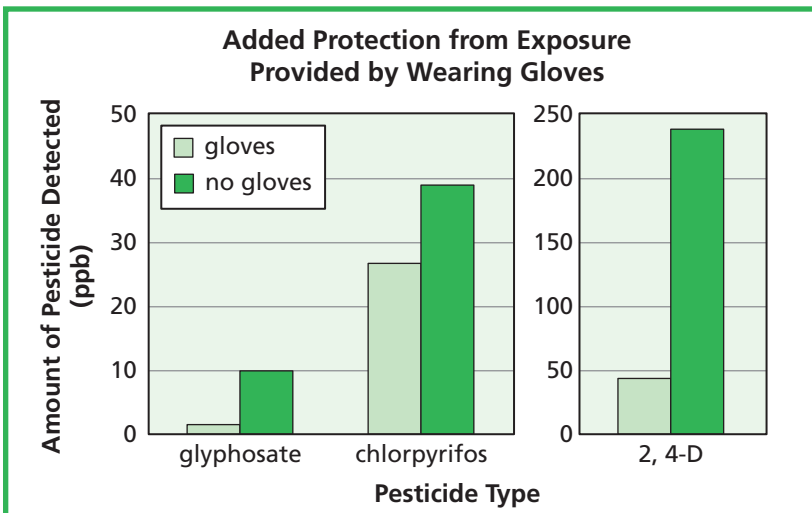


Figure 6.1
Farmers who wore gloves while applying pesticides reduced their risk of exposure (The Farm Family Exposure Study, John Acquavella).

REFERENCE CHART FOR GLOVES*

- Category A Any waterproof material
- Category B ONLY butyl rubber or barrier laminate
- Category C Butyl rubber, nitrile, neoprene, polyvinyl chloride, barrier laminate, or Viton®
- Category D ONLY butyl rubber or barrier laminate
- Category E Nitrile, neoprene, barrier laminate, or Viton®
- Category F Butyl rubber, nitrile, barrier laminate, or Viton®
- Category G ONLY barrier laminate or Viton®
- Category H ONLY barrier laminate or Viton®

*Two or more hours contact



Nitrile and butyl rubber gloves.

Edward Crow, Maryland Department of Agriculture

of the task. Discard the gloves if there is any sign of wear or if the gloves leak.

Do not use gloves made of any kind of absorbent material, lining, or flocking, including leather or cloth (exception: cloth gloves are used with fumigants). These types of gloves absorb pesticide and trap it closely against your bare skin, greatly increasing skin absorption.

Choose a glove size that fits you comfortably. Gloves that fit well provide increased dexterity for equipment maintenance or calibration. Gloves that are too tight stretch the material, allowing pesticides to break through. Gloves that are too large can get caught in equipment. And gloves that are too loose may allow pesticides to run down the inside and be directly absorbed by your skin.

Select gloves designed to give you extra protection when needed for the job, such as elbow-length gloves when mixing and loading. Wear gloves according to how you are applying the pesticide. Do not use a glove beyond the breakthrough time.

When using reusable gloves, rinse them at each break and wash them thoroughly at the end of the workday. Absorbed pesticides will continue to permeate the material if not cleaned. Make sure your gloves are in top condition. Throw out any gloves showing wear. Check glove integrity before each use. Rinse disposable gloves before discarding them.

Good work practices—gloves

- Wear waterproof or chemical-resistant gloves when applying

pesticides. Although pesticide labels do not always specifically require gloves, wearing them reduces your exposure (exception: when handling fumigants).

- Check gloves closely for holes by filling the gloves with clean water and gently squeezing. Discard them if you find any leakage.
- Wear gloves whenever you might get pesticides or residue on your hands, such as when cleaning sprayer nozzles or working around contaminated equipment or surfaces.
- Wear gloves according to the type of arm movements you make when handling pesticides (see Figure 6.2).
- Wash your gloves before taking them off between tasks.
- If pesticide is spilled, splashed, or gets inside your gloves, take them off immediately. Wash your hands and put on a clean pair of gloves.
- Replace your gloves immediately if they get cut, torn, or damaged.
- If making several applications during the day, change out gloves between jobs to avoid contaminating yourself and your vehicle.

- Rinse and slash used gloves before discarding.

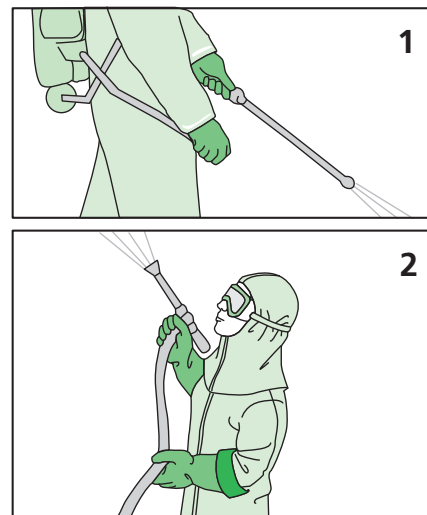


Figure 6.2

Wear gloves according to how you are applying the pesticide: (1) sleeves over gloves for jobs where your hands are mostly lowered, (2) gloves outside your sleeves with cuff folded up 1 or 2 inches when spraying above your head.

PROTECT YOUR EYES

Eyes readily absorb pesticides. When a label says to wear protective eyewear, you may use goggles; a face shield; safety glasses with shields at the front, brow, and temple; or a full-face respirator. Use common sense and select eyewear that protects you for the task at hand. Eyewear made of impact-resistant material, such as polycarbonate, can protect you from flying

objects, such as granular pesticides. However, safety glasses will not protect your eyes from pesticide splashes.

Products that are corrosive to the eyes (e.g., Danger) require a particular type of eyewear. For example, goggles may be required when your eyes may be exposed to liquids or par-



Tight-fitting goggles help protect your eyes from pesticide exposure.

ticulates during a certain application or use. Wear tightly fitting goggles when you are in high-exposure situations, such as an open cab during an air-blast application; applying mists, fogs, or aerosols indoors; or in any other location where you will be enveloped in a spray, mist, or dust. Make sure goggles are splash- and spray-proof and have an air baffle system for airflow and no side vents. If fogging is a problem, use anti-fog lens treatments or purchase low-fog goggles.

If your eyewear has a headband that is made of pesticide-absorbent material, change it often or use a rubber strap. If possible, wear the strap under your hat or hood to protect it from becoming contaminated.

Protective eyewear can be worn with a half-face respirator. If you wear eyeglasses, you can buy an eyeglass insert for your full-face respirator that is fitted with your prescription. People who wear contact lenses should consult an eye doctor or their medical professional before using pesticides or wearing respirators.

Good work practices—eyewear

- Minimum eyewear is safety glasses with shields at the front, brow, and temple.
- If goggles are required, have an eyewash dispenser immediately available.
- Consult an eye doctor if you wear contact lenses.

PROTECT YOUR RESPIRATORY SYSTEM

When you use pesticides, you may be exposed to toxic gases, vapors, particulates (solids or liquids), or all of these. A respirator is a safety device that protects you from inhaling contaminated air. The pesticide label states whether you must use a respirator and if so, which type. The respirator type is based on the pesticide formulation, application method, and environment where the application is made.

The National Institute for Occupational Safety and Health (NIOSH) certifies that respirators have been tested according to certain standards. The NIOSH approval of a respirator

indicates that it protects the wearer against specified contaminants. All respirator manufacturers issue approval certificates with a chart of all of the components considered part of the approved assembly. Respirator approvals are manufacturer-specific: do not interchange parts, cartridges, or filters between different manufacturers' units. These certificates are typically package inserts with new respirators, cartridges, and filters.

Find out if there are federal, state, tribal, or territorial health and safety regulations that stipulate proper respirator selection, care, and use.

TYPES OF RESPIRATORS

Atmosphere-supplying respirators

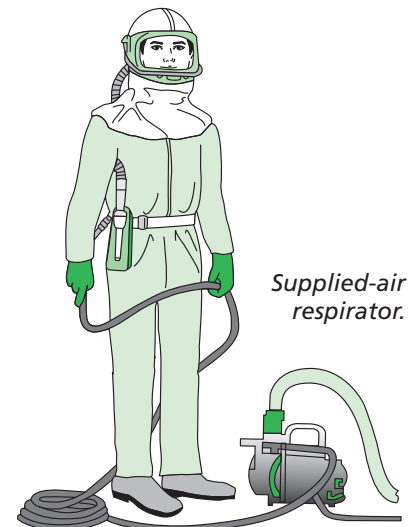
- Supplied-air respirator
- Self-contained breathing apparatus (SCBA)

Air-purifying respirators

- Non-powered particulate respirators
- Powered air-purifying respirators (PAPR)
- Chemical cartridge respirators (half facemask and full facemask)
- Gas masks with canisters



Self-contained breathing apparatus (SCBA).



Supplied-air respirator.



There are other respirators on the market that are not NIOSH-approved, such as nuisance dust masks and some surgical masks. When a respirator is required for working with pesticides, wear a NIOSH-approved device that is listed on the label.

Types of Respirators

The two classes of respirators most often required for protection from pesticide exposure are atmosphere-supplying and air-purifying respirators.

Atmosphere-supplying respirators provide clean, breathable air from an uncontaminated source. Examples are airline respirators and self-contained breathing apparatus. In very specific uses, such as using phosphide fumigants in enclosed areas, the environment may be immediately dangerous to life and health. In these cases, the only kind of atmosphere-supplying respirators that may be used are either a pressure-demand self-contained breathing apparatus (SCBA) with a full facepiece or a pressure-demand full facepiece air-line respirator with an SCBA escape bottle for emergencies.

Air-purifying respirators (APRs) remove contaminants from the air that you breathe. These respirators do not supply oxygen and should never be used in an environment that has limited oxygen or is immediately dangerous to life or health.

Air-purifying respirators may be either powered or nonpowered.

- Powered air-purifying respirators (PAPRs) use a blower to pass contaminated air through purifying elements. PAPRs are available with a tight-fitting facepiece or a loose-fitting hood.
- Nonpowered air-purifying respirators have tight-fitting facepieces that seal directly to your face. There are single-use particulate-filtering facepiece respirators and half-masks and full facepiece

SAMPLE PESTICIDE LABEL LANGUAGE

Wear a NIOSH-approved respirator with an organic vapor (OV) cartridge with any combination N, R, or P filter with NIOSH approval number prefix TC-84A; or a NIOSH-approved powered air-purifying respirator with OV cartridge and combination HE filter with NIOSH approval number prefix TC-23C; or a NIOSH-approved gas mask with an OV canister with NIOSH approval number prefix TC-14G.

masks with replaceable purifying elements. Gas masks, which use canisters instead of cartridges, are one type of APR.

Purifying Elements for Air-Purifying Respirators

When selected and used appropriately, purifying elements for air-purifying respirators remove specific contaminants from the air passing through them. The pesticide label specifies which type of purifying element is required. Elements that remove particulates (e.g., dusts or sprays) are called **filters**, while vapor- and gas-removing elements are called either **chemical cartridges** or **chemical canisters**.

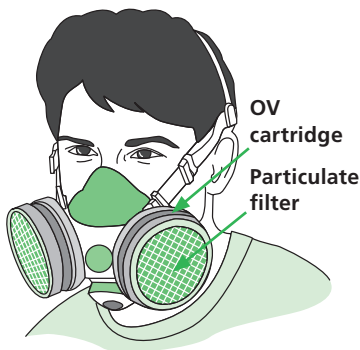
Particulate Filters

Particulate filters remove dusts, aerosols, or sprays suspended in the air that you breathe. Particulate filters **DO NOT** remove gases or vapors. The type of filter required on the pesticide label depends on whether the respirator is powered or nonpowered.

- **PAPR particulate filters** are rated “High Efficiency.” When a PAPR with a particulate filter is required, the pesticide label will specify this by the acronym “HE.”
- **Nonpowered APR particulate filters** are NIOSH-rated for three levels of oil degradation resistance (N, R, and P) and three levels of filter efficiency (95, 99, and 100). A higher efficiency rating means lower filter leakage.



Powered air-purifying respirator (PAPR) with particulate filter (TC-21C).



Half face mask chemical cartridge and particulate filter (TC-84A).



Gas mask with canister (TC-14G).

- N-series filters are not oil-resistant.
- R-series filters are oil-resistant for up to eight hours.
- P-series filters are oil-proof.

For a nonpowered APR, the pesticide label specifies an N, R, or P filter to be used with your respirator. N-series filters must not be used with pesticide mixes that contain oil because the filter's efficiency may become degraded with use and fail to protect you. If you add an adjuvant to a tank mix, do not use an N-series filter as the adjuvant may either contain oil or act like an oil.

The pesticide label may also specify the filter efficiency (95, 99, or 100) needed. For example, if the pesticide label specified a filter efficiency of 100 for all three oil degradation ratings, you could select an N100, R100, or P100 filter. The class of the filter (such as N95) will be clearly marked on the filter, filter package, or respirator box.

Always change particulate filters (HE, N, R, and P) for PAPR or non-powered APR respirators whenever they are damaged, torn, soiled, or it becomes too difficult to breathe. As you use a particulate filter, pesticides load on its surface. Use caution when handling soiled filters. Once a particulate filter becomes dirty, it cannot be cleaned. To avoid spreading pesticide contamination to you or your respirator, discard particulate filters when they become soiled.

EPA regulations require that you replace particulate filters according to respirator manufacturer recommendations or pesticide labeling (whichever is more frequent). If there are no other use directions, dispose of particulate filters at the end of eight hours of cumulative use.

Chemical Cartridges or Canisters

Chemical cartridges or canisters use sorbents to remove contaminant-specific gases and vapors. They do not remove particulates! The most typical chemical cartridge or canister specified by the label for pesticide applications is an organic vapor removing (OV) cartridge or canister.

Always use the type of chemical cartridge or canister purifying element required by the pesticide label! Keep purifying elements sealed until ready to use. Although it is not a requirement, some respirator manufacturers stamp the expiration date of purifying elements on the outside of the product package. Do not use a purifying element after the expiration date, even if it was never opened. The service life of a chemical cartridge or canister depends on the type and concentration of pesticide, the user's breathing rate, and humidity.

Chemical cartridge respirators, when selected appropriately, are essentially 100% efficient until the gas or vapor breaks through. Any taste, smell, or irritation indicates that breakthrough of the pesticide has occurred. Cartridges should be changed immediately whenever you detect breakthrough in the mask. And once used, an organic vapor cartridge must be disposed of at the end of the day. The pesticide trapped by the sorbent in the cartridge may desorb very easily overnight. If you were to use the cartridge the next day, you could breathe in the desorbed pesticide vapors. Always dispose of chemical cartridges at the end of a workday unless the manufacturer directs otherwise.

GOOD WORKING PRACTICE

Make sure that the respirator protects you for the duration of use. Replace cartridges if necessary. Always dispose of chemical cartridges at the end of the workday unless the manufacturer directs otherwise and as allowed by state, tribe, or territory regulations.

Combination Chemical Cartridge and Particulate Filters

The pesticide label may direct you to use both a chemical cartridge or canister and a particulate filter. You have two options:

- A chemical cartridge or canister with a disposable N, R, or P filter using a retaining ring.

NIOSH DESIGNATIONS FOR RESPIRATORS

TC-84A:	Filtering facepiece respirators (N, R, or P) APR with particulate filters (N, R, or P) APR with combination chemical cartridge and particulate filter (N, R, or P)
TC-21C:	Powered air-purifying respirator with particulate filter (HE)
TC-23C:	APR with chemical cartridges PAPR with chemical cartridges PAPR with combination chemical cartridge and particulate filter (HE)
TC-14G:	Gas mask with or without particulate filter (N, R, or P) Tight-fitting PAPR with gas canister with or without particulate filter (HE)
TC-13F:	Self-contained breathing apparatus Supplied-air respirator with a self-contained escape bottle
TC-19C:	Supplied-air respirator

- A single combination cartridge or canister.

The combination chemical cartridge or canister for nonpowered air-purifying respirators will include N-, R-, or P-rated filters. The combination chemical cartridges for powered air-purifying respirators will include an HE filter.

Follow the same change-out practices listed individually for particulate filters and chemical cartridges. For example, if you were using a combo chemical cartridge with a P100 filter and detected breakthrough in your mask, you would change out your cartridges immediately even though the filter was still useable.

Identifying the Respirator Type from the Pesticide Label

The respiratory protection required by the pesticide label is product- and task-specific. The pesticide label will typically cite respiratory protection required using a NIOSH “TC” (Testing and Certification) designation. The NIOSH designations correspond to the types of respirators that may be specified by the pesticide label and include: TC-84A, TC-21C, TC-23C, TC-14G, TC-13F, and TC-19C.

Use Tight-Fitting Respirators Properly

Before selecting and using any respirator, get a medical evaluation to make sure wearing a respirator does not endanger your health. Next, read and understand the manufacturer’s instructions and NIOSH approval certificate that accompany the respirator and its components.

For full protection, conduct a fit test before wearing a tight-fitting particulate-filtering facepiece, half mask, or full-face mask. When wearing a tight-fitting respirator, nothing must interfere with the seal between the surface of the mask and your face, including beards and stubble.

- **Fit Tests**—Fit testing is a method to select the right size and type of tight-fitting respirator for your face. Perform a qualitative or quantitative fit test of a given mask type on a user’s face to select the best-fitting respirator. It is important to get a fit test annually and whenever you use a different respirator facepiece. Get fit tested again whenever something physically changes that could affect the fit of



In a quantitative fit test, a particle-counting instrument is used to measure respirator fit.



Positive pressure seal check



Negative pressure seal check

Be sure to perform a seal check each time you use your respirator.

your respirator (e.g., facial scarring, dental work, cosmetic surgery, or a significant change in body weight). A respirator cannot protect you from pesticide exposure if it does not fit your face.

- **Qualitative fit test**—A method that uses a test agent outside the mask to check for leakage at the seal to the face. Kits for qualitative testing are available and easy to use.
- **Quantitative fit test**—A method that uses instrumentation to numerically measure leakage into the respirator.
- **User Seal Checks for Tight-Fitting Respirators**—Perform either positive or negative user seal check—preferably both—every time you put on your mask to make sure that it is properly seated on your face. This also ensures that all inhalation and exhalation valves are functioning properly.
 - **Positive-pressure user seal check**—Cover the exhalation port with the palm of your hand and lightly exhale into the mask. You will feel air escaping through any gaps in

your seal. Readjust the mask until there is no leakage.

- **Negative-pressure user seal check**—Cover or seal off the surface or hose where air is inhaled and suck in. If your mask is properly sealed, it should collapse on your face with no signs of leakage in the facepiece or hoses. If you cannot get a seal, readjust the mask until there is no leakage.

If you cannot get a proper fit with a tight-fitting respirator, you can use a PAPR with a loose-fitting helmet or hoodlike head covering that does not have to form a seal on your face. PAPRs do not need a fit test, and people with facial hair can use them.

Always consult the pesticide label for the appropriate respirator and purifying elements. If you have any questions about your respirator, consult the manufacturer or use online resources. Be sure to review the manufacturer approved labels for use limitations of the respirator. Contact your Cooperative Extension pesticide safety education program or your state, tribal, territorial, or federal safety and health agency for help in selecting the correct respirator and any of its component parts.

MAINTAINING CLOTHING AND PERSONAL PROTECTIVE EQUIPMENT

At the end of each workday, wash all work clothes and PPE. Some items, such as clothes and coveralls, can be washed using a washer and dryer. Other items, such as gloves, protective suits, goggles, aprons, boots, and eyewear, require hand washing. Wear protective gloves when handling contaminated items. Rinse and discard disposable items. Dispose of any nonreusable or contaminated item carefully to prevent cross-contamination or contamination of others who might handle the discarded item. Dispose of heavily contaminated items as household hazardous waste.

Woven Work Clothes and Coveralls

Laundry fabric coveralls and work clothing after each day's use. Some commonsense guidelines for cleaning pesticide-soiled clothing include:

1. Outdoors, shake any dry material from cuffs and pockets and then hang garments to air them out.
2. Wash work clothes and coveralls worn when handling pesticides separately from other laundry.
3. Load only a few items into the washing machine so there is



Wash pesticide-contaminated items separately from other laundry.

plenty of agitation and water for dilution.

4. Use hot water and the highest water level.
5. Prerinse items by using the prewash cycle.
6. Use heavy-duty liquid detergent.
7. Run the washer on the longest wash cycle. Use two entire machine cycles for lightly or moderately contaminated items.
8. Properly handle and discard heavily contaminated clothing.
9. Line dry laundered items outdoors if possible.
10. Run one additional empty cycle without clothing, using detergent and hot water, before using the washer for your household laundry.

If using a laundry service, notify them the clothing may be contaminated with pesticides.

Never wash any garments made of absorbent materials that have been splashed or soaked with undiluted pesticide or large quantities of diluted pesticide. Remember to remove them immediately and dispose of them carefully.



Discard contaminated PPE in the appropriate container.

Nonwoven Clothing

Coveralls may be either a one-day disposable item or a reusable garment. For reusables, make sure to check the PPE manufacturer's use limitations and laundering instructions. Replace these garments regularly and at any sign of wear. If any PPE cannot be cleaned properly, dispose of it according to applicable federal, state, tribal, and local regulations. Follow manufacturers' instructions, if any, for the service life of reusable nonwoven garments. Pay close attention when reusing these items, and be ready to change them whenever you think that the inside surface may be contaminated.

If using disposable garments, render them unusable and discard. If they are heavily contaminated with high-risk pesticides, handle them appropriately and take them to a household hazardous waste facility.

Boots and Gloves

Be sure to clean boots and gloves, even if they are worn only briefly. Before taking your gloves off, wash them thoroughly. Wash both the inside and outside of boots and gloves once removed. Inspect these items and discard if there is any sign of wear or if they leak. Hang or leave to dry. Gloves are not designed to be reused over and over again. Replace them often to ensure protection of your hands. Properly cared for, boots should last multiple seasons. Sun will degrade rubber materials quickly, so store gloves and boots out of the sun.

Eyewear and Respirators

Most eyewear, respirator bodies, facepieces, and helmets are designed to be cleaned and reused. These items can last many years if they are good quality and are maintained according to the manufacturer's directions.

Respirators require more maintenance than most PPE. When you have finished using your respirator, remove and properly dispose of any expendable components, such as filters, cartridges, or canisters. Wash the facepiece according to the respirator



Clean goggles, face shields, and respirator bodies and facepieces in detergent and hot water.

manufacturer's directions. Take care to clean under and around gaskets and valves. Allow to air dry. Store cleaned respirators, as well as replacement purifying elements, in a clean, dry place that is not exposed to sunlight or extreme temperatures. Make sure that the rubber facepiece is not distorted when stored so that it maintains its shape.

Do not store any protective equipment—including respirators—with or near pesticides or other chemicals.

SUMMARY

Wearing PPE can reduce the potential for dermal, inhalation, ocular, and oral exposure, thereby lowering the chances of pesticide injury, illness, or poisoning.

Consult the pesticide label for the minimum PPE required by law. In order to appropriately select and wear

PPE, you must understand both its protections and its limitations. Then determine what protective equipment you need for the pesticide task at hand. Personal protective equipment reduces your exposure to pesticides but does not necessarily eliminate it. Maximize your safety by following certain good work practices when using pesticides.

Contact your Cooperative Extension pesticide safety education program for assistance in the selection, use, and maintenance of PPE for handling pesticides. Check the “Agricultural Use Requirements” box on the label and the WPS requirements for any other statements about PPE use in farms, forests, nurseries, or greenhouses.

Personal hygiene is critical. Wash your hands every time you remove your gloves. Shower at the end of the day.



Review Questions

CHAPTER 6: PERSONAL PROTECTIVE EQUIPMENT

Write the answers to the following questions, and then check your answers with those in Appendix A.

- Which statement about PPE requirements listed on the pesticide label is *true*?**
 - A label may have different PPE requirements for pesticide handlers and early-entry workers.
 - You are not required to wear all the PPE listed on the label.
 - Wearing the PPE listed on the label eliminates your exposure to pesticides.
- Which part of the product formulation determines what glove type is needed?**
 - Active ingredient.
 - Surfactants.
 - Solvents.
- If there are no manufacturer use recommendations, a pesticide applicator should replace the chemical cartridges of his or her respirator:**
 - At the end of each season.
 - After one week of use.
 - At the end of each workday.
- When oil may be present, which particulate filter must be used?**
 - N-series.
 - P-series.
 - Dust mask.
- Air-purifying respirators protect applicators from pesticide exposure by:**
 - Filtering and/or absorbing the pesticide.
 - Breaking down the pesticide.
 - Neutralizing the pesticide.
- You should do a qualitative fit test of your respirator:**
 - Every five years.
 - Semiannually.
 - If you have a significant change in weight.
- Every time you wear any tight-fitting respirator to apply pesticides, you should *first*:**
 - Perform seal check(s).
 - Do a qualitative fit test.
 - Put Vaseline[®] on the edges of the respirator to enhance the seal.
- Which statement about washing work clothes soaked with a pesticide concentrate is *true*?**
 - Use cold water and one wash cycle.
 - Wash separately from other laundry items.
 - Do not attempt to wash it—dispose of it immediately.
- Work clothes worn to apply pesticides should be laundered with a suitable detergent:**
 - After each day's use.
 - After they get wet with spray.
 - When they have a strong odor like the pesticide.

