







VOLCORE



The brand name VolCore[™] was inspired by combining two words: VOLCANO and CORE. Volcanos immediately create imagery of heat and fire, and the earth's core is made of molten metal, nearly as hot as the surface of the sun.

INTRODUCTION

Workplace burn injury and fatalities are frequently the result of the worker's clothes catching on fire from two primary workplace hazards: flash fire and electric arc flash also referred to as "thermal incidents."

When a thermal incident ignites non-flame resistant clothing, the worker is exposed to injury from the burning or the melting of the garment. If a garment continues to burn, the area of injury increases and can also result in internal injuries, such as lung and airway damage.

The American Burn Association (ABA) reports that over 486,000 people receive medical treatment for burns each year, and survivors with 40 to 60 percent body burn typically stay 54 days in the hospital with an average cost of \$780,000.

OSHA says that ten percent to 45 percent of all burns happen at work and that 40 percent of workplace burn fatalities are from fires and explosions. It is estimated that 50 percent of all jobsite electrical injuries are due to arc flash, resulting in 2,000 people visiting burn centers each year for treatment.

Burn injuries are expensive, debilitating, often life-threatening and in too many cases deadly. Arc-Rated (AR) and Flame-Resistant (FR) clothing can help reduce the risk of burn injury from thermal incidents and is required in many industries, including oil and gas, electric power utilities, metallurgy, mining, paper and pulp, food processing, paint, and for all workers who come in contact with energized electrical equipment.



HAZARDS

FLASH FIRE

The National Fire Protection Association (NFPA) defines a flash fire as "a type of short duration fire that spreads by means of a flame front rapidly through a diffuse fuel, such as dust, gas, or the vapor of an ignitable liquid, without the production of damaging pressure."

Combustible dust is also a flash fire hazard. If it is ignited within a confined space, it can explode and is a potential threat within industries where sanding, polishing or grinding occur. Although a flash fire is only three seconds or less, it can produce temperatures from 1000 degrees F to 1900 degrees F. Don't let the three seconds fool you. If a worker is not wearing flame-resistant clothing (FRC), his or her clothing can ignite during that three seconds and continue to burn even though the thermal incident may be over. It is ironic that most burn injuries result from the clothing igniting or melting instead of the incident itself, which is short-lived.

ARC FLASH

The electrical industry is not a stranger to arc flash hazards as many of daily activities expose workers to risk. Some of these risks include voltage testing, removing circuit breakers, and opening bolted panel covers. The NFPA describes an arc flash as "an electric current that passes through air when insulation or isolation between electrified conductors is no longer sufficient to withstand the applied voltage."



FR VERSUS AR

According to the current NFPA 70E standard, all arc-rated clothing must also be flame-resistant to qualify for the arc rating. In other words, all AR clothing is FR, but not all FR clothing is AR.

Like FR clothing, all AR clothing must provide both a thermal barrier that insulates workers against burns and the fabric must be self-extinguishing. However, AR garments are required to carry an arc rating on the garment label.

All fabrics specified for use in AR workwear are tested according to ASTM F1959. The arc rating can be reported in one of two ways:

Arc Thermal Protective Value (ATPV), which is a rating of the arc burn protection capability of garment. The higher the arc rating, the more protection a garment gives because the fabric has demonstrated a higher resistance to catching on fire. The ATPV is expressed in calories per centimeter square (cal/cm2) and represents the thermal exposure from an electric arc that will create a second-degree burn in human tissue.

Energy of Breakopen Threshold (EBT)— If the ATPV can't be calculated because the fabric breaks open, the energy that causes the fabric to break open is called EBT. Like ATPV, the higher the rating, the greater the protection.

Keep in mind that while both values can be reported, only one arc rating is given to fabric and that rating is based on the first value that is reached, which is considered the "lowest value." According to the ASTM F1506 standard, the lowest value will be used on the garment's label. When considering the NFPA 70E standard, approximately 90 percent of all electrical trade workers generally fall into Category 1 and 2, meaning they require arc rated clothing with an ATPV rating of 8 or higher.

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STANDARDS

ASTM 1506

ASTM F1506 is a self-certification performance specification intended to supply minimum requirements for apparel used by electrical workers exposed to momentary electric arc and related thermal hazards.

INCLUDES VERTICAL FLAME TEST:

- Unwashed fabric
- home-laundered 25 times

PPE REQUIRED FOR HRCO-4

- Char length = 6"
- After flame = 2 seconds

NFPA 2112 Standard on Flame-

Standard on Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire specifies the minimum design, performance, certification, and testing requirements for flame-resistant fabric and garments for use in areas at risk from flash fires.

NFPA 70E

Essential for manufacturers and certifying agencies, this standard protects workers from flash fire exposure and injury by specifying performance requirements and test methods for flame-resistant fabric and garments.

HAZARD/RISK CATEGORY (HRC)	MINIMUM ARC RATING (CAL/CM ²)	ARC-RATED CLOTHING	PROTECTIVE EQUIPMENT
СЛТО	N/A	Protective clothing with nonmelting or untreated fiber at least 4.5 oz/yd; long-sleeve shirt, long pants (does not have to be arc rated); gloves	Safety glasses or goggles, hearing protection, heavy- duty leather gloves (as needed)
СЛТЭ	4 Cal/CM ²	Coveralls or long-sleeve shirt and long pants; face shield or arc-flash suit hood; gloves; jacket, parka, rainwear or hard hat liner (as needed)	Hard hat, safety glasses or goggles, hearing protection, heavy-duty leather gloves, leather work shoes (as needed)
CATQ	8 Cal/CM ²	Coveralls or long-sleeve shirt and long pants; balaclava and face shield or arc-flash suit hood; gloves; jacket, parka, rainwear or hard hat liner (as needed)	Hard hat, safety glasses or goggles, hearing protection, heavy-duty leather gloves, leather work shoes (as needed)
СЛТЭ	25 Cal/CM ²	Long-sleeve shirt; long pants; coveralls; arc-flash suit jacket; arc-flash suit pants; arc-flash suit hood; gloves; jacket, parka, rainwear or hard hat liner (as needed)	Hard hat, safety glasses or goggles, hearing protection, heavy-duty leather gloves, leather work shoes
СЛТФ	40 Cal/CM ²	Long-sleeve shirt; long pants; coveralls; arc-flash suit jacket; arc flash suit pants; arc-flash suit hood; gloves; jacket, parka, rainwear or hard hat liner (as needed)	Hard hat, safety glasses or goggles, hearing protection, heavy-duty leather gloves, leather work shoes

FABRIC TERMS

- Aramid The chemical family of FR fibers like Nomex® (meta-aramid) and Kevlar (para-aramid)
- Nomex The brand name for the meta-aramid produced by DuPont™
- Kevlar The brand name for the para-aramid produced by DuPont™
- *Modacrylic –* A generic name for a type of inherently FR fiber
- FRC Flame-resistant clothing



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NEESEWearFR

INDUSTRY TERMS

• Flame Resistant (FR) – A fabric or product that resists ignition and self extinguishes after removal of the ignition source

• Flame Retardant – A chemical treatment applied to a flammable base fabric that gives it FR properties

• Inherent – An FR fabric that is made of fibers that are flame resistant due to the chemical structure of the fibers and has not been chemically treated

• **Treated** – An FR fabric in which flame-retardant chemicals are added to the fabric after it has been woven or knitted

• Vertical Flame Test – A basic test that determines whether or not a fabric is FR by measuring how much of the fabric is consumed after 12 seconds of flame exposure

• Char Length - A measurement of the damaged fabric after the Vertical Flame test

• **TPP** – Thermal Protective Performance of a fabric; the amount of heat it takes to pass through the fabric and cause a second-degree burn; CGSB 155.20 requires a fabric have a minimum of 6 cal/cm² when tested with a spacer

• **Manikin Test/Body Burn** – A simulated flash fire test using an instrumented manikin to calculate the estimated percentage of second and third degree body burns after three seconds of exposure; NFPA 2112 requires the percentage to be below 50 percent

• **HTP** – Heat Transfer Performance of a fabric; the amount of heat it takes to pass through a fabric to cause second-degree burns based on the skin burn curve; NFPA 2112 requires a fabric to have a minimum of 6 cal/cm² when tested with a spacer and 3 cal/cm² in contact



WHAT DOES FR STAND FOR?

FR stands for Flame Resistant, which is the ability of a material to self-extinguish upon the removal of an ignition source.

WHAT DOES FRC STAND FOR?

FRC stands for Flame Resistant Clothing. Safety professionals and customers often refer to Flame Resistant Apparel as "FRC."

WHO WEARS FLAME RESISTANT (FR) CLOTHING?

People who work in hazardous environments that may involve the following hazards:

- Electric Arc (electricians, electric utility lineman, etc.)
- Flash Fire (refinery, chemical and pharmaceutical workers, etc.)
- Combustible Dust Explosion (workers in the paper and pulp industry, food processing, paint, and many more industries).
- All workers who come in contact with energized electrical equipment.

WHAT IS COMBUSTIBLE DUST?

Combustible Dust that is in a finely divided form and suspended in air in the right concentration, can become explosive. Employees can be killed or seriously injured during a combustible dust incidient.





HEADQUARTERS

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