



# NFPA® 70E STANDARD & FREQUENTLY ASKED QUESTIONS

## NFPA® 70E - STANDARD FOR ELECTRICAL SAFETY IN THE WORKPLACE

National Fire Protection Association (NFPA) 70E, Standard for Electrical Safety in the Workplace, 2015 Edition addresses electrical safety related work practices, safety-related maintenance requirements and other administrative controls for activities such as inspection, operation, repair or demolition of electric conductors, electric equipment, signaling and communications conductors and equipment, and raceways. It also includes safe work practices for employees performing other work activities that can expose them to electrical hazards such as installation of conductors and equipment or installations used by the electrical utility that are not an integral part of a generating plant, substation or control center.

Notable changes to the 2015 Edition include the elimination of Hazard/Risk Category O; hazard/risk categories are now referred to as "PPE Category", deletion of the term "Prohibited Approach Boundary" and new tables used to determine the need for and selection of appropriate arc-rated (AR) PPE.

A hard hat, hearing protection, safety glasses or goggles, heavy duty work glove and leather footwear are required for all PPE categories. An arc-rated flash suit hood or arc-rated wrap around face shield is required for PPE category 1; an arc-rated balaclava must be worn with the arc-rated wrap around face shield for PPE category 2 activities. An arc-rated flash suit hood is mandatory for PPE categories 3 and 4. NFPA 70E continues to allow non-melting flammable (non-arc-rated) materials to be used as undergarments; however, garments that are not arc-rated cannot be used to increase the arc rating of a garment or a clothing system. Annex H "Guidance on Selection of Protective Clothing and other PPE" still exists and provides a table defining the simplified two-category system of choosing appropriate PPE.

## WHAT EMPLOYERS NEED TO KNOW

70E is a national consensus standard that establishes "best practices" for protection from electric arcs.

Employers must conduct a shock risk assessment to establish limited and restricted approach boundaries and an arc flash risk assessment to establish an arc flash boundary.

Under NFPA 70E employers must document and implement an overall electrical safety program that includes hazard/risk evaluation and job briefing procedures. This program must be audited annually. If energized electrical conductor or circuit parts operating at 50 volts or more are not placed in an electrically safe work condition, written authorization by work permit is required. Employees must be qualified to do the work and trained to understand the specific hazards and potential injury associated with electrical energy. Employees exposed to shock hazards must be retrained annually in cardiopulmonary resuscitation.

When work will be performed within the arc flash protection boundary, the employer must document the incident energy exposure in calories per square centimeter. Arc-rated clothing conforming to the requirements of ASTM F1506 and appropriate PPE must be worn either based on the incident energy determined for the specific task or by using separate tables in NFPA 70E to determine the need for arc-rated PPE and the arc flash PPE category.risk category.

## THREE STEPS TO COMPLIANCE WITH NFPA® 70E

### IMPLEMENT AND DOCUMENT AN OVERALL ELECTRICAL SAFETY PROGRAM

The employer must implement and document an overall electrical safety program that directs activity appropriate for the voltage, energy level and circuit conditions. This includes hazard/risk evaluation and job briefing procedures and must be audited annually. Employees must be qualified to do the work and trained to understand the specific hazards and potential injury associated with electrical energy. Employees exposed to shock hazards must be retrained annually in cardiopulmonary resuscitation.

### SELECT PPE

Employees must wear arc-rated clothing wherever there is a possible exposure to an electric arc flash above the threshold incident energy level for a second-degree burn (1.2 cal/cm<sup>2</sup>). Conductive items such as jewelry, necklaces, etc. may not be worn where they present a contact hazard. Clothing made from synthetic materials that melt such as nylon, polyester, polypropylene and Spandex may not be used unless such blends meet the requirements of ASTM F1506 and do not exhibit melting and sticking during arc testing.

Be aware that other PPE may be required for specific tasks including hearing protection, voltage-rated tools and gloves, etc.

**"Flame-resistant protective apparel can mean the difference between minor survivable burns and major life threatening injuries."**



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## WHO IS COVERED?

Employees during activities such as installation, operation, maintenance and demolition of exposed energized electrical conductors or circuit parts. Research shows that approximately 5% of the employees in any operation work as electricians, maintenance or other categories of work covered by this standard.

## DOES OSHA ENFORCE NFPA 70E?

OSHA believes that the NFPA 70E standard offers useful guidance for employers and employees attempting to control electrical hazards, but OSHA has not conducted a rulemaking and therefore does not “enforce” NFPA 70E. OSHA does use consensus standards, such as NFPA 70E as evidence of hazard recognition in evaluating General Duty Clause violations.

## WHERE CAN I GET A COPY?

NFPA 70E is available from NFPA, 1 Batterymarch Park, P.O. Box 9101, Quincy, MA 02269-9101; phone: 1-800-344-3555; on-line at: <http://catalog.nfpa.org>.

## WHAT IS ATPV; E<sub>BT</sub>?

There are two types of arc rating: ATPV and E<sub>BT</sub>. Each reports a 50% probability of a specific fabric response:

ATPV (Arc Thermal Performance Value) predicts a 50% probability that sufficient heat transfer through the fabric panel will cause the onset of second-degree burn injury based on the Stoll Curve. It is the measure of protection that a garment provides against the heat flux of an arc flash.

E<sub>BT</sub> (Energy Breakopen Threshold) predicts a 50% probability that the material will break open before the sensor detects probable onset of a second-degree burn. Breakopen is defined as any open area of at least 2.5cm. This means that an ATPV could not be reached, and at the breakopen point, skin could be exposed and a burn could occur.

## WHERE DO I FIND ARC RATINGS?

Arc ratings are included on Bulwark garment labels and in the Bulwark Catalog and Wholesale Product Guide. This information is also available on line at [www.bulwark.com](http://www.bulwark.com).

## MY CUSTOMER HAS DONE THEIR CALCULATIONS AND SOME TASKS REQUIRE A HIGHER LEVEL OF PROTECTION THAN IS AVAILABLE FROM SINGLE LAYER GARMENTS. WHAT DO I OFFER THEM?

The total system arc rating of layered ensembles must be determined by a multilayer arc test on the combination of all layers assembled as they would be worn, rather than

adding the arc ratings of the individual layers. Arc ratings of individual layers cannot simply be added together. Any garment worn as the outer layer, including rainwear, must be AR. Electrical switching clothing (flash suits) is available for those needing HRC 3 (25 minimum ATPV) or HRC 4 (40 minimum ATPV). Many insulated outerwear garments also have ATPVs greater than 25. These can be used for specific applications where higher arc ratings are needed. Keep in mind that hearing, head, face and neck protection are also required for these higher exposure levels. To review Bulwark® tested combinations, visit our Layered Arc Rating Calculator at <http://www.bulwark.com/Calculator>.

## THERE ARE SOME REALLY COMPLEX CALCULATIONS IN 70E. DO I HAVE TO BECOME AN ELECTRICAL ENGINEER TO UNDERSTAND THE STANDARD?

Arc-rated clothing and PPE must be worn based on the calculated incident energy determined for the specific task. On a temporary basis the tables found in NFPA 70E can be used. When opting to use the tables, refer to Table 130.7(C)(15)(A)(a) to first determine if arc flash PPE is required. If arc flash PPE is required, then consult Table 130.7(C)(15)(A)(b) [for AC equipment] or Table 130.7(C)(15)(B) [for DC equipment] to determine the appropriate arc flash PPE category.

## INFORMATIVE

Annex H provides a simplified approach to select appropriate arc-rated clothing and PPE based on “everyday work clothing” or an “arc flash suit” also on a temporary basis.

## CAN'T THOSE COVERED BY THIS STANDARD JUST WEAR HEAVYWEIGHT NON-MELTING FLAMMABLE GARMENTS SUCH AS DENIM JEANS?

No. Employees must wear AR clothing wherever there is a possible exposure to an electric arc flash above the threshold incident-energy level for a second-degree burn (1.2 cal/cm<sup>2</sup>).

## CAN WORKERS CONTINUE TO WEAR FLAMMABLE T-SHIRTS UNDER THEIR ARC-RATED GARMENTS?

Layering of non-melting flammable garments is permitted to be worn under AR garments for added protection. Garments that are not arc-rated cannot be used to increase the total arc rating of a clothing system.