



# Protective Clothing for Ebola Virus Disease (EVD)

## Technical Bulletin

**This document provides general guidance for the use of DuPont Protective Apparel for Ebola virus disease response. Protective apparel is only one component of a comprehensive Personal Protective Equipment program recommended for Ebola response.**

**These suggestions are based on recommendations of the World Health Organization (WHO), the U.S. Centers for Disease Control (CDC), and Médecins Sans Frontières (MSF).**

**These organizations and resources offer extensive information on the Ebola outbreak:**

[United States Centers for Disease Control \(CDC\)](http://www.cdc.gov)

[World Health Organization \(WHO\)](http://www.who.int)

[CDC Q&As](#)

[Médecins Sans Frontières International \(MSF\)](#)

Protective clothing and protective equipment are only part of any comprehensive response to Ebola virus disease. Public health management of Ebola virus disease involves a combination of techniques: quarantines, avoidances, engineering controls, work practices, administrative controls, and proper use, donning and doffing of personal protective equipment. Consult with local authorities before undertaking any control or response activities. Ensure that the guidance is appropriate for the conditions and activities in which you will engage.

Once introduced into the human population, the Ebola virus is spread through direct contact with: a sick person's blood or body fluids, objects that have been contaminated with the virus, or infected animals.\*

Exposure to Ebola viruses can occur in healthcare settings where hospital staff are not wearing appropriate protective equipment, such as masks, gowns, and gloves, according to the CDC. For more information on how to prevent the spread of Ebola, visit:

[CDC infection prevention and control recommendations](#)

### Personal Protective Equipment (PPE)

- All persons entering the patient room should wear at least:
  - Gloves
  - Gown (fluid resistant or impermeable)
  - Eye protection (goggles or face shield)
  - Facemask
- Additional PPE might be required in certain situations (e.g., copious amounts of blood, other body fluids, vomit, or feces present in the environment), including but not limited to:
  - Double gloving
  - Disposable shoe covers
  - Leg coverings

**PLEASE NOTE:** Protective apparel is only one component of a comprehensive personal protective equipment (PPE) program recommended for Ebola virus disease response.

### Questions and Answers

#### 1. What is Ebola virus disease?

Ebola virus is the cause of a viral hemorrhagic fever disease. Symptoms of Ebola include fever and additional symptoms like severe headache, muscle pain, vomiting, diarrhea, stomach pain, or unexplained bleeding or bruising. Symptoms may appear anywhere from 2 to 21 days after exposure to ebola virus, although 8–10 days is most common.\*

#### 2. How is Ebola transmitted?

The virus is spread through direct contact (through broken skin or mucous membranes) with the body fluids (blood, urine, feces, saliva, and other secretions) of a person who is sick with Ebola, or with objects like needles that have been contaminated with the virus, or infected animals.\*

#### 3. Can DuPont recommend personal protective equipment (PPE) to use for Ebola virus disease?

The CDC and WHO websites above provide direction on infection prevention and control procedures related to Ebola. The selection of appropriate PPE (including respiratory, eye, head, foot and hand protection) is the responsibility of the end-user and must be made following a thorough hazard assessment of the work tasks and the environment. It must also be checked that the selected PPE meets relevant government and industry standards and that individuals are properly trained in the donning, doffing, use and disposal of PPE to avoid contamination.

\* "Questions and Answers on Ebola." CDC.gov. <http://www.cdc.gov/vhf/ebola/pdf/ebola-qa.pdf>.  
Field images courtesy of EU Humanitarian Aid and Civil Protection

The information provided by DuPont is not intended as a substitute for any hazard assessment testing that the end-user needs to conduct to determine the suitability of our products for their particular purposes. This information is offered for consideration and is not a recommendation.

#### 4. Which DuPont garments comply with European standards?

DuPont™ Tychem® C remains the best-in-class protective suit when handling biological and infective agents such as micro-organisms, bacteria, virus and fungi, as it meets the EN 14126 in the highest performance class.

Alternatively, a hooded Tyvek® garment with taped seams, used in conjunction with Tychem® C

accessories for enhanced protection of areas most exposed to potentially contaminated blood, sweat, and body fluids may be considered.

Additional information on DuPont protective garments that meet European standards for protection against infective agents and blood-borne pathogens can be found [here](#).

#### 5. What does it mean to be compliant to the EN 14126?

EN 14126 comprises the following material tests, carried out by an independent third party on the garment fabric only:

- Screening pressure test: Resistance to penetration by blood and body fluids using synthetic blood: ISO 16603

- Resistance penetration by blood-borne pathogens using a bacteriophage ("virus" penetration simulation): ISO 16604
- Resistance to penetration by biologically contaminated liquids (wet bacterial penetration): EN ISO 22610
- Resistance to penetration by biologically contaminated liquid aerosols: ISO/DIS 22611
- Resistance to penetration by biologically contaminated solid particles (dry microbial penetration): ISO 22612

Their performance in each of these tests is reflected by their classification, and can be found in the respective garments' technical literature.



DuPont™ Tychem® C\*



DuPont™ Tychem® QC\*



DuPont™ Tychem® SL\*



DuPont™ Tyvek® 800 J\*



Hooded Tyvek® garment with taped seams\*

#### DuPont™ Tychem® C Accessories¹



Apron\*



Overboot\*



Sleeve\*

1. Accessories alone will not provide adequate protection.

\* Model name, number, and product availability may vary by region. Please check with your nearest DuPont representative for product availability.



**PLEASE NOTE:** Fabrics are tested using recognized procedures to determine the level of barrier against proxy materials for blood-borne pathogens. They are not tested against specific viruses, such as Ebola.

## 6. Which DuPont garments comply with North American standards for blood-borne pathogens (ASTM F1670 and ASTM F1671)?

DuPont™ Tychem® QC and DuPont™ Tychem® SL fabrics and their taped seams have been tested and passed the requirements of North America ASTM Standards F1670 and ASTM F1671. Product compliance to those two standards can be found here:

[ASTM F1670](#)

[ASTM F1671](#)

Additionally, Tychem® QC or Tychem® SL aprons can be worn [on top of the coveralls](#).

## 7. What does it mean to be compliant to the ASTM F1670 and ASTM F1671 tests?

The garment fabric and seams have been tested by an independent third party lab to ASTM Standard test methods:



PPE is recommended for people assisting with disinfection.

- ASTM F1670 – Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Synthetic Blood
- ASTM F1671 – Standard Test Method for Resistance of Materials Used in Protective Clothing to Penetration by Blood-Borne Pathogens Using Phi-X174 Bacteriophage Penetration as a Test System

**PLEASE NOTE:** Fabrics and seams are tested using recognized procedures to determine the level of barrier against proxy materials for blood-borne pathogens. They are not tested against specific viruses, such as Ebola.

## Additional Information on DuPont Personal Protection Products and Relevant Standards

[Protective Clothing and Bloodborne Pathogens](#)

[Clothing to Protect Against Infection](#)

### DISCLAIMER:

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 obligation or liability in connection with this information. It is the user's responsibility to determine the nature and level of hazard 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 informational 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 lower barrier performance than the fabric. Tychem® and Tyvek® garments are intended for limited use and can be worn until damaged, altered or contaminated. These garments should not be laundered for reuse in protective apparel or cleanroom applications. Damaged, altered or contaminated garments should be disposed of in an appropriate manner. **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 WHATSOEVER IN CONNECTION WITH ANY USE OF THIS INFORMATION.** This information is not intended as a license to operate under, or a recommendation to infringe upon, any trademark, patent or technical information of DuPont or others covering any material or its use.

### WARNINGS:

- 1) Tyvek®, ProShield® Basic, ProShield® NexGen® and most Tychem® fabrics are not flame resistant and should not be used around heat, flame, sparks or potentially flammable or explosive environments.
- 2) Tychem® should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only Tychem® ThermoPro, Tychem® Reflector® and Tychem® TK styles 600T/601T (with aluminized outer suit) garments are designed and tested to help reduce injury during escape from a flash fire. Users of Tychem® ThermoPro, Tychem® Reflector® and Tychem® TK styles 600T/601T (with aluminized outer suit) garments should not knowingly enter an explosive environment. Consult the Tychem® user manual, located on our website, for instructions on proper use, care and maintenance of your Tychem® garments.
- 3) Garments should have slip-resistant or antislip materials on the outer surface of boots, shoe covers or other garment surfaces in conditions where slipping could occur.
- 4) If fabric becomes torn, scratched or punctured, or if a garment closure or seam fails, user should immediately discontinue use of garment to avoid serious injury, including potentially deadly chemical exposure(s). Seams and closures may provide less protection than fabric.
- 5) Serged and/or bound seams are degraded by some hazardous liquid chemicals, such as strong acids, and should not be worn when these chemicals are present.
- 6) The outer glove on Tychem® Reflector®, Tychem® TK600T and TK601T suits may contain natural rubber latex which may cause allergic reactions in some sensitized individuals. Additionally, some internal components not expected to contact the wearer during use may contain natural rubber latex which may cause allergic reactions in some sensitized individuals. Anyone who begins to exhibit an allergic response during the use of DuPont products should immediately cease using these products. The incident should also be reported to DuPont at 1-800-441-3637 so that an investigation can be initiated.

### Customer Service:

EMEA: 00800 387 66 858

United States: 1 800 931 3456

Canada: 1 800 387 9326

[www.PersonalProtection.DuPont.com](http://www.PersonalProtection.DuPont.com)



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