

THE SCIENCE OF FABRIC SELECTION

Understanding the terms, criteria, and considerations for choosing flame-resistant fabrics.

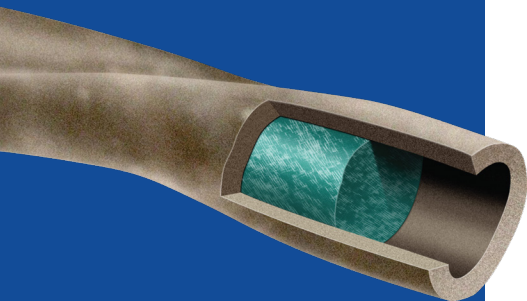
In the protective clothing market, there are many choices to make when specifying personal protective equipment (PPE). Flame-resistant and arc-rated (FR/AR) fabrics, which form the foundation of bodywear PPE and largely dictate the level of protection achieved, come in numerous formulations, all with their own set of characteristics. Even within a specific FR/AR fabric, attributes like arc rating and comfort can vary significantly among brands. This white paper explores the industry so that you can select a reliable, functional fabric to serve as the foundation of your protective clothing.

Very little guidance is available to properly categorize FR fabrics as inherent, treated, or engineered. In fact, the definition of inherent has become so blurred that it now describes any fabric containing FR fibers, as the industry requires no defined percentage.

THE WESTEX® DIFFERENCE

Westex engineered fabrics lock the FR properties into place and are guaranteed to be flame resistant for the useful life of the garment.

Our constantly-evolving suite of proven FR/AR technologies safeguards against flash fires, electrical arc flashes, and molten metals.



The Complexity of Simplified Terms

It is easy to allow simplified terms like “inherent” or “treated” to guide you during the FR specification process. Developed to oversimplify a necessarily technical process, inherent and treated labels can persuade a purchaser and may detract from the full scope of information needed to make this important decision. Drawing on our insights as one of the few FR fabric manufacturers in the world developing the full spectrum of FR/AR fabrics, we see first-hand that these qualities are only a small part of the specification process. By understanding the fundamental differences among FR technologies and how these distinctions impact performance, safety managers can navigate the complex world of FR/AR fabrics to make informed decisions based on real differentiators.

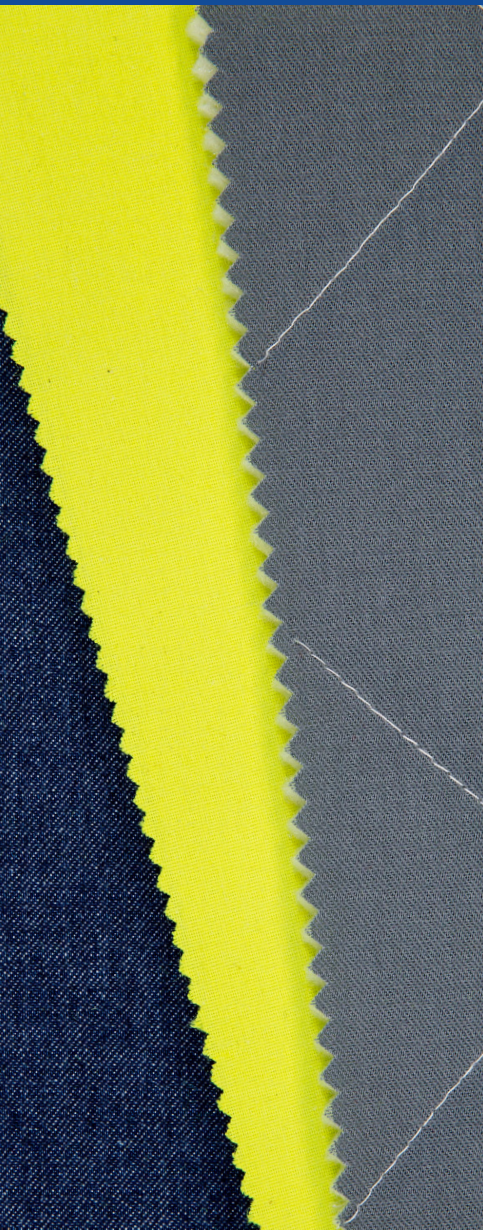
Understanding the Terms

Born out of the desire to describe different approaches to producing FR/AR fabrics, the terms “inherent” and “treated” are thought to classify flame-resistant fabric. Inherent fabrics tend to be aramid, in which the flame-resistant properties are engineered into the fiber. Treated fabrics are typically cotton or cotton-based and made to be flame-resistant after the fabric is woven.

For over 30 years, these terms have described the difference in how the two categories of FR fabrics were produced. When they originated, inherent fabrics lasted longer than those considered to be treated fabrics. This is still true with some treated fabrics that use topical or spray coatings, yet scientific and technological advances helped progress the durability of treated FR fabrics so much so that engineered fabrics emerged.

The key to specifying a quality FR/AR fabric for any protective garment is to analyze the hazards employees face.

If FR protection is equal, choosing a fabric becomes a matter of comfort, user preference, and consensus standard performance.



How Engineered Fabrics Are Different

Fabric can be engineered to acquire FR properties at the fiber development stage or during the fabric creation stage. Reliable technologies use chemistry and fire science to interrupt the combustion process to create fabrics with excellent durability. Once these technologies are applied, the FR characteristics are permanently embedded into the fibers of the fabric and will not wash out or wear out over the course of the garment's lifetime, when cleaned and properly maintained per the manufacturer's fabric care instructions. As such, the value proposition of engineered FR fabrics becomes a matter of comfort, user preference, and consensus standard performance, rather than lasting protection.

Evaluating Your FR Fabric Selection

All FR fabrics in the industry meet one or more of the industry consensus standards. In fact, in order for garments to adhere to NFPA 70E®, NFPA® 2112, and CGSB 155.20, the fabric must meet applicable ASTM and NFPA standards performance criteria. The fabric test methods for evaluating both flash-fire protection and fabric performance for baseline arc flash include ASTM F1959: Standard Test Method for Determining the Arc Thermal Performance Value of Materials for Clothing and ASTM F1930: Standard Test Method for Evaluation of Flame-Resistant Clothing for Protection Against Fire Simulations Using an Instrumented Manikin.

It is important to note that even if two fabrics meet the same industry consensus standard, their performance can vary widely within an acceptable range. So choosing a fabric that best meets your specific needs becomes a critical component. Keeping this performance indicator in mind, the key then to specifying a quality FR/AR fabric for any protective garment is to analyze the hazards employees face and to account for their environment. From there, it is a matter of choosing the best fabric to protect those who are entrusting their safety to you. However you're evaluating fabrics, the most important factor in your decisions should be scientific test results.



When specifying FR fabric for protective garments, here are five key criteria to consider:

01

DOES THE FABRIC MEET MY HAZARD REQUIREMENTS?

Like the oversimplified usage of “inherent” and “treated” in the market, standard certification can also be exaggerated. Terms like “NFPA® 2112-certified” and “Cat 2”—initially intended to helpfully indicate a product met certain standards—inadvertently cause confusion. It is not enough to know that a fabric meets the standard for your specific hazard; you also want to know how the fabric performs under hazardous conditions. Reviewing things like body burn percentages helps provide a clearer picture of how the fabric performs beyond the baseline provided by the standard.

02

HOW DOES THE FABRIC PERFORM IN LABORATORY EVALUATION?

Proven fabric brands are known for consistency in the market and regularly evaluate the performance of each lot of fabric they produce. While meeting consensus standards is an important threshold, it is just that—a minimum performance indicator. Fabrics can meet standards and still vary widely in their performance within that standard. Request the test data to better understand the fabric’s performance, and when it is time to order FR garments, specify the FR fabric by name.

KEY TAKEAWAYS FOR FR/AR FABRIC SELECTION

Safety and comfort come from the fabric brand—not the garment brand.

Specify the fabric in your garments, no matter the brand.

Avoid garments where the fabric brand isn't identified.

Look for details about the fabric manufacturer's quality control and testing.

Understand the FR fabric's certification and ask for third-party test results.

Select a fabric brand that best meets your needs.

03

HOW DOES THE FABRIC PERFORM IN THE REAL WORLD OVER TIME?

In addition to laboratory evaluation, consider how FR fabrics perform in real-world settings. This can be analyzed in several ways—from the actual incidents where FR fabrics protected a wearer to how the fabric holds up over time. Dedicated to increased accountability for fabric performance, Westex is proud to be the first manufacturer in the industry to test fabrics in real-world situations, in addition to the controlled environment of industry standards testing.

04

DOES THE FABRIC DEMONSTRATE PERFORMANCE AND LONGEVITY CHARACTERISTICS IMPORTANT TO ME?

Understanding fabric characteristics like long-term shrinkage, color wash down, abrasion, or durability can help you understand a garment's performance and longevity. If a garment is specified with a reputable FR fabric and is cared for properly, the concern of durability is diminished. Taking into account your workplace needs, like whether durability demands justify investing in more expensive fabric initially, will help inform what type of investment makes the most sense.

05

WILL MY EMPLOYEES WANT TO WEAR IT?

Investing in FR clothing is critical to protecting your employees. However, it is only beneficial if worn properly. One key area to consider is the comfort and performance attributes of the fabric given your work environment. For example, Westex offers a variety of fabrics designed with unique benefits, such as greater flexibility, moisture management, better corporate brand appearance, or those that look like everyday streetwear. Prioritize characteristics that will help create a want-to-wear experience for your workers.

Deciding Holistically

As one of the few FR fabric manufacturers in the world producing aramid, cotton-rich, and blend FR fabrics, Westex strongly recommends that FR clothing program decisions be guided by a holistic approach, rather than relying solely on inherent or treated classifications. Much of your decision should be guided by a host of technical criteria—prioritizing fabric performance above all to arrive at an FR fabric selection best suited for your unique needs.

ABOUT THE AUTHOR

Scott Francis is the Technical Sales Manager for Westex. Involved in the safety industry for nearly 30 years, Scott has extensive knowledge of FR hazards, standards, fabrics, and clothing. He has addressed end users, associations, and garment suppliers thousands of times regarding relevant safety topics.

ABOUT WESTEX®: A MILLIKEN BRAND

Westex® creates flame-resistant and arc-rated (FR/AR) textiles recognized for unmatched quality, comfort and proven performance. Since 1951, our life-saving materials and technologies have been the last line of defense for hardworking men and women in the utility, oil and gas, electrical maintenance and metals industries. For more information, visit westex.com.

