

# PERSONAL PROTECTIVE EQUIPMENT FOR PESTICIDE HANDLING

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Pesticides provide protection against mosquitoes, biting flies, ticks, and other disease-carrying organisms that can harm humans, animals, and crops. While all pesticides are considered toxic, the degree of toxicity varies greatly. Health effects depend on the type of pesticide. For example, pesticides containing organophosphates and carbamates affect the nervous system. Others may cause cancer, affect the hormone or endocrine system in the body, or irritate the skin and eyes. Consequently, the Environmental Protection Agency (EPA) requires that specific signal words appear on product labels according to their respective toxicity category. Following is a general description of the four toxicity classifications.

- **Toxicity Category I** – All pesticide products shall bear on the front panel the signal word “Danger.” In addition, if the product is assigned a Toxicity Category I on the basis of its oral, inhalation, or dermal toxicity, the word “Poison” shall appear in red on a contrasting background, and the skull and crossbones shall appear in immediate proximity to the word “Poison.”
- **Toxicity Category II** – All pesticide products shall bear on the front panel the signal word “Warning.”
- **Toxicity Category III** – All pesticide products shall bear on the front panel the signal word “Caution.”
- **Toxicity Category IV** – All pesticide products shall bear on the front panel the signal word “Caution.”

The National Pesticide Information Center (1-800-858-7378) can also provide information about pesticide products and their toxicity.

## SELECTING PERSONAL PROTECTIVE EQUIPMENT

Pesticides are available in many forms including liquid concentrates, wettable powders, emulsifiable concentrates, and aerosols. Each form presents a different hazard when mixing, handling, loading, and applying the product. For example, pesticide handlers are at increased risk of skin and eye exposure when using pesticide powders in high wind conditions.

Safely using pesticides depends on selecting the appropriate pesticide for the pest, using the directed amount, and following the product label for personal protection. Label information often specifies that the user wear personal protective equipment (PPE) such as gloves, clothing, eye protection, and respirators. This information is included in the “Precautionary Statements” section of the label. It is essential that you wear appropriate PPE and read the Materials Safety Data Sheet (MSDS) for that product prior to using the pesticide. The MSDS is available from the pesticide dealer.

To help pesticide applicators select appropriate PPE, the EPA’s Worker Protection Standard has defined eight chemical resistance categories (A through H) that appear on pesticide labels (see Table 1.) Items listed in these categories are made of materials that the pesticide cannot pass through during the times indicated below Table 1. Workers should choose the category of resistance which best matches the handling task and exposure duration. The appropriate category is based upon the solvent used in the

pesticide, not the pesticide itself. Thus, there will be instances in which the same pesticide with two different formulations (wettable powder-WP and emulsifiable concentrate-EC, for example) will require PPE from two different chemical resistance categories.

Selection Category Listed on Pesticide Label	TABLE 1. TYPES OF PERSONAL PROTECTIVE MATERIAL (Source: US EPA)							
	Barrier Laminate	Butyl Rubber ≥ 14 mils	Nitrile Rubber ≥ 14 mils	Neoprene Rubber ≥ 14 mils	Natural Rubber ≥ 14 mils	Polyethylene	Polyvinyl Chloride (PVC) ≥ 14 mils	Viton ≥ 14 mils
A (a dry and water-based formulation)	High	High	High	High	High	High	High	High
B	High	High	Slight	Slight	None	Slight	Slight	Slight
C	High	High	High	High	Moderate	Moderate	High	High
D	High	High	Moderate	Moderate	None	None	None	Slight
E	High	Slight	High	High	Slight	None	Moderate	High
F	High	High	High	Moderate	Slight	None	Slight	High
G	High	Slight	Slight	Slight	None	None	None	High
H	High	Slight	Slight	Slight	None	None	None	High

**High:** Highly chemical resistant. Clean or replace PPE at end of each day's work period. Rinse off pesticides at rest break.

**Moderate:** Moderately chemical resistant. Clean or replace PPE within an hour or two of contact.

**Slight:** Slightly chemical resistant. Clean or replace PPE within ten minutes of contact.

**None:** No chemical resistance. Do not wear this type of material as PPE when contact is possible.

Personal protective equipment for handling pesticides includes protective clothing, filtered respirators, and breathing apparatus, as well as eye, hand, and foot protection. Following is a discussion of PPE and the most common options available. Additional PPE and options may be available that are not discussed here.

## CLOTHING

Pesticide absorption through the skin is the most common cause of pesticide poisoning and may occur during mixing, loading, application, and equipment maintenance. Wearing appropriate protective clothing will minimize exposure. For some less toxic pesticides, wearing long-sleeve shirts and long-legged pants, coveralls, or aprons over your normal work clothes is sufficient. However, for highly toxic pesticides, full-body, chemical-resistant suits made of plastic or coated with PVC, butyl, or neoprene may be required.

Chemical-resistant clothing is generally classified as either reusable or disposable. Reusable clothing is usually constructed of laminated woven or non-woven fabric (such as rubberized rainwear). This type of clothing provides excellent protection against most pesticides, including liquid concentrates. Because reusable clothing can be cleaned and reused, this type of clothing is less expensive in the long-term. However, the purchase price for reusable clothing can be expensive. Reusable clothing is sometimes heavy and uncomfortable in hot conditions. Take appropriate precautions to prevent heat-related illnesses when wearing reusable clothing.

Disposable protective clothing is usually constructed of spun bonded (non-woven) fabrics that do not absorb pesticides as quickly as woven materials. The most popular type of spun bonded disposable clothing is made of Tyvek®. This type of material provides an effective barrier to several pesticide sprays and dusts.

## RESPIRATORS

Respirators protect workers from dusts and chemical fumes, and must be carefully selected according to the degree of hazard. The pesticide label should specify the type of respirator to use. All workers required to wear respirators should first get a medical checkup. Some people may not be able to wear some types of respirators due to medical conditions. Because the proportion of heads and faces differs among individuals, respirators should be purchased to fit the person. Avoid purchasing a one-size-fits-all respirator. Test the respirator prior to chemical exposure to ensure that it works correctly.

### **Air-Purifying Respirators**

Air-purifying respirators are available in three types: mechanical filter, chemical cartridge, and canister cartridge. Mechanical filter respirators provide protection only against dusts. Thus, they are acceptable when applying dusts and granules. They are not recommended for liquid spraying. Two-strap dust respirators provide much more protection than single-strap dust masks. They seal better while maintaining their shape and integrity. Models are available with exhale valves that make breathing easier, padding over the bridge of the nose for a better seal and comfort, and stronger straps.

Chemical cartridge respirators provide protection against intermittent exposure to most fumes, vapors, and gases depending on the cartridge used. They have a partial facemask fitted with one or two replaceable cartridges. These cartridges contain an absorbent material (often activated charcoal) that filter out all but the most toxic vapors. They provide added protection when spraying toxic pesticides, using toxic chemicals in confined areas, or hand spraying certain crops.

Canister cartridge respirators provide protection against dust and most fumes, vapors, and gases. Canister respirators are recommended when exposure is continuous.

### **Supplied-Air Purifiers**

Supplied-air purifiers (self-contained breathing apparatus) should be used with high concentrations of extremely toxic pesticides when the oxygen supply is limited. These devices use the same filter media as chemical cartridge respirators but have a cylinder air supply and an air line that connects to a safe air source. Breathing is much easier, because drawing air through the filter requires no effort.

Check the label—make sure the respirator is approved for use by the National Institute for Occupational Safety and Health (NIOSH). Mechanical filters should be replaced when breathing becomes difficult or the filter is damaged. Chemical cartridges should be replaced according to the manufacturer's recommendations or the pesticide label, or when odor or irritation is noticed. A pesticide handler should also perform a fit test before each exposure to determine the correct size of a respirator face piece. A respirator that does not fit is of no value.

## EYE PROTECTION

Eyes are very sensitive to pesticides; damage from pesticide exposure is often permanent. Precautionary statements on labels of pesticide liquids having the signal words "Warning" or "Danger" generally indicate the use of eye protection. Eye protection is available in many forms, including safety glasses, a variety of goggles, and face shields. Prescription glasses and safety glasses provide little protection when working with liquid pesticides that splash. Goggles offer more protection all around the lens, preventing entry of particles from any angle.

Goggles have three types of venting that provide different levels of protection. Open-vented goggles provide impact protection only. Indirect vents prevent chemical splash exposure. Non-vented goggles protect the eyes from gases, mists, and fumes. Full-face shields worn over safety glasses provide protection against splashes.

## HAND PROTECTION

Hand protection is available in many forms, including gloves, barrier creams, hand cleaners, and lotions. These help prevent toxic chemicals from entering the skin through direct contact, cuts, and abrasions on the hands. Pesticide labels frequently specify use of waterproof or chemical-resistant gloves. Keep in mind that not all waterproof gloves are chemical resistant. Unlined, liquid-proof neoprene, butyl, PVC, or nitrile gloves with tops that extend well up the forearm are best. Avoid lined gloves, because the lining may absorb the pesticide and can be hard to clean.

Be aware that some fumigants penetrate rubber, neoprene, and leather and, if trapped inside the glove, can cause severe skin irritation or be absorbed through the skin. Read the label carefully to determine the appropriate hand protection. Also, refer to the chemical resistance category listed on the pesticide label to select the proper material for PPE.

Only properly fitted gloves should be worn. Tight gloves limit dexterity and are uncomfortable. Gloves that are too large can interfere with work and may cause accidents. Never use leather gloves when handling chemicals. Gloves should be long enough to cover the entire hand and part of the forearm. Wearing long-sleeve clothing will provide an extra barrier for the skin. Always wear your sleeves outside your gloves to prevent pesticides from getting inside gloves. After using chemicals and before removing your gloves, rinse and clean them thoroughly. After removing your gloves, wash your hands again.

Make sure that you have extra gloves available. When gloves become damaged or wear out, throw them away, and use another pair. If there is a question about whether the gloves leak, do not use them. There is a simple way to test gloves for leaks. Fill them with water and squeeze the top. If water comes out, replace the gloves.

## FOOT PROTECTION

Toes and feet can be injured when working with pesticides. For some pesticides, foot protection may only specify “shoes plus sock.” However, other labels may direct the pesticide handler to wear “chemical-resistant footwear plus socks.” Chemical-resistant footwear is generally boots made principally of natural rubber, which may be coated with polyurethane, PVC, or blends of these materials. In addition, shoe covers may be worn over footwear that is not chemically resistant, including shoes and boots made of leather or fabric.

Wear your pant legs outside the boots or shoe covers to prevent pesticides from splashing inside the pant legs. Also, make sure to clean any pesticide dust or liquid from protective footwear before leaving the contaminated area. Pesticide residue can track into other areas exposing animals and humans to contamination.

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