

Updated Requirements for Personal Protective Equipment Help Ensure Worker Safety

By Vladimir Ostrovsky

No matter how good the equipment, there is always a chance of an arc flash occurring when an electrician works on switchgear or even just turns it on. Temperatures of an arc flash can reach upwards of 35,000 degrees in less than a second, burning a person directly or causing ignition of non-flame resistant clothing or the melting of clothing into the skin. So it is very important to understand the risk element of that brief but highly potent unwelcome event and make sure all workers protect themselves as much as possible, according to current NFPA (National Fire Protection Association) 70E standard.



Keeping workers as safe as possible from arc flash is an entire way of thinking involving safe practices (including lockout/tag out and signage in compliance with the NEC requirements), use of insulated/insulating hand tools, insulating rubber gloves with leather protectors, and arc flash personal protective clothing, all conforming to prevailing industry-recognized standards.

For example, a FR (flame resistant) rated lab coat, even one that falls below the knees, may not be enough. That coverage would not necessarily protect an electrician from an arc coming from a lower piece of equipment. A ball of fire could roll up underneath. Rather, an individual needs 360 degrees of protection that an arc flash suit or coverall and hood would afford. Taking a less costly approach affords only a false sense of safety because it does not provide the required level of protection for the

Fortunately, electricians have the benefit of recent additions and clarifications in the newly updated NFPA 70E standard 2004 Edition, which will significantly boost worker safety.



In Section 130.7 (C)(12) (Factors in Selection of Protective Clothing), the standard notes that if FR clothing is required it may be worn integrated with flammable, non-melting apparel and should cover associated parts of the body as well as all flammable apparel worn as layering beneath it. Meltable fibers such as acetate, nylon, polyester, polypropylene, spandex or any other polyblend are not permitted. The standard goes on to explain that FR clothing should cover as much exposed area as possible, with shirt sleeves fastened at the wrists and shirts and jackets closed at the neck. The clothing should allow for movement and for visibility. Whenever rainwear is called for, that too must be put on over FR clothing and should also be made from FR material with arc rating.

According to the updated standard, FR materials include flame-retardant treated cotton and other fibers that can ignite but will not continue to burn after the ignition source is removed. They can reduce burn injuries during an arc flash by providing a thermal barrier between the worker and the arc flash. (Clothing made from non-melting flammable material, such as cotton,



Where the worker is required to wear an entire flash suit (which should always be easy to remove), the included hooded face shield should have an arc rating suitable for the arc flash exposure that meets ASTM (American Society Testing Material) F2178. The revised standard now requires, in Category 2, a face shield or a flash suit hood with an arc rating for heat protection and with

glasses is required. And if there is an exterior air supply into the hood, the hoses and pump housing must be either constructed of non-melting and nonflammable materials or covered by FR materials.

While the culture of the workplace is changing toward greater concern for safety, with management providing more personal protection equipment (PPE) than previously to protect their workers on the job, to substantially improve safety the workers need to use it all consistently. There should be formal training, in the classroom and/or on the job, to educate workers on the necessity of wearing PPE whenever working on energized equipment or when testing to verify if equipment is energized or not.

The worker needs to understand that just as he or she has de-energized a piece of equipment, locked it out, tagged it out and followed any other appropriate work procedures before it is determined to be “de-energized,” in the same way, the full measure of protective equipment should be put on prior to re-energizing the power.



According to the standard, Section 130.3, (Flash Hazard Analysis), a flash hazard analysis to determine the Flash Protection Boundary and the personal protective equipment that people within it shall use is now required.

The revised standard, 130.16(D)(1) (Insulated Tools and Equipment), also dictates that, in addition to proper personal protection, insulated tools and/or handling equipment be used when working inside the Limited Approach Boundary of exposed live parts wherever there could be accidental contact. The Limited Approach Boundary details the distance from live parts to the employee based on the potential shock hazard depending upon voltage ranges.

The revision to 130.6(D), (Conductive Articles Being Worn) stipulates that no conductive jewelry, clothing or metal frame glasses can be worn.

Updated Standards on Protective Equipment, Table 130.7 (C)(8), now require face protective products to conform to ASTM F 2178-02 and raingear to comply with ASTM F 1891-02a, and updating gloves, sleeves, gloves and sleeves, and leather protectors to their appropriate 2002 ASTM standards. To assure worker safety, all new flame resistant clothing should carry the proper ASTM rating.



Management may, indeed, have to re-educate long-time workers who, relying on dumb luck, have always used non-insulated pliers and “haven’t got a shock yet” in the very real dangers of arc flash. Times already have changed a lot from about sixty or so years ago, when a 1942 “American Electricians’ Handbook” noted how an electrician could use the taste test - applying the tongue to wire - to verify a live low voltage circuit. A peculiar mildly burning sensation indicated the presence for low voltage. The culture has evolved but there is still plenty of room for more change, with several tool-related specifics clearly addressed in NFPA 70E.

For example, in Table 130.7(F), (Standards on Other Protective Equipment), the standard states that insulated hand tools should conform to ASTM F 1505, which confers the minimum safety standard for insulated and insulating hand tools. So, regardless of what promises are printed on the packaging, unless the tool indicates ASTM F 1505 compliance, there is no guarantee that the tool conforms to the standard.

Other safety-enhancing features to look for in new tools: finger guards on pliers and other hand tools, where a worker’s hand could otherwise slip forward onto or in the way of exposed electric wire; and incorporation of the internationally recognized orange layer of insulation over a yellow layer of insulation, facilitating easy spotting of nicks and cuts in the outer layer.

Experience is never a substitute for proper personal protective equipment when working on or near exposed live parts.

Author bio: Vladimir Ostrovsky is the Director of International Sales and Corporate Training for W.H. Salisbury. He is a member of the American Society for Testing Materials and of the National Fire Protection Association. Ostrovsky is also a trainer for the National Joint Apprenticeship and Training Committee of the National Electrical Contractors Association and the International Brotherhood of Electrical Workers.

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