

FR Clothing: The Importance of Proper Labeling

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Introduction

For over twelve years, the presenter has been both a leader and participant in the committees that develop standards for flame resistant clothing. As the president of a distributor and manufacturer of safety apparel, he has a commitment to the safety of workers in the energy sector. This experience and commitment combines in this presentation, which will address specific industry labeling standards and the importance to safety managers. Proper labeling can be overlooked, and it is important to be educated and aware of best practice methods with regard to how personal protective apparel should be labeled; whether you are a safety manager, a worker, a manufacturer or distributor, this knowledge will improve compliance and general safety.

The Federal Trade Commission (FTC) requires that clothing and textile products commonly used in the household be labeled according to clearly identified requirements. While safety apparel purchased by the employer does not neatly fit into the definition of products covered by the FTC Care and Labeling Rule, the procedure is relevant. The information that must be detailed on household garment labels does appear in safety standards that apply to protective equipment. Briefly reviewing FTC requirements will allow us to better self-regulate the care and labeling of protective apparel.

Household textiles will have two distinct labels. The first label must address:

- Fiber content, in descending order of predominance.
- A manufacturer's identity, which may be in the form of a full name or Registered Identification Number (RN).
- The country of origin must also be printed on this label, whether or not the garment can be marked "Made in USA" will be determined by both where the garment is manufactured and where the materials originated.

While the first label need not be permanent, the care instructions label is required to be attached to a garment for its useful life. This lists:

- Instructions for regular care and
- warnings, should a particular procedure be known to cause harm to the garment.

We are familiar with this label, as providing us with laundering recommendations.

If we are to consider, as an industry, any specification comparable to the Federal Trade Commission's Care and Labeling Rule, the NFPA 2112, to be reviewed later, and the F2302-08 Labeling Requirements may very well be the best examples. Providing a minimum requirement for labeling protective clothing as heat and flame resistant for applications where the potential for flame contact or high heat exposure exist, F2302 insists upon the same labeling format that the FTC requires for household garments. For the sake of simplicity and consistency in garment labeling, this is important. The consumers must also be considered; it is much easier to appropriately care for personal protective equipment if the labels are in the same style as the labels attached to everyday clothing.

The F2302-08 Labeling Requirements state that the minimum information on a label for heat or flame resistant will be:

- the name of the clothing manufacturer or RN number;
- the name or style number of the clothing item;
- care instructions for protective clothing;
- information regarding the limitations of use for this item, or warnings, which must include a statement "for single use only" if the garment is not intended for reuse.

In addition to this standard, each thermal or flame hazard has its own set of labeling requirements.

The Hazards

<u>HAZARD:</u>	Electric Arc	Flash Fire	Visibility
Industries:	Electrical maintenance, including electric utilities, as well as industrial and commercial electrical maintenance	Chemical, Gas & Oil	Road workers, first responders, maintenance, electric, gas & sanitary service workers
Safety Standard:	OSHA 1910.269 NESC 2007 NFPA 70E	NFPA 2112	OSHA 23 CFR Part 634
Garment Performance Standard:	ASTM F1506	NFPA 2112	ANSI 107-2004
Test Methods:	ASTM F6413 ASTM F1959	ASTM F1930 ASTM D6413	Background Material & Retroreflective Material tested for mechanical & performance properties according to ANSI 107-2004
Labeling Requirements:	Meets F1506; designates the arc rating	Meets NFPA 2112 Certification	ANSI 107-2004 compliant: pictogram, Performance Class & Level

Table 1. A summary of the hazards and the relative standards that are pertinent to 'at-risk' industries.

Workers who wear FR Clothing are currently faced with three major hazards; arc flash, flash fire, and the risk of low visibility. These unique dangers have qualified the design of standards to monitor the safety of workers in "at-risk" industries.

Arc Flash

The primary industry to be affected by the dangers of arc flash is the electrical maintenance field. OSHA, NESC, and NFPA 70E work towards eliminating the potential risk of arc flash injury by requiring employers to assess the risk for potential electrical hazards, specifically citing arc flash,

and stipulating that employees wear appropriate protective apparel once the intensity of the hazard has been determined.

While the existing OSHA 1910.269 does not require systematic hazard assessment and protection, under a proposed but not finalized revision of OSHA 1910.269, employers are required to determine, to the best of their ability, the heat energy from electric arcs to which their employees could potentially be exposed. The workplace must be assessed for flame and arc hazards, and employees will be required to wear the appropriate protective apparel, and under certain conditions flame resistant clothing. The clothing will have an arc rating equal to or greater than the available heat energy; it will not melt, ignite, or continue to burn in the presence of electric arcs.

Similarly, NFPA 70E presents a different standard for evaluating electrical safety in the workplace. 70E applies to all electrical maintenance except utility, rail, mine and marine work. In accordance with section 130.3, “All parts of the body inside the Arc Flash Protection Boundary shall be protected.”¹ This section further calls for the maintenance of protective equipment in “safe and reliable condition.”²

In addition to 1910.269, which is a Federal standard, the NESC is adopted on a state-by-state basis. Becoming effective on January 1, 2009, the 2007 NESC states that an employer will be required to ensure that potential exposure to electrical arc is assessed for employees who work near energized parts or equipment. If this assessment results in a finding of a possible exposure greater than 2 cal/cm², employees shall be required to wear clothing with an effective arc rating no less than the anticipated level of arc energy.³

These safety standards, assessing the arc flash hazard, segue into the standard that evaluates the performance of the protective apparel. The Garment Performance Standards relative to arc flash protective clothing are generally intended to determine that the clothing is tested appropriately, primarily for flammability and arc rating, and is labeled accordingly.

ASTM F1506 is a performance specification that covers flame resistant garments intended for wear by electrical workers who are at risk for exposure to electric arcs and the related thermal hazards. The fabric is required to be arc tested and flame resistant. This specification requires specific information on the garment label:

- a tracking ID code system (commonly referred to as the ‘lot number’),
- the manufacturer’s name or RN Number,
- size
- associated standard labeling (which makes an understanding of FTC labeling practices important),
- care instructions
- fiber content,
- ATPV or EBT arc rating, and

¹ National Fire Protection Association. NFPA 70E Standard for Electrical Safety in the Workplace 2009 Edition. Quincy: 2008. 31.

² National Fire Protection Association. NFPA 70E Standard for Electrical Safety in the Workplace 2009 Edition. Quincy: 2008. 31.

³ Institute of Electrical and Electronics Engineers, Inc. National Electrical Safety Code 2007 Edition. New York: 2006. 280.

- “Meets performance requirements of F1506”.⁴

As was previously stated, and can be inferred by the ATPV or EBT rating required on the label, the garment must be tested to determine the arc rating. This method, as detailed by ASTM F1959, measures the amount of arc energy that has a 50% likelihood of producing a 2nd degree burn to human skin. Also, a garment meeting F1506 must have a char length of less than 150mm (6 in) and a less than 2 second after flame when tested according to the vertical flame test, ASTM D6413.⁵

Flash Fire

Those who risk potential exposure to flash fire, those in the petroleum, petrochemical, chemical, and related fields, should be knowledgeable concerning NFPA 2112. This standard specifies the minimum design, performance, certification requirements, and test methods for flame resistant garments in at-risk areas.⁶

Under NFPA 2112, all garments determined to be flame resistant must have UL third-party certification. Certification shall depend on compliance with this standard, which will include garment design, performance, testing and inspection of the facility.

Flame resistant clothing must be tested in accordance with ASTM F1930, a simulated controlled flash fire environment using a sensed manikin. A fabric meeting the requirements of NFPA 2112 must predict less than 50% body burn in a 3 second test. In addition, garments meeting the requirements of NFPA 2112 should also pass a vertical flame test (ASTM D6413).

NFPA 2112 may be, in comparison to other industry safety standards, the most inclusive, describing both garment standards and care labeling guidelines. According to section 3-1 of NFPA 2112, all FR garments must have a product label with the certification organization’s identifier permanently attached to the product label. This may also be included as part of the label, or adjacent to it. The garment label must be permanently attached inside the product, and clearly visible. This label will be worded in English, with the option of an additional language. Symbols and graphics will also be permitted as supplements to worded statements. These visual representations must be consistent. The product label shall include:

- This statement printed in letters of at least 2.5 mm (0.10 in.) high: "THIS FLAME-RESISTANT GARMENT MEETS THE REQUIREMENTS OF NFPA 2112, STANDARD ON FLAME-RESISTANT GARMENTS FOR PROTECTION OF INDUSTRIAL PERSONNEL AGAINST FLASH FIRE, 2007 EDITION."
- The item name, number, or design
- Manufacturer's name, identification, or designation.
- Manufacturer's address
- Country where manufactured
- Manufacturer's garment identification number, or lot number, or serial number

⁴ ASTM International. F1506-02a Standard Performance Specification for Flame Resistant Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards. West Conshohocken: 2002. 3-5.

⁵ ASTM International. F 1959/F 1959 M-05a Standard Test Method for Determining the Arc Rating of Materials for Clothing. West Conshockon: 2005. 1

⁶ National Fire Protection Association. NFPA 2112 Standard on Flame-Resistant Garments for Protection of Industrial Personnel Against Flash Fire 2007 edition. Quincy: 2006. 4.

- The size
- Fiber content
- A statement reading, “DO NOT REMOVE”⁷

It is the responsibility of the garment manufacturer to provide end-users with information including warnings and instructions. Additional information to be provided will include a sizing chart specific to wearer measurements. The symbol for “Read user instructions before use,” (Exhibit 1) should be included if this information is not provided on or adjacent to the product label.⁸

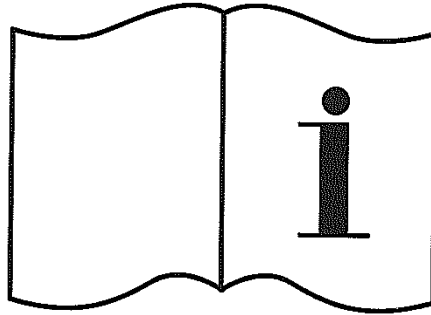


Exhibit 1. Presented is an example of the ‘Read User Instructions’ symbol.

Visibility

It is difficult to specify finite industries in which workers would be at risk from injury due to low visibility. As of November 24, 2008, the Federal Highway Administration added part 634, entitled *Worker Visibility*, to Title 23, requiring that workers on Federal-aid highway rights of way wear high visibility and reflective ANSI 107-2004 compliant safety apparel, and specifically Performance Class 2 or 3. First responders (including law enforcement, fire fighters, and security personnel), maintenance workers, electric, gas and sanitary service workers have all suffered casualties in numbers equal to or in excess of five in a single year, according to the 2003 Census of Fatal Occupational Injuries. In a 2005 Report to Congress by the National Traffic Safety Administration, there is a reported link between similar accidents and low visibility.⁹

There are three distinct performance classes, which are determined by the area of the material, which influence the visibility of the wearer. Table 3 presents the minimum areas of visible material as defined by ANSI 107-2004.

⁷ National Fire Protection Association. NFPA 2112.9.

⁸ National Fire Protection Association. NFPA 2112. 7-9

⁹ “Meeting the Work Zone Visibility Deadline”. Occupational Health & Safety. 2 Aug 2007. 16 Feb 2009 <<http://ohsonline.com/Articles/2007/08/Meeting-the-Work-Zone-Visibility-Deadline.aspx>>. 1.

	Performance Class 3	Performance Class 2	Performance Class 1	Performance Class E	Headwear
Background material	0.80 m ² (1240 in ²)	0.50 m ² (775 in ²)	0.14 m ² (217 in ²)	0.30 m ² (465 in ²)	0.05 m ² (78 in ²)
Retroreflective or combined-performance material with background material	0.20 m ² (310 in ²)	0.13 m ² (201 in ²)	0.10 m ² (155 in ²)	0.07 m ² (108 in ²)	0.0065 m ² (10 in ²)
Photometric performance	Level 2 or Level 1	Level 2 or Level 1	Level 2 or Level 1	Level 2 or Level 1	Level 2
Combined-performance material used without background material			0.20 m ² (310 in ²)		0.05 m ² (78 in ²)
Photometric performance			Level 2 or Level 1		Level 2 or 1

Table 3. Documented are the minimum areas of visible material for ANSI compliant garments.

ANSI 107-2004 provides uniform requirements and guidelines for the design, performance specifications, and use of high-visibility and reflective safety apparel. For ANSI compliant garments, the product must be tested by an accredited lab and certified, or self-certified.

The garment performance standards to be investigated shall include:

- The minimum width of retroreflective or combined-performance material.
- The spacing between the bands of retroreflective or combined-performance materials, which must equal the width of the bands themselves.
- The distance between the bottom of the garment and the retroreflective or combined-performance materials, which is to be no less than 1.97 inches.
- The placement of the retroreflective or combined-performance material on the sleeves.
- The gaps for fastening in the retroreflective, combined-performance material or the background materials that is to be no less than 1.97 inches.
- There will be 360 degrees of visibility of retroreflective or combined-performance material.¹⁰

Testing methods for ANSI compliant garments are numerous. Both the background materials and the retroreflection material will be tested individually for mechanical and performance properties. Since these tests are so many, we will give an overview of what must be done to obtain certification. For more depth, the ANSI 107-2004 document and related testing standards will provide more detailed technical data.

Retroreflective material must be tested for Photometric performance against abrasion, flexing, exposure and folding in cold temperature, temperature variation and rainfall. Also, it must be tested for washing and dry cleaning, should a care label indicate that laundering is appropriate for that garment.¹¹

¹⁰ International Safety Equipment Association. ANSI 107-2004. 4-6.

¹¹ International Safety Equipment Association. ANSI 107-2004. 9.

When selecting ANSI compliant clothing, be aware that certified garments successfully meeting these standards will state “ANSI 107-2004” certification on the garment label. In addition, ANSI garments will be labeled in accordance to the standard itself.

Care labeling will indicate washing instructions and the maximum number of times that the finished garment can be laundered (ex. 25 x) and still retain its visibility, as well as the FTC symbols for care and laundering recommendations as set forth in ASTM D5489. There should also be instructions for use. These will include: how to wear the garment (putting it on and removing it if relevant); warnings of misuse; limitations on use; correct storage and the maximum periods between maintenance checks; proper maintenance and cleaning; number of cleaning processes (washing cycles) that will not impair the performance level.¹²

In general, the labeling shall be attached to the product and care labeling shall appear on these garments or on the product labels. They will be visible and durable-for the useful life of garment, meaning they will remain affixed for the recommended number of washing cycles. The product label must also include the name of the manufacturer or RN number; product type (commercial name); the size; name of this ANSI standard (107-2004), and a pictogram. The pictogram will depict the actual garment, Performance Class & Level of photometric performance of retroreflective or combined performance material.¹³



Exhibit 2. Presented is an example of an ANSI-compliant garment label.

Labeling

In accordance with each standard, garments will be labeled to indicate use in preventing injury from arc flash, low visibility or flash fire. In some instances, these dangers will combine and garments will meet multiple standards. However, we must recognize that not all standards are binding law. Indeed OSHA CFR 1910.269 is federal law; however, NESC is adopted on an individual state basis and NFPA 70E has been enforced under the OSHA general duty clause. With all this taken into consideration, the format as provided by the Federal Trade Commissions Care Labeling Rule and the Textile and Wool Acts provides an excellent foundation for manufacturers of safety apparel. It is important to provide consistency in labeling when it comes to personal protective apparel. Indeed, many of the standards reviewed have similarities—the most vital information reappears in every one of these standards’ labeling requirements:

¹² International Safety Equipment Association. ANSI 107-2004. 11-12.

¹³ International Safety Equipment Association. ANSI 107-2004. 12.

- Manufacturer
- Item or product type
- Care and Product Use Instructions
- Standard Compliance

Improper labeling can have significant consequences for the wearer that can range from minor inconvenience to extreme danger:

- There was a recent recall of an in-service sweatshirt by a major manufacturer who did not disclose the fabric manufacturer. This product was labeled as being flame resistant, but had failed the vertical flame test because the FR treatment was not durable.
- In a separate incident, a manufacturer had made the decision to discontinue the production of a jean from the Ultra Soft material, and reproduce the garment with unbranded flame resistant denim. The new garments were delivered, produced from the new denim, but with the Ultra Soft part numbers.
- Another issue arose with a separate manufacturer who had been complying with the labeling instructions provided by ANSI 107-2004, however once the manufacturer had printed the pictogram, it was found to be a depiction of a hi-vis vest and not a rendition of the actual garment itself.

These errors could be avoided with more intense adherence to the respective standards. It would be even more advisable for manufacturers and distributors to label personal protective clothing in a manner that is clear and consistent across the board.

Use of the Federal Trade Commission model as a basic guide and insistence upon each product label providing six principle staples of information can serve to minimize negative effects on workers and safety managers.

1. Manufacturer: found in the labeling guidelines of F2303-08, NFPA 2112, ASTM F1506, and ANSI 107-2004.
2. The country of manufacture: significant information for end-users appearing in NFPA 2112.
3. A garment name and ID number (Tracking ID Code): will enable more efficient tracking of individual products. Required by NFPA 2112, F2303-08, ASTM F1506 and ANSI 107-2004.
4. Fiber Content: important information with FR fabrics, where blends are prohibited. Already required by NFPA 2112.
5. Statement indicating compliance with relative standards:
 - a. ANSI 107-2004 will include pictogram with Level and Performance Class.
 - b. ASTM F1506 will indicate Arc Rating.
 - c. NFPA 2112 will carry the certification organization's identity.
6. Care Instructions are universally acknowledged by NFPA 2112, ASTM F1506, ANSI 107-2004 and F2303-08 to be necessary information required on garment labeling.

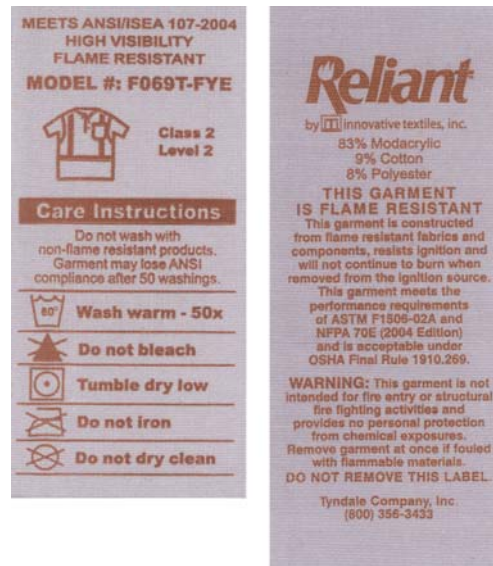


Exhibit 3. Presented is an example of a ‘best practices’ label with the suggested six principles of information.

Summary

The performance of personal protective equipment is central to worker safety. Unfortunately, your role as a Safety Professional is not limited to keeping workers safe; you also have a responsibility to adhere to safety laws and best practices. In the unfortunate event of an accident, your employer must be able demonstrate that the safety program conformed to all regulations. In the world of FR Clothing, the garment labels are the surest way to determine if a worker in an accident was wearing the proper safety equipment or not. By knowing and understanding the relevant standards and labeling requirements, you are empowered to choose garments for your FR clothing program that will properly protect workers from the hazards they face in their jobs.

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