



TIE LINE UPDATE

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Flame Resistant (FR) Clothing

Flame resistant clothing, more commonly referred to as FR clothing, is an important piece of the electrical safety puzzle. The materials used to produce FR clothing are of two general types, cloth of cotton or cotton/polyester fiber treated with a fire retardant material and cloth made from inherently flame resistant fiber such as meta-aramid (Nomex), para-aramid (Kevlar and Twaron) and poly-benzimidazole (PBI). Blends of fibers are also used to enhance performance and feel of FR fabrics. FR clothing should be labeled with its thermal rating. These thermal ratings generally specify the amount of energy per area the clothing can sustain on one side before wearer suffers serious burns or the fabric breaks open. This rating is expressed in calories per square centimeter.

OSHA Requirements

Workers who may be exposed to the risk of an electric arc must be properly protected. Currently there are no specific requirements dictated by OSHA for the use of FR clothing, however there is rule making in progress for utility workers. OSHA does stipulate in 1910.335(a)(1)(i)

“Employees working in areas where there are potential electrical hazards shall be provided with, and shall use, electrical protective equipment that is appropriate for the specific parts of the body to be protected and for the work to be performed.”

OSHA requires that employers be aware of hazards and utilize known methods, PPE and other safety equipment to “... furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;” NFPA 70E 2009 edition provides a comprehensive industry

consensus standard for electrical safety including protective clothing for arc-flash hazards.

Why FR Clothing Is Important

Arc flash incidents, even at low voltages can release significant amounts of energy. The magnitude of an arc flash is related to how much energy is available and how long the incident lasts. Since voltage is generally constant it is available current, that determines the level of energy. A 100 or 200 amp three phase, 480 volt circuit, in an industrial distribution system, that faults (is short circuited) may easily deliver 10 or 15 thousand amps until the breaker clears, and produce incident energy levels of 10 to 12 calories per square centimeter at a distance of 12 inches from the source. This level of thermal energy over the duration of just a few cycles is enough to ignite 100% cotton work clothes. The burn injury the worker suffers are always greatly increased once their clothing ignites. Synthetic materials which can melt into the burned flesh will cause more drastic burn injuries.

Things to Keep in Mind

While some situations could result in burns to the skin, even with the protection required by NFPA 70E burn injury should be reduced and survivable. Due to the explosive effect of some arc events, physical trauma injuries could occur. Arc flash clothing does not address protection against physical trauma other than exposure to the thermal effects of an arc flash. It is important to understand that the rating is the amount of incident energy at which the wearer has a 50% chance of the onset of a second degree burn. The rating does not guarantee absolute protection.

Dress For The Occasion

FR clothing is available in a wide range of styles and ratings. Underwear, shirts/pants, coveralls, jackets/bib-overalls/hoods, outerwear, rainwear, balaclava or sock-hood, hard hat/face shield all are available rated for various thermal protection levels. Arc-rated gloves, heavy leather gloves and rubber insulating gloves with leather protectors provide protection for the hands. Heavy leather work shoes or boots will protect the feet. The most important point in selecting the appropriate arc-flash clothing system is to know the level of possible exposure. This most often requires an engineering study, called arc-flash hazard analysis, to be performed.

The Whole is Greater Than The Sum of The Parts

Layering of FR clothing results in protection levels significantly greater than the sum of the ratings of each layer. This is due to the insulating properties of the air trapped between the layers. It also explains why loose clothing will provide better thermal protection than tight fitting garments. When FR clothing is required, it should cover all parts of the body as well as all flammable apparel and allow movement and visibility. Only non-melting, flammable underwear and work clothes should be worn under FR clothing.

For more information visit the Burlington Safety web site at www.burlingtonsafety.com.