

HOW DO I COMPLY?

“Flame Resistant protective apparel can mean the difference between minor survivable burns and major life threatening injuries.”

NFPA 70E - STANDARD FOR ELECTRICAL SAFETY REQUIREMENTS FOR EMPLOYEE WORKPLACES

National Fire Protection Association (NFPA) Standard 70E, 2004 Edition, became effective February 11, 2004. This American National Standard addresses electrical safety requirements for employees who install, maintain, or repair electrical systems. This standard covers virtually all aspects of workplace electrical safety, recognizing hazards associated with the use of electrical energy, and taking precautions so that hazards do not cause injury or death.

The 2004 Edition added significant sections on Personal Protective Equipment (PPE). Part II of this standard addresses electrical safety-related work practices for employees who work

on or near exposed energized electrical conductors or circuit parts. These employees must be qualified to perform the work and trained to understand the associated hazards. When working within a defined “flash protection boundary”, they must wear flame resistant protective clothing matched to the expected exposure. Non flame-resistant clothing is not acceptable because it is made from fabric that will ignite and burn.

For More Information on 70E visit:
www.nfpa.org

WHAT EMPLOYERS NEED TO KNOW

NFPA 70E is a voluntary standard that establishes “best practices” for protection from electric arcs.

Employers must conduct both shock and flash hazard analysis to establish a flash protection boundary.

If live parts operating at 50 volts or more are not placed in an electrically safe work condition, written authorization by an energized electrical work permit is required.

The employer is responsible for the safety and training of employees. Employees must be qualified to do the work and trained to understand the specific hazards and potential injury associated with electrical energy.

Flame resistant clothing and personal protective equipment (PPE) must be worn based on the incident energy associated with the specific task as determined by:

1. Flash hazard analysis

2. Review of the requirements for the task from the PPE Matrix (Table 130.7(C)(9)(a)), OR

3. Using the simplified approach to select appropriate clothing based on whether the task requires “everyday work clothing” or “electrical switching clothing” (Annex H)

Three Steps to Compliance with NFPA 70E:

- Conduct both shock and flash hazard analysis to determine incident energy potential within the flash protection boundary.
- Determine PPE required based on incident energy associated with the specific task.
- Select PPE matching the hazard to the arc rating of the garments.

HOW DO I COMPLY?

THREE STEPS TO COMPLIANCE WITH NFPA 70E:

1. Conduct both a shock and flash hazard analysis

Employers are required to conduct a hazard analysis to determine the “flash protection boundary.” Inside the flash protective boundary, exposure to an electric arc is predicted to cause a second-degree burn injury and PPE is required. Required FR clothing and other PPE is based on the specific hazard present.

The severity of the arc hazard is defined as incident energy in calories per centimeter squared (cal/cm²). It may be determined by three methods. Method A estimates the incident energy based on

knowledge of the electrical systems and work practices; Method B estimates the incident energy by determining hazard risk category classifications from tables of common work tasks; Finally, Method C lays out a simplified two-category FR clothing system that provides two PPE clothing categories, “everyday work clothing” and “electrical switching” clothing, to assure adequate PPE in facilities with large and diverse electrical systems.

2. Determine PPE clothing needs based on degree of hazard

| Hazard/Risk Category | Clothing Description (Typical number of clothing layers is given in parentheses) | Required Minimum Arc Rating of PPE [J/cm2(cal/cm2)] |
|----------------------|--|--|
| 0 | Non-melting, flammable materials (i.e., untreated cotton, wool, rayon, silk, or blends of these materials) with a fabric weight of at least 4.5 oz/yd ² (1) | N/A |
| 1 | FR Shirt and FR pants or FR coveralls (1) | 16.74 (4) |
| 2 | Cotton underwear - conventional short sleeve and brief/shorts, plus FR shirt and FR pants (1 or 2) | 33.47 (8) |
| 3 | Cotton underwear plus FR shirt and FR pants plus FR coverall, or cotton underwear plus two FR coveralls (2 or 3) | 104.6 (25) |
| 4 | Cotton underwear plus FR shirt and FR pants plus multilayer flash suit (3 or more) | 167.36 (40) |

NOTE: Arc Rating can be either ATPV or EBT.

3. Select protective clothing

Garments are rated based on their ability to protect against electric arcs. This arc rating is expressed in cal/cm². The standard requires that garments have a minimum arc rating, which may be either ATPV or EBT.

Be aware that other PPE may be required for specific tasks including double-layer FR flash hoods, FR hard hat liners, safety glasses or safety goggles, hard hat, hearing protection, leather

gloves, voltage-rated gloves, and voltage-rated tools.

The most prudent course for any company faced with an ignition hazard is to select protective clothing made from flame resistant fabrics. Untreated cotton and wool are not flame resistant and fabrics made from these fibers do not make adequate protective clothing for the range of hazardous conditions encountered in industry.

This overview was developed by Bulwark Protective Apparel and is neither a substitute for the standard nor an official publication of the NFPA. Please refer to NFPA 70E Standard for *Electrical Safety In The Workplace, 2004 Edition*, available from NFPA, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101 for all questions and for specific interpretations.

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NFPA 70E

2005 EDITION

WHO NEEDS 70E PROTECTION

Safety directors, electrical contractors, maintenance electricians, linemen, owners, managers, supervisors who work directly with 480V or greater electrical equipment, or oversee those who do.

BECAUSE

Everything Can Change
IN A FLASH

FREQUENTLY ASKED QUESTIONS

1. Who is covered? Employees who install, maintain, or repair electrical systems. Research shows that approximately 10% of the employees in any operation work as electricians, maintenance, or other categories of work covered by this standard.

2. Is it the law? NFPA 70E is a voluntary standard. However, covered employers can increase worker safety and avoid potential liability by complying with this standard.

3. Where can I get a copy?

70E is available from NFPA
1 Batterymarch Park
PO Box 9101
Quincy, MA
02269-9101
Phone 1-800-344-3555
or look online at:
<http://catalog.nfpa.org>.



4. What is ATPV? EBT? The standard requires that garments have a minimum Arc Thermal Performance Value (ATPV). The ATPV is expressed in calories per cm² and represents the thermal exposure from an electric arc that will create a second-degree burn in human tissue.

If the ATPV cannot be calculated because the fabric breaks open, the energy causing the fabric to break open is expressed as the Energy of Breakopen Threshold (EBT).

5. Where do I find the arc ratings? Arc ratings are included on Bulwark® garment labels and in the Bulwark® catalog and price list. Typically an FR garment is chosen based on the employer's hazard analysis because its arc rating exceeds the potential incident energy in the work environment.

6. My customer has done their calculations and they need a higher level of protection. What do I offer them? For those needing NFPA 70E category 3 (25 minimum ATPV) or category 4 (40 minimum ATPV), many insulated outerwear garments have ATPVs greater than 25, and even greater than 40. These can be used for specific applications where higher arc ratings are needed. A second choice is layering.

NFPA 70E describes wearing cotton underwear plus an FR shirt and pants plus an FR coverall to achieve a 25 ATPV.

7. There are some really complex calculations in 70E. Do I have to become an electrical engineer to understand this stuff? Five hazard risk categories are specified in the standard based on specific job tasks. These range from hazard risk category 0 that allows untreated 100% cotton up to category 4 that requires an FR shirt & pants plus a double layer switching coat and pants.

As a simplified alternative to the five specified hazard categories, the standard also lays out a two-category FR clothing system (Annex H, Table H.1). For "everyday work clothing", this system requires either an FR long-sleeve shirt (minimum ATPV 4.0) over an untreated cotton T-shirt with FR pants (minimum ATPV 8.0) or FR coveralls (minimum ATPV 4.0) worn over an untreated cotton T-shirt (or an untreated natural fiber long-sleeve shirt) with untreated natural fiber pants. This covers category 1 and 2 tasks and probably covers 95+% of requirements.

8. Can't those covered by this standard just wear heavyweight non-FR 100% cotton? Probably not. Non-FR garments can only be worn for hazard risk category 0. The standard requires FR clothing whenever there is a possible exposure to an electric arc flash above the threshold incident energy level for a second degree burn, 5J/cm² (1.2cal)/cm²

9. Some durable FR treated fabrics are blends of cotton and nylon and the fabrics used in Bulwark® Cool Touch® garments are blends of NOMEX® and FR rayon. Isn't that a problem since NFPA 70E has specific language excluding synthetic fibers? The standard was revised in the 2004 edition to allow blends of meltable fibers as long as those fibers meet the requirements of ASTM F1506 and do not exhibit melting and sticking during arc testing in accordance with ASTM F1959.



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