



NFPA 70E & CSA Z462...

Understanding Underlying ASTM Standards

By Randell Bouton Hirschmann

Arc Flash safety is a relatively new concept to many, affecting electrical contractors, utilities, industrial electricians and others. While rubber insulating gloves have been around for nearly a century and should be commonly used in the field, the first arc flash rated faceshield was developed by the Oberon Company relatively recently in 1985. Products providing protection against the arc flash hazard soon expanded to include a comprehensive list covering the electrical worker from “head to toe”, including clothing, and other resources.

2008 was an important year in Electrical Safety. It saw the

introduction of Canada’s own Electrical Safety Standard CSA Z462 Workplace electrical safety and the 8th revision of the NFPA 70E Standard for Electrical Safety in the Workplace. Both standards provide an important guide to establishing an electrically safe workplace for electricians, linemen, thermographers and anyone working in close proximity to exposed energized electrical conductors or circuit parts. Much has been written about these standards, but there is a great deal of confusion regarding the underlying standards for electrical protective clothing that support them.

ASTM F1959 – Cornerstone For Arc Flash Protective Clothing

The American Society of Testing & Materials (ASTM) F18 Committee has for over a decade been developing standards covering the manufacturing and use of arc flash personal protective equipment. The result is the drafting of ASTM F1506, F1959, F2178, F2621 and F2676 standards.

ASTM F1959 is the cornerstone for arc flash protective clothing. It is the test method devised to determine how a fabric is to be tested for its arc rating and how the data is to be interpreted. Every fabric sold for arc flash protection is required to undergo this testing. As part of this evaluation, a set of a minimum of 20 fabric samples or “panels” is tested to determine its insulating characteristic against an arc flash generated under laboratory conditions. These results are measured against the Stoll curve, developed by Alice Stoll, a U.S. Military researcher, to determine the point at which sufficient energy can pass through the fabric to create a 50% probability of the occurrence of a 2nd degree burn on human tissue (based upon Alice Stoll’s research). ASTM F1959 is not a product test, but a simple fabric test best utilized by a manufacturer in the selection of fabrics for use in its arc flash protective clothing products.

ASTM F1506 takes this raw data and creates a standard to interpret these results. ASTM F1506 does not certify a garment. It includes details and restrictions on the construction of the garments, such as labeling and construction. It is worth emphasizing that the Arc Thermal Performance Value (ATPV) of a fabric does not offer 100% protection, but simply states the point at which the fabric system has a 50% probability of protecting from an amount of arc flash heat. It is for this reason that some manufacturers promote the presence of improved probability points, encouraging the use of products at 5% probability at the onset of a second degree burn rather than 50% probability.

Standard Recognizes Potential For Disparity Between Fabric & Testing

To this point, many manufacturers insert labels into their garments with arc ratings that have been shared with them by the manufacturer of the fabric they have purchased . . . but their protective clothing and equipment products have never been evaluated in a laboratory to ensure that the garments and hoods are in fact manufactured correctly or provide the actual protection stated by the arc rating. Recognizing the potential disparity between fabric testing and product testing, the ASTM F18 committee went to work on and developed ASTM F2178 to evaluate the performance of arc flash hoods and arc rated face shields. This was an important turning point in the industry because at this time there were arc flash hoods in the marketplace claiming to provide a high level of protection because of the fabric rating, but in some cases clear plastic lenses were used, which provide little or no protection. Many users purchased these hoods, believing them to provide enhanced protection against the arc flash hazard, when in fact they provided little more than wearing nothing at all. ASTM F2178 now obligates any company manufacturing arc flash hoods and arc rated face shields to conduct testing on its product, as it is sold, and label the product as such. This is an actual product testing that details specifically what level of arc flash protection the actual product will provide.

Newest Standard Is For Arc-Suppression Blanket

The ASTM F2621 standard was released in 2008 to cover arc rated finished products, i.e. garments as sold. Another important development is this standard requires the testing of a garment by a manufacturer, as sold into the marketplace. The goal of this standard is to reinforce ASTM F1506 to ensure that a garment does not incorporate flammable materials into its construction or deficiencies in its design (such as air vents in the garment design through which energy could travel or using 2 layers of fabric on the chest but only one layer on the arms and back). Unfortunately, despite the fact that this standard is nearly a year old, it is not as yet possible to conduct actual testing in accordance with this standard because the instrumented mannequins, required to conduct the testing have not been built by the arc testing laboratories. It is expected that the new mannequins will be available in late 2009

The newest standard is ASTM F2676, the Arc Suppression Blanket standard. While blankets have been around for several years now, there has not been a uniform method to evaluate their performance. These blankets were often little more than layers of fabric stitched together with little understanding of how they would perform. F2676 established the method to evaluate the performance of a blanket, incorporating into its results both pressure and time, giving the user real information to determine which blanket is most suitable for their task.

CSA Z462 And NFPA 70E Analyzes Testing For On-The-Job Application

Both CSA Z462 and NFPA 70E reference other standards that cover shoes, helmets/hard hats and other elements of safety equipment. The final piece of the puzzle is protection for the hands. The ASTM D120 standard covers rubber insulating gloves and sleeves. This standard is well known. It details the method for testing and evaluating these products as insulation from voltage. There is not, as of yet, a standard for the evaluation of the arc rating of the rubber insulating gloves or their leather protectors from the incident energy of an arc flash. While there is no agreed method to determine a protective arc rating offered by a rubber or fabric glove, the ASTM F18 committee is currently working to develop one,

The Electrical Safety Standards, CSA Z462 and NFPA 70E, take all of this testing information and provide information on how to analyze when it is required and how it can be applied in the real world, identifying what type of garment and what level of protection is required for the specific electrical hazards of arc flash and shock. CSA Z462 and NFPA 70E are not PPE standards, but provide details on how a comprehensive Electrical Safety Program including hazard evaluation, identification, quantification, risk assessment and safety auditing, establish the broader requirements for a company’s documented Electrical Safety Program. ⚠

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