

# Personal protective equipment: proper use, storage and maintenance

By Cami Esmel McAvoy

This article grants one General Standards (Core) CEU when submitted and approved toward the renewal of a Florida Department of Agriculture and Consumer Services Restricted Use pesticide license.

All pesticide handlers and early entry workers are required by law to wear the appropriate personal protective equipment (PPE) listed on the label. For handlers (mixer/loaders, flaggers and applicators), the minimum PPE is listed in the Precautionary Statement on the pesticide label. For early entry workers, the minimum PPE is listed in the Agricultural Use Requirements because this type of work falls under the Worker Protection Standards. It is allowable to wear more PPE than is listed on the label.

## QUALIFICATIONS OF PPE

Ordinary clothing usually does not qualify as PPE, even though the label describes specific work clothing (e.g., long pants, long sleeved shirt, etc.). Dermal (skin) exposure to pesticides is the number-one path of entry. Clothing should be free of holes and tears, and have a tight fabric weave to prevent dermal exposure. Shirts and coveralls should be fastened tightly to the lower neck. The label may indicate whether PPE should be chemical resistant, water resistant or waterproof.

Chemical resistant means that the material does not allow any measureable amount of pesticide through it during normal use. The

clothing should be loose-fitting, leaving an air gap between the clothing and skin to minimize passage of chemical onto the skin when in contact with clothing. This is different from fabrics which are water resistant or waterproof. Water resistant allows a small amount of spray to pass through, whereas waterproof restricts water soluble materials that are not oil-based. Remember that PPE is designed to protect against exposure to pesticides through your skin, respiratory tract and eyes.

The Environmental Protection Agency (EPA) has a chart which lists chemical resistant PPE materials. The label will indicate what EPA category is required under the PPE heading. If you have trouble interpreting the PPE statement on a label, the Citrus Pest Management Guide has a chapter devoted to this topic. This chapter can be found online at the UF-IFAS Citrus Research and Education Center website using the following link: [www.crec.ifas.ufl.edu/extension/pest/PDF/2015/Interpreting%20PPE.pdf](http://www.crec.ifas.ufl.edu/extension/pest/PDF/2015/Interpreting%20PPE.pdf)

## DISPOSABLE VS. REUSABLE PPE

Personal protective equipment can be disposable or reusable. Disposable PPE is good for short intervals, allows for dexterity, is inexpensive and can be made from vinyl, latex or polyethylene. Chemical resistant disposable aprons, footwear and gloves should be worn once and thrown away. Reusable PPE can be more expensive than disposable PPE.



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Reusable PPE has to be maintained and checked for leaks or damages to the surface of each individual reusable item. Life span of reusable PPE depends upon the material, but a general rule of thumb is as follows: five to seven days for most reusable PPE, and 10 to 14 days for extra-heavy-duty PPE. Reusable PPE must be properly cleaned after each use.

All PPE and pesticide-contaminated clothing should be washed using heavy-duty detergent, hot water and the longest washing cycle available. Heavy to moderately contaminated items should be washed twice. PPE that is extremely contaminated should be disposed of as hazardous waste and replaced. All cleaned PPE should be hung to dry away from where it could come in contact with pesticides. After cleaning your PPE in a washing machine, run the washing machine with detergent and hot water to clean it, especially if it will be used for regular household cleaning of family laundry.

## TYPES OF PERSONAL PROTECTIVE EQUIPMENT

Coveralls, chemical-resistant suits, chemical-resistant aprons, gloves, footwear, eye protection and respirators are all types of PPE. The pesticide label determines how much and what kind of PPE should be worn. The label is the law!

### Coveralls, Chemical-Resistant Suits and Aprons

Coveralls should be made of sturdy material such as cotton, polyester, synthetic blend and denim or non-woven fabric. If the coverall is made up of two pieces, the coat or shirt should not be tucked into the pants. Also, coveralls should never be tied around a pesticide handler's waist.

Requirements for chemical-resistant suits are an indicator that the product is very hazardous. Suits are typically made from rubber or plastic as one or two pieces. In Florida, heat stress can be a serious issue with chemical-resistant suits. Scheduling

applications during the coolest part of the day or at night may be required.

Chemical-resistant aprons are typically used for mixing, loading and/or cleaning equipment. They protect the handler from pesticides directly splashing onto him or her and contaminating other PPE. Aprons can be a safety hazard when working around equipment with moving parts.

### Gloves, Footwear and Eyewear

Non-porous gloves should always be worn any time a person is working with pesticides. They can reduce pesticide exposure up to 98 percent when worn correctly. Gloves for PPE should be made of material that is chemical resistant (example: barrier laminate, nitrile rubber or butyl rubber) or listed on the label. Chemical-resistant gloves range in thickness from 12 mils to 22 mils. Gloves made from natural materials such as leather or canvas do not protect hands and forearms from pesticide exposure. These natural



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materials readily absorb pesticides and can't be decontaminated. Disposable gloves designed for human health occupations are not chemical resistant because they are less than 12 mils in thickness. Remember your hands and forearms are more likely to be exposed to pesticides, especially during mixing or by spills.

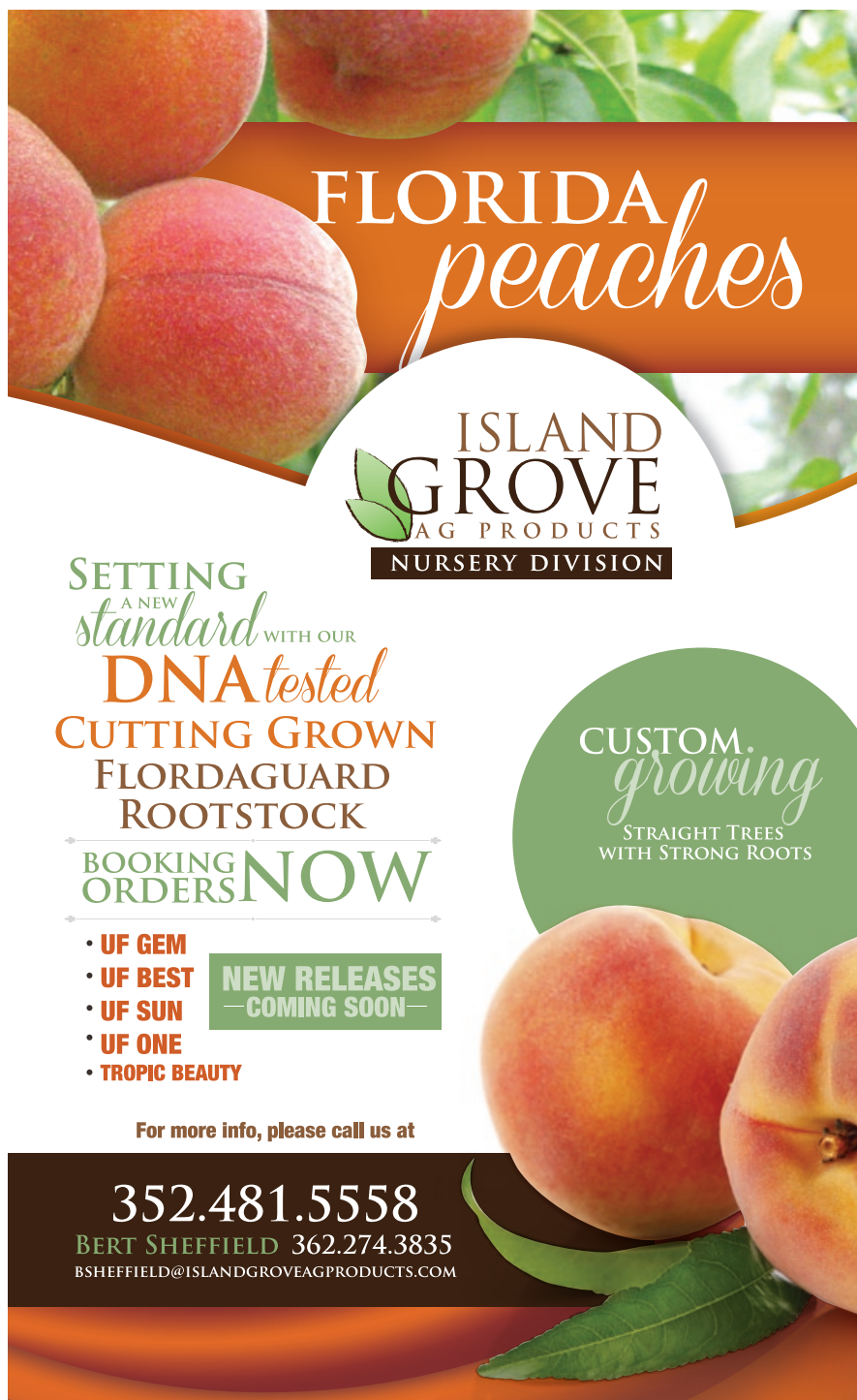
If the label specifies shoes and socks as PPE, natural materials (canvas and leather) may not offer enough protection for some pesticides. If wearing leather boots, wear shoe covers to protect your feet and boots from contamination. Waterproof or chemical-resistant footwear should cover the ankles and come up halfway to the knee. Footwear should never have pant legs tucked into them. Any pesticide spilled on a pant leg that is tucked into a boot will run directly inside the footwear.

Eyes are extremely sensitive to chemical exposure. Goggles, face shields and safety glasses with shields at brow and sides all qualify as PPE eyewear. Goggles with air baffles made of polycarbonate often prevent fogging. Face shields and safety glasses should be used during handling tasks. Both goggles and safety glasses can be paired with a half-face respirator.

## Respirators

Respirators are specialized PPE that have specific requirements for use and maintenance. The EPA requires pesticide manufacturers to label products which are harmful to the human respiratory system and provide language for specific respirator requirements.

The United States Occupational Safety and Health Administration (OSHA) respiratory protection standard requires certification that an approved medical physical and respirator fit test have been acquired by any worker before being used for any pesticide application. The employer is required to provide an OSHA-approved medical evaluation which will determine an employee's ability to use a respirator. Employers are also required to train the employee in correct usage and care of a respirator.



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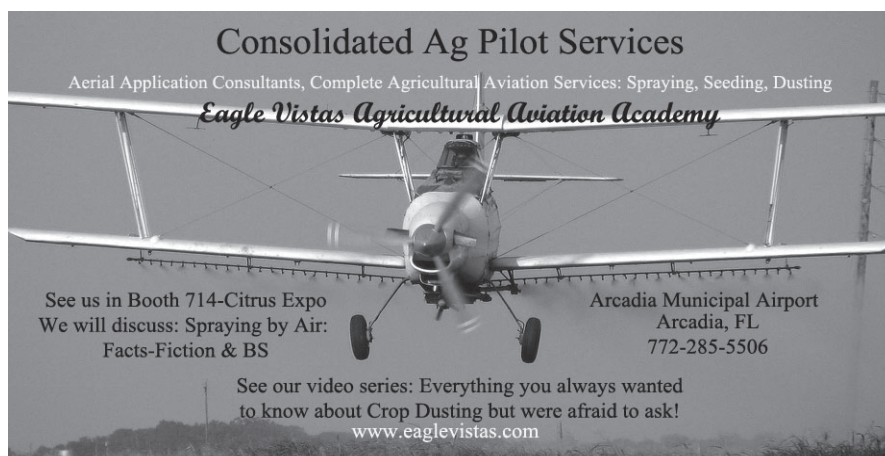
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All respirators must be National Institute of Occupational Safety and Health (NIOSH) approved. A respirator should fit snugly, yet be firm and comfortable at all points on the face. Facial hair, scars, raised moles and weight changes can influence the fit test. A respirator requires that no facial hair be present to ensure proper fit. Fit tests should be conducted when initially issued and annually thereafter. Fit tests can be quantitative or qualitative. Quantitative fit tests enumerate particle leaks during normal usage. Qualitative fit tests use an odorant or irritant during normal usage to check for leaks.

A user should conduct a seal check every time a respirator is used for a pesticide application. There are two types of user seal checks that can be conducted by the user: positive pressure and negative pressure checks. For the positive pressure check, the user covers the exhalation valve and exhales gently into the face piece. A slight positive pressure should build up inside the face piece without evidence

**Table 1.** Listing of color codes for respirator cartridges that can be used in pesticide applications.

Color Code	Color	Protects Against
	Black	Organic Vapors (Pesticides), and Paint Spraying*
	Green	Ammonia: Anhydrous or from Livestock Confinement
	Yellow	Acid Gases
	Olive	Organic Vapors, Ammonia and Acid Gases
	Pink	Dusts and Welding Fumes

\*exceptions include isocyanate containing paints and fumigants (unless allowed on the label)

of leakage. The positive pressure check is often used as a test in the field.

For a negative pressure check, the user should close off the air inlet valves (cartridges), inhale gently to collapse the face piece slightly, and hold his or her breath for 10 seconds. The face piece should remain collapsed with no leakage detected. Maintaining a good seal when covering the inlet valves is difficult, thus making this type of seal check the harder of the two field pressure checks to conduct.

In addition to being NIOSH approved, respirators must have a TC prefix. This prefix denotes that the respirator has been reviewed by

NIOSH for the specific pesticide and should be marked on the apparatus. Manufacturers have approvals specific to their products. Parts and filters can't be interchanged between different manufacturer models. For example, a respirator with the prefix TC-23C can be either an air-purifying respirator with chemical cartridge or powered air-purifying respirator with chemical cartridge/particulate filter. The required respirator with an approved prefix will be stated on the pesticide product label.

Cartridges and filters are classified with the letters N, R or P as well as 95, 99 or 100. The letters denote whether the cartridge or filter is not resistant



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to oils (N), resistant to oils (R) or oil proof (P). The numbers denote the percentage of filtering efficiency. An N95 cartridge would not be oil resistant and would have only moderate filtering efficiency (95 percent). In addition, chemical cartridges for TC-23C respirators have color codes. The color code reflects the specific chemicals that the filter provides protection against (Table 1, page 44).

## Respirator Maintenance

The respirator manufacturer and/or the pesticide label will state when cartridges and filters should be replaced. Cartridges and filters can also be replaced based upon increased breathing resistance. Cartridges that are damaged, worn, or in some cases when an end-of-life indicator is present should be immediately replaced. The life span of most cartridges depends upon how they were used and maintained.

The respirator face piece should be cleaned after each use with hot water and a detergent. Sanitize the face piece regularly by submerging it in two tablespoons of bleach in 1 gallon of hot water for two minutes, rinse and hang dry in a clean, pesticide-free area. When dry, store the face piece in a closed plastic bag. Cartridges should also be stored in a closed plastic bag between uses to maximize their life span. 🍌

**Source Material:** Personal Protective Equipment for Handling Pesticides by Fred Fishel, PI28, UF-IFAS and Respirators for Pesticide Applications by Fred Fishel, PI77, UF-IFAS.

*Cami Esmel McAvoy is a multi-county Extension agent for Sumter and Pasco counties.*

Mail answer sheet or a copy of the form to: Dr. Cami Esmel McAvoy, Sumter County Extension, 7620 SR 471, Suite 2, Bushnell, FL 33513. If you have questions regarding this form, test or CEUs, contact Cami Esmel McAvoy at cami13@ufl.edu or call (352) 569-6872.

## Personal protective equipment: proper use, storage and maintenance test

To receive one CORE continuing education unit (CEU), read "Personal protective equipment: proper use, storage and maintenance" in the August issue of *Citrus Industry* magazine. Answer the 20 questions on the magazine's website ([www.citrusindustry.net](http://www.citrusindustry.net)) or mail the applicator form to the author. The article and test set will be valid up to one year from the publication date. After one year, they expire and CEU credit will no longer be available. Please allow at least 10 business days after submission to receive your CEU approval form.

- |   |   |   |
|---|---|---|
| 1. The minimum PPE for handlers is listed under the Agricultural Use Requirements section of the pesticide label.                   | T | F |
| 2. It is allowable to wear more PPE than is stated on the label.  | T | F |
| 3. Ordinary clothing usually does not qualify as PPE.   | T | F |
| 4. Waterproof means that water soluble particles are restricted, but not oils.  | T | F |
| 5. Reusable PPE should be cleaned using the longest washing cycle, with heavy duty detergent and hot water.                         | T | F |
| 6. Disposable PPE has a live span of five to seven days of use.   | T | F |
| 7. Chemical-resistant suits listed on the label as PPE indicate a very hazardous product.   | T | F |
| 8. It is acceptable to tuck a coat or shirt into pants when applying pesticides.  | T | F |
| 9. Clean PPE should be stored in a location near where the handler mixes and loads pesticides.                                      | T | F |
| 10. Chemical-resistant gloves range in thickness from 1 mil to 60 mils.   | T | F |
| 11. Canvas or leather gloves can be used as PPE.  | T | F |
| 12. Waterproof footwear should cover the ankle and come up halfway to the knee.   | T | F |
| 13. Safety glasses with shields at the brow and sides qualify as PPE eyewear.   | T | F |
| 14. The U.S. OSHA respiration protection standards require a medical physical and fit test for any worker needing a new respirator. | T | F |
| 15. Respirator fit tests should be conducted only once a year.  | T | F |
| 16. A positive pressure check is commonly used in the field to test a respirator seal.  | T | F |
| 17. Facial hair will not influence a fit test for a respirator.   | T | F |
| 18. A yellow cartridge code indicates protection against acid gases.  | T | F |
| 19. Parts and filters can be interchanged between different manufactured respirators.   | T | F |
| 20. Both respirator face pieces and cartridges should be stored in a clean zip-top plastic bag between uses.                        | T | F |

### Please mark the boxes below to rate your knowledge gained from this exercise:

Your knowledge of personal protection equipment use and maintenance before completing this exercise:

☐ Very Low    ☐ Low    ☐ Moderate    ☐ High    ☐ Very High

Your knowledge of personal protection equipment use and maintenance after completing this exercise:

☐ Very Low    ☐ Low    ☐ Moderate    ☐ High    ☐ Very High

### Pesticide Applicator CEU Form

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