



Protective Clothing for Agricultural Workers and Pesticide Handlers

Technical Bulletin for North America

Typically, the Occupational Safety and Health Administration (OSHA) provides worker protection standards and guidance for employers; however, for the protection of agricultural workers from pesticides (including insecticides, rodenticides, fungicides, etc.), the Environmental Protection Agency (EPA) provides protection standards and guidance to the employers in 40 CFR 170, "Worker Protection Standard" and 40 CFR 156 "Labeling Requirements for Pesticides and Devices." Although the following information is intended to provide guidance, the final federal authority is found in these regulations. Copies can be obtained at <http://www.epa.gov> or from the Federal Government Printing Office (GPO). Please check standard requirements because certain pesticides may exceed these minimum levels. States can implement more stringent regulations. Assistance on specific state regulations can be obtained from local cooperative extension agents. Specific personal protective equipment (PPE) topics from the California regulations will be addressed below.

The federal Agricultural Worker Protection Standard (WPS) was adopted to reduce the risks of injury resulting from worker exposure to pesticides on farms or in nurseries, greenhouses and forests. This standard covers a wide range of worker protection topics, including training, certification, notification, work and administrative practices, as well as PPE. Unless added by a state, the WPS does not apply to the following pesticide applications:

- Wide-area, government-sponsored public pest control programs such as mosquito abatement and Mediterranean fruit fly eradication;
- On livestock or other animals, or in or about animal premises;
- On non-commercial, non-research plants, including plants in habitations, home fruit and vegetable gardens, and home greenhouses;

- On ornamental gardens, parks and public or private lawns and grounds intended for only aesthetic purposes or climatic modification;
- By direct injection directly into agricultural plants ("hack and squirt," "frill and spray," chemigation, soil-incorporation or soil-injection are covered in the WPS);
- Structural pest control, control of vegetation along rights-of-way, pasture and rangelands; and in other non-agricultural production areas;
- Control of vertebrate pests, such as mice, rats and other rodents;
- As attractants or repellents in traps;
- On the harvested portions of agricultural plants or on harvested timber; and
- For research of unregistered pesticides.

The federal WPS recognizes two work activities with potential pesticide exposure risk: 1) pesticide handling and 2) early-entry.

The requirements for PPE selection, care, use and maintenance for "early-entry" and for "pesticide handling" are similar. A "handler" is essentially any worker who is at risk of pesticide exposure during the handling or applications of the pesticides or subsequent cleanup and maintenance of equipment or containers. "Early-entry" occurs after application and before the end of the "restricted-entry interval" for that pesticide. A number of pre-conditions must be met before early-entry is permitted and only certain work activities are permitted.

Residual exposure is also addressed in the standard. More information can be found at: <http://www.epa.gov/pesticide-worker-safety/restrictions-protect-workers-after-pesticide-applications>.

EPA's Agricultural WPS

In September 2015, the EPA revised the 1992 Agricultural WPS regulation to increase protection from pesticide exposure. Changes to this regulation include expanded worker training, hazard communication, PPE, notification and other requirements. More information can be obtained at <http://www.epa.gov/pesticide-worker-safety/farm-worker-protection-standard-factsheet>. The following information summarizes portions from the EPA's Agricultural WPS.

Selection

The minimum PPE for "handlers" is listed in the "HAZARDS TO HUMANS (AND DOMESTIC ANIMALS)" section of the pesticide product label. The "DIRECTIONS FOR USE" section describes the minimum PPE for early-entry. Both sections list requirements for body protection: clothing, gloves, footwear and eyewear. If applicable, requirements for headgear and respiratory protection will also be listed.

Examples of body protective clothing are coveralls, chemical-resistant suits, chemical-resistant aprons and chemical-resistant headgear. Long-sleeved shirts, short-sleeved shirts, long pants, short pants, shoes, socks and other items of work clothing are not considered PPE in the federal regulation, although pesticide labeling may require that such work clothing be worn during some activities.

Coveralls are loose fitting, one- or two-piece garments made from woven or nonwoven fabrics. They cover, at a minimum, the entire body except head, hands and feet.

Waterproof means no measurable movement of water or aqueous solutions through the material during use.

Chemical-resistant means no measurable movement of the pesticide through the material during use.

A **chemical-resistant suit** is a loose-fitting, one- or two-piece chemical-resistant garment that covers, at a minimum, the entire body except head, hands and feet. A chemical-resistant suit may be substituted for coveralls and any required additional layer of clothing. A **chemical-resistant apron** covers the front of the body from mid-chest to the knees. A chemical-resistant suit may be substituted for coveralls and a chemical-resistant apron. **Chemical-resistant headgear** can be either a chemical-resistant hood or a chemical-resistant hat with a wide brim.

The protective clothing requirements are modified when "closed" handling system, enclosed tractor cabs and aerial application methods are used.

DuPont™ Tyvek® garments meet the EPA Agricultural WPS requirements for "coveralls." Tyvek® garments meet the definition of "chemical-resistant," if the application is a solid pesticide. Tyvek® Xpert, Tyvek® Plus and Tyvek® 800 also may meet the definition for "waterproof" and/or "chemical-resistant" in the Standard, depending on the guidance on the pesticide label.

Additionally, DuPont™ Tychem® garments may meet the "chemical-resistant" suit requirements of the Standard, depending on the guidance on the pesticide label. The design of the suit, seam construction, duration and amount of exposure, concentration of active ingredients, permeation data and physical working environment should all be considered when making a garment selection. Refer to DuPont™ SafeSPEC™ (SafeSPEC.DuPont.com) for assistance with determining if there is an appropriate DuPont garment available.

Use

When PPE is specified, the employer shall provide, daily, the appropriate PPE in clean and operating condition. The employer shall assure that PPE is used correctly for its intended purpose and is used according to the manufacturer's instructions.

Care and Maintenance

The employer shall assure that, before each day of use, all PPE is inspected for leaks, holes, tears or worn places, and any damaged equipment is repaired or discarded.

The employer shall not allow or direct any employee to wear home or to take home PPE contaminated with pesticides. The employer shall assure that contaminated PPE is kept separately and washed separately from any other clothing or laundry. The employer shall assure that 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, it shall be washed thoroughly in detergent and hot water. The employer shall inform any person who cleans or launders PPE that such equipment: may be contaminated with pesticides; the potentially harmful effects of exposure to pesticides; the correct way(s) to clean PPE and to protect themselves when handling such equipment.

Storage

The employer shall assure that all clean PPE shall be either dried thoroughly before being stored or shall be put in a well-ventilated place to dry. The employer shall assure that all PPE is stored separately from personal clothing and apart from pesticide-contaminated areas. The employer shall assure that employees have a clean place, or places, away from pesticide storage and pesticide use areas: where they may store personal clothing not in use; where they can put on PPE at the start of any exposure period; and where they can remove PPE at the end of any exposure period.

Disposal

If any PPE cannot be cleaned properly, the employer shall dispose of the PPE in accordance with any applicable federal, state and local regulations. Coveralls or other absorbent materials that have been drenched or heavily contaminated with an undiluted pesticide that has the signal word "DANGER" or "WARNING" on the label shall not be reused.

Heat Stress

When the use of PPE is specified by the labeling of any pesticide, the employer shall assure that no employee is allowed or directed to perform work unless appropriate measures are taken to prevent heat-related illness.

California Regulations

Garments made of Tyvek® and Tychem® meet the agricultural worker protective clothing requirements in the state of California.

- **Tyvek®** may be utilized where the California regulations require a “coverall.”
- **Tychem®** garments meet the requirements for “chemical-resistant” clothing.

Under the California Code of Regulations, Title 3 - Food and Agriculture, Division 6 Pesticide and Pest Control Operations, Section 6738.1 sets the minimum requirement when it states “Personal protective equipment may be required by pesticide product labeling, regulations, or restricted material permit conditions. Except as provided in section 6738.4 the employer shall assure that: (e) Employees wear coveralls whenever they handle pesticides with the signal word “DANGER” or “WARNING” except when using fumigants unless the pesticide product labeling expressly requires the use of coveralls.” The California standard definition of coveralls is similar to the federal definition and also advises that coveralls are different from the work clothing that the employee or employer may be required to provide. Coveralls made from uncoated Tyvek® have been recognized as acceptable under these regulations since 1989.

Section 6738.1(g)(1) instructs the employer to provide “chemical-resistant” clothing if required by the pesticide label. The California definition of chemical-resistant mirrors the federal definition. However, under California regulations, if the temperature exceeds 80°F during daylight or 85°F at night, the employer must address the risk of heat stress from chemical-resistant coveralls. The employer can implement engineering controls that limit worker exposure (like closed load/mix systems or enclosed cabs), provide a cooled chemical-resistant suit or use other methods that maintain the effective working environment at or below the temperature limits.

Tychem® garments meet the California requirements for “chemical-resistant” clothing. Tychem® QC and Tychem® SL have been recognized as acceptable since 1989.

Representatives of the California Department of Pesticide Regulation have ruled that a chemical-resistant material must provide a vapor-barrier and cannot be microporous and cannot be designed to be “breathable.” Garments made of microporous composites, such as DuPont™ NexGen® and DuPont™ ProShield® 50 are microporous and cannot be utilized as “chemical-resistant” under these regulations.

The State of California does not approve or register protective apparel, despite the claims of some protective apparel manufacturers. The only claim that a garment manufacturer can make is that their garment “meets the requirements” of regulations enforced by the California Department of Pesticide Regulations. In the past, the agency has reviewed manufacturer’s claims and “confirmed” or “agreed” that the claimed performance meets the requirements of the standard. There is not independent verification or certification.

This information is based on public information available from the California Department of Pesticide Regulations as well as correspondence with the agency representatives. It is always the user’s responsibility to determine the appropriate level of toxicity and proper PPE. The final authority is the California regulations, which are available at <http://www.cdpr.ca.gov/docs/legbills/calcode/subchpte.htm#a0303>

This information is based upon technical data that DuPont believes to be reliable. It is subject to revision as additional knowledge and experience are gained. DuPont makes no guarantee of results and assumes no obligations or liability in connection with this information. It is the user’s responsibility to determine the level of toxicity and the proper personal protective equipment needed. The information set forth herein reflects laboratory performance of fabrics, not complete garments, under controlled conditions. It is intended for information use by persons having technical skill for evaluation under their specific end-use conditions, at their own discretion and risk.

Anyone intending to use this information should first verify that the garment selected is suitable for the intended use. In many cases, seams and closures have shorter breakthrough times and higher permeation rates than the fabric. If fabric becomes torn, abraded or punctured, end user should discontinue use of garment to avoid compromising the barrier protection. SINCE CONDITIONS OF USE ARE OUTSIDE OUR CONTROL, WE MAKE NO WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WITHOUT LIMITATION, NO WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE AND ASSUME NO LIABILITY IN CONNECTION WITH ANY USE OF THIS INFORMATION. This information is not intended as a license to operate under or a recommendation to infringe any patent, trademark or technical information of DuPont or others covering any material or its use.



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