



**When It Comes To Safety...
The Fabric Brand Matters.**



ARC FLASH



FLASH FIRE



MOLTEN METAL



MARKET PROVEN PERFORMANCE
AN ORIGINAL
INDURA Ultra Soft®
Flame Resistant Fabrics
WESTEX INC. BRAND
LOOK FOR THE LABEL!



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866.4.WESTEX

(866.493.7839)

INTERNATIONAL 001.773.523.7000



COMPANY PROFILE



THE COMPANY

Westex Inc., established in 1919, has over a half century of experience producing flame resistant fabrics. Westex continues to hold a dominant position as the world's largest producer of durable flame resistant cotton and cotton blended fabrics.

Westex has made a commitment to continual improvement of protective fabrics through innovative research and development. Our strong commitment to inventory coupled with over one million square feet of manufacturing & warehousing in three facilities and five state-of-the-art INDURA® production lines (in two separate locations) allows Westex to provide unparalleled worldwide support to the protective clothing marketplace.

Westex's INDURA® Ultra Soft® and INDURA® flame resistant fabrics are the premier brands in the industry and today, they are specified at thousands of end-user companies globally. Millions of garments made from the INDURA® Ultra Soft® and INDURA® fabric line are being worn today by workers in many industries including electrical maintenance, electric & gas utilities, oil, gas, petrochemical, chemical, military and ferrous metals industries.

Westex recognizes that in the event of an electric arc flash, flash fire, molten metal splash or other thermal exposure, the performance of the flame resistant (FR) fabric used to construct the garment is a critical factor in determining the level of protection the garment will afford the wearer. The FR fabric is also a main factor in determining the comfort, durability and the overall value equation of an FR protective clothing program. Over the past half century Westex has earned a reputation of building the most advanced systems, equipment and technology in the industry. Westex is committed to consistently producing the highest quality flame resistant cotton and cotton blend fabrics possible, providing excellent service & technical support and continued focus on innovative research & development to further enhance the safety, comfort and value of protective clothing programs.

This brochure will emphasize the characteristics of INDURA® Ultra Soft® and INDURA® brand fabrics in balancing the three crucial factors significant to the implementation of a protective clothing program: **Protection, Comfort and Value.**

Knowledgeable Westex representatives are readily available to assist with any questions you may have. Please call us toll free at (866) 4-WESTEX (866-493-7839) or visit www.westexinc.com.



Westex quality control inspection line, Chicago Plant.

COMPANY PROFILE



WESTEX INC.
COMPANY PROFILE

Established 1919

50+ Years Experience Producing
Flame Resistant Fabrics

Proprietary Technology

Custom-Engineered Equipment

Consistent Quality

Government Certified Laboratory

ISO 9001: 2000 Certified

Industry Leadership

Innovative Fabric Styles

Comprehensive Technical Support

Market Proven Performance

Commitment to Inventory

Over 1,000,000 sq. ft.
of Manufacturing & Warehousing

Five State-of-the-Art INDURA®
Production Lines



Chicago, IL U.S.A. Plant



Georgia U.S.A. Plant

INDURA® Ultra Soft®
AND INDURA® OVERVIEW

INDURA® Ultra Soft®
TECHNOLOGY

FLAME RESISTANT
CLOTHING BASICS

ELECTRIC ARC FLASH
PROTECTION

FLASH FIRE
PROTECTION

WHY SPECIFY
INDURA® Ultra Soft®?



INDURA® Ultra Soft® OVERVIEW

THE ADVANCED INDURA® Ultra Soft®

PRODUCT LINE OVERVIEW

Westex's advanced INDURA® Ultra Soft® line of flame resistant 88% cotton/12% high tenacity nylon fabrics, introduced in 1996, are guaranteed flame resistant for the life of the garment in either high temperature industrial or home washing procedures. The fabric is engineered to focus the excellent abrasion resistance of the nylon on the outer surface to enhance garment wear life, while the cotton fibers are focused towards the skin to optimize comfort. In addition, INDURA® Ultra Soft® fabrics are engineered to have an extremely soft feel to further enhance the superior comfort properties of cotton. INDURA® Ultra Soft® fabrics are fully flame resistant and the 12% nylon actually enhances the protective performance in some cases, such as an electric arc and flash fire exposures.

WEAR LIFE

INDURA® Ultra Soft® is expected to wear over 75% longer than 100% cotton fabrics in similar weights leading to an excellent value equation. Please note that additional wear-life may not be realized in extreme wear situations including but not limited to welding and metals environments.

END USE APPLICATIONS

Today, INDURA® Ultra Soft® brand flame resistant fabrics are specified by thousands of end-user companies in many industries around the world. With millions of garments in service worldwide, INDURA® Ultra Soft® has a strong reputation for providing an excellent balance of protection, comfort, and value. Licensed manufacturers use INDURA® Ultra Soft® to produce garments for electric arc flash protection (see pages 10-15) in electric utilities and electrical maintenance, for protection from flash fire (see pages 16-18) in the oil, gas, chemical and petrochemical industries and for protection from molten ferrous metal splash (see page 19) in steel mills & foundries. They are also used in the military, wildland firefighting and tactical clothing applications.

FABRICS STYLES & TYPICAL GARMENT APPLICATION

INDURA® Ultra Soft® fabrics are available in a wide variety of fabric styles, weights and colors. The tables below contain a list of Westex's current INDURA® Ultra Soft® styles. Please contact Westex for information on stocking colors.



88% cotton
12% high tenacity nylon

QUICK FACTS

- Since 1996
- Guaranteed flame resistance for the life of the garment
- Comfort of Cotton
- New softer feel for enhanced comfort
- Enhanced protection from electric arc and flash fire exposures
- Multi-purpose protection from electric arc flash, flash fire, molten ferrous metal, and welding exposures
- 75%+ extended garment wear life
- "Double-Shrunk" Technology
- Excellent value equation

INDURA® Ultra Soft® – WOVEN FABRICS

STYLE NO.	WEIGHT	WEAVE	TYPICAL GARMENT APPLICATIONS
301	7 oz (237g/m ²)	Twill	Shirts/Lightweight Coveralls
451	9 oz (305 g/m ²)	Twill	Pants/Jackets/Coveralls/Bib Overalls
331	5.5 oz (186 g/m ²)	Chambray Denim	Shirts
341	5.5 oz (186 g/m ²)	Twill	Shirts
881	8 oz (270 g/m ²)	Basketweave	Pants/Jackets/Coveralls
391	13 oz (440 g/m ²)	Denim	Blue Jeans/Jean Jackets
801	13 oz (440 g/m ²)	Sateen	Pants/Jackets/Bib Overalls/Coveralls
961	11 oz (372 g/m ²)	Duck	Pants/Jackets/Bib Overalls/Coveralls

INDURA® Ultra Soft® – KNIT & FLEECE FABRICS

STYLE NO.	WEIGHT	WEAVE	TYPICAL GARMENT APPLICATIONS
130	6 oz (203 g/m ²)	Interlock Knit	T-Shirts/Henley Shirts/Polo Shirts
131	6.5 oz (220 g/m ²)	Rib Knit	Cuffs/Collars/Balaclavas/Underwear
180	11 oz (372 g/m ²)	Fleece	Sweatshirts/Hoodies
181	10.5 oz (355 g/m ²)	Rib Knit	Cuffs/Collars/Balaclavas/Underwear

INDURA® OVERVIEW



THE ORIGINAL INDURA® 100% COTTON

PRODUCT LINE OVERVIEW

Westex's original INDURA® line of flame resistant 100% cotton fabrics, introduced in 1987, are guaranteed flame resistant for the life of the garment in either high temperature industrial or home washing procedures. In fact, the INDURA® brand name was derived from "industrial (wash) durability" due to the fact that INDURA® was the first flame resistant cotton fabric that was engineered to provide guaranteed flame resistance. Since the introduction of INDURA® in 1987 millions of garments have been installed in successful protective clothing programs worldwide.

WEAR LIFE

INDURA® 100% Cotton is expected to have a similar wear life as regular non-flame resistant cotton in like weights.

END USE APPLICATIONS

Licensed manufacturers use INDURA® to produce garments for protection from molten ferrous metal splash (see page 19) in steel mills & foundries, for protection from flash fire (see pages 16-18) in the oil, gas, chemical and petrochemical industries and for electric arc flash protection (see pages 10-15) in electric utilities and electrical maintenance. INDURA® continues to offer trusted protection and consistent performance and is still popular for use in contractor coveralls as well as jacket/pant applications in steel mills and foundries. The majority of electric utilities, oil, gas, petrochemical and chemical programs opt for the advanced INDURA® Ultra Soft® due to the gains in protection, comfort and long-term value (see page 4).

FABRICS STYLES & TYPICAL GARMENT APPLICATION

INDURA® fabrics are available in a wide variety of fabric styles, weights and colors. The tables below contain a list of Westex's current INDURA® styles. Please contact Westex for information on stocking colors.

INDURA® – WOVEN FABRICS				
STYLE NO.	WEIGHT	WEAVE	CONTENT	TYPICAL GARMENT APPLICATIONS
30	7 oz (237 g/m ²)	Twill	100% Cotton	Shirts
45	9 oz (305 g/m ²)	Twill	100% Cotton	Pants/Jackets/Coveralls
85	9 oz (305 g/m ²)	Sateen	100% Cotton	Pants/Jackets/Coveralls
306	12 oz (406 g/m ²)	Denim	100% Cotton	Blue Jeans/Jean Jackets
308	14 oz (474 g/m ²)	Denim	100% Cotton	Blue Jeans/Jean Jackets
315	12 oz (406 g/m ²)	Whipcord	100% Cotton	Jackets/Pants

INDURA® Ultra Soft® and INDURA® Laundry Care and Maintenance

INDURA® Ultra Soft® and INDURA® have been designed to withstand the most rigorous industrial laundering conditions anticipated for proper cleaning of work clothing. Westex guarantees the flame resistance of INDURA® Ultra Soft® and INDURA® fabrics for useful life of such garments when proper care procedures are employed. It is important to recognize that the thermal protective properties of any flame resistant fabric can be compromised by the presence of contaminants on the fabric from which the garment is made. Please contact Westex or visit www.westexinc.com for a detailed INDURA® Ultra Soft® and INDURA® Cleaning and Maintenance Guide.

INDURA® Ultra Soft® and INDURA® fabrics meet the requirements of:

- NFPA 70E
- NFPA 2112*
- ASTM F1506
- ASTM F1002
- EN 531
- CSA Z462
- NFPA 1977*
- OSHA 1910.269
- CGSB 155.20*
- ISO 11611*

*Select styles.



PROPRIETARY STATE-OF-THE-ART

Westex guarantees the flame resistance of INDURA® Ultra Soft® and INDURA® fabrics for the life of the garment. This guarantee has been demonstrated in laboratory testing and through the auditing of samples from the millions of garments in the protective clothing marketplace for over two decades. There are many “unseen” details that go into the production of durable flame resistant cotton and cotton blend fabrics. This starts with the production of the base material, dyeing, preparation, FR engineering process, internal laboratory testing, external laboratory testing and technical support all the way to the proven performance of the FR fabric in the market. Westex has spent decades perfecting the highly technical, proprietary flame resistant fabric technology to produce INDURA® Ultra Soft® and INDURA®, which are both market proven and trusted fabric brands. This high level of performance is achieved by Westex’s proprietary production process, which combines advanced custom engineered machinery with sophisticated computer equipment to conduct the “ammonia cure” system.

CONTROL FROM START TO FINISH

DEVELOP CUSTOM-ENGINEERED SPECIFICATIONS

Westex’s strict custom-engineered specifications for the construction of the base fabrics are designed to work well with the INDURA® FR engineering process and optimize wear performance.

SPIN FIBERS TO YARNS

INDURA® Ultra Soft® fabrics contain very specialized high tenacity nylon fibers that have excellent abrasion resistant properties. These fibers are intimately blended with cotton fibers and spun using ring-spinning technology to produce the highest strength fabric possible.

WEAVE FABRIC

INDURA® Ultra Soft® base fabrics are woven to focus the excellent abrasion resistance of the nylon on the face of the fabric to enhance garment wear life, while the cotton fibers are focused towards the skin to optimize comfort.

DYE FABRIC

INDURA® Ultra Soft® and INDURA® fabrics are dyed using the highest quality dyes available for cotton fabrics to assure optimal lightfast and colorfast performance on a consistent basis.

SPECIAL PREPARATION PROCESS

Westex employs advanced proprietary fabric preparation steps that specifically prepare the fabrics for the INDURA® process.

MULTI-STEP INDURA® TECHNOLOGY

The details of the INDURA® engineering process are proprietary but, in part, the INDURA® technology involves a special fabric preparation process, custom-engineered equipment, several additional steps in the multi-step FR engineering process, computer monitoring equipment and extensive laboratory testing. INDURA® Ultra Soft® fabrics incorporate patented finishing technology.



WESTEX INC. CUSTOM ENGINEERED

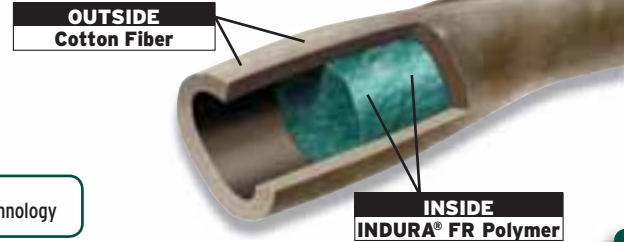
“Each year millions of garments made with INDURA® Ultra Soft® and INDURA®

INDURA® Ultra Soft® TECHNOLOGY



In the INDURA® engineering process, a high quality phosphonium salt precondensate flame retardant chemical is applied and polymerized with gaseous ammonia forming a long-chain flame retardant polymer impregnated into the core of each cotton fiber. This flame retardant polymer acts as a catalyst promoting the charring of the fabric. This accelerated charring prohibits the support of combustion by reducing the fuel source. The flame retardant chemical acts in the solid phase to produce this char. Please contact Westex or visit www.westexinc.com for a detailed INDURA® Ultra Soft® & INDURA® cleaning and maintenance guide.

The INDURA® engineering process forms a long chain flame retardant polymer impregnated into the core of each cotton fiber.



 = Westex Inc. Proprietary Technology

<p>MULTI-STEP FABRIC SOFTENING</p> <p>Westex's proprietary multi-step fabric softening process involves a unique balance of chemical and mechanical procedures. The advanced INDURA® Ultra Soft® technology provides dramatically improved softness & comfort.</p>	<p>"DOUBLE-SHRUNK" TECHNOLOGY</p> <p>Westex's proprietary "Double-Shrunk" technology is far superior to any other process utilized today. This advanced "Double-Shrunk" technology is engineered into every yard of INDURA® Ultra Soft® and INDURA® fabric.</p>	<p>INTERNAL TESTING & DOCUMENTATION</p> <p>Westex has a government certified laboratory with a full staff of experienced technicians who administer a full battery of tests consistently throughout each production lot. The test reports, along with retained samples from the lot, are filed in Westex's laboratory and available for inspection.</p>	<p>EXTERNAL LABORATORY TESTING</p> <p>Westex has committed a large annual budget on an ongoing basis, dedicated to independent testing to fully evaluate electric arc flash performance and flash fire performance of INDURA® Ultra Soft® and INDURA®.</p>	<p>SHIP FABRIC TO LICENSED CUSTOMER</p> <p>Westex requires all customers to sign a Sales & Trademark License Agreement which requires, in part, for the garment manufacturer to sew an INDURA® Ultra Soft® or INDURA® label into the garment to allow the end-user to easily identify the brand of fabric that was used to produce the garment.</p>	<p>TECHNICAL SUPPORT AFTER THE SALE</p> <p>Westex Inc. is fully committed to the protective clothing marketplace and we stand behind every yard of INDURA® Ultra Soft® and INDURA® sold. We offer comprehensive technical assistance to our customers, distributors and end-users both before and after the sale.</p>
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CONTROL FROM START TO FINISH

INDURA® PRODUCTION EQUIPMENT



brand fabrics are being specified and worn by workers around the world."



FLAME RESISTANT (FR) CLOTHING BASICS

FLAME RESISTANCE DEFINED

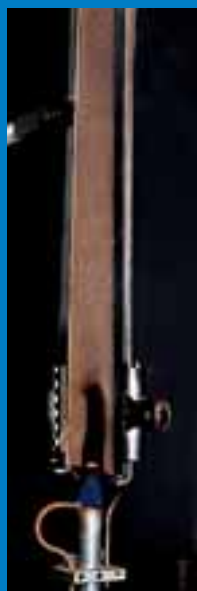
Flame resistance is the characteristic of a fabric that causes it to self-extinguish when the source of ignition is removed. The most commonly used test method is ASTM D6413* *Standard Test Method for Flame Resistance of Textiles* (Vertical Test). The vertical flame test is a test method with no pass/fail requirements. Industry established standards range from 4" to 6" (100 mm to 150 mm) maximum char lengths. It is very important for flame resistant fabrics to self-extinguish. Fabrics that self-extinguish after the source of ignition is removed can dramatically reduce body burn percentage and increase the chance for survival. However, char length measurements by themselves have no correlation to the protection afforded by a flame resistant fabric. True protection to thermal events is better measured by testing the thermal resistance of fabrics against exposures to simulated hazards, such as the flash fire manikin test (see pages 16-18) or the arc thermal performance test (see pages 10-15).

“Although passing the vertical flammability requirements is an essential criterion for protective clothing fabrics, it is only one of a battery of tests that fully describes the protective characteristics.”

ASTM D6413



Vertical flame test on non-flame resistant fabric.



Vertical flame test on INDURA® Ultra Soft® fabric.

*Please review ASTM D6413 for a complete description of test procedures.

PRIMARY VS. SECONDARY PROTECTIVE CLOTHING

EXAMPLES OF PRIMARY PROTECTIVE CLOTHING



Primary Protective Clothing is defined as clothing that is designed to be worn for work activities where significant exposure to molten substance splash, radiant heat, and flame is likely to occur. An example of primary protective clothing is firefighter turnout gear and aluminized suits. INDURA® Ultra Soft® and INDURA® are **not** designed for use as primary protective clothing.

EXAMPLES OF SECONDARY PROTECTIVE CLOTHING



Secondary Protective Clothing is designed for continuous wear in designated locations where intermittent exposure to molten substance splash, radiant heat, and flame is possible (as defined by ASTM Standard F1002). INDURA® Ultra Soft® and INDURA® flame resistant fabrics are designed for use as **secondary protective clothing**.

FLAME RESISTANT (FR) CLOTHING BASICS



THE NEED FOR FR CLOTHING

Everyday, workers in the electrical maintenance, utility, oil, gas, petrochemical and steel industries work in environments that may expose them to hazards that could cause severe or fatal burn injuries. In the event of a momentary electric arc flash, flash fire or molten metal splash exposure, everyday non-flame resistant work clothes can ignite and will continue to burn even after the source of ignition has been removed. Untreated natural fabrics will continue to burn until the fabric is totally consumed and non-flame resistant synthetic fabrics will burn with melting and dripping causing severe contact burns to the skin.

Government reports note that the majority of severe and fatal burn injuries are due to the individual's clothing igniting and continuing to burn, not by the exposure itself.

The use of flame resistant clothing will provide thermal protection at the exposure area. The level of protection typically rests in the fabric weight and composition. After the source of the ignition is removed, flame resistant garments will self-extinguish, limiting the body burn percentage.

KEYS TO EVALUATING AND COMPARING FR FABRICS

The first step is to search out and evaluate information that was generated using the following three criteria. By doing this you can evaluate different types of FR fabrics on a level playing field and ensure that you're comparing "apples to apples."

#1) Identify your potential hazard. Exposures such as electric arc flash and flash fire are unique hazards with vastly different characteristics and the test results do not directly correlate to one another. The results from flash fire testing should not be substituted for electric arc flash testing when evaluating products. Be wary of fiber and/or fabric producers that attempt to draw comparisons between these two hazards.

#2) Identify industry consensus standards for the exposure. Industry standards have been developed for electric arc flash and flash fire testing. For electric arc flash, ASTM has developed F1959, which produces an ATPV (Arc Thermal Performance Value). NFPA 2112 was created for employees that work in environments where a potential flash fire hazard exists.

#3) Make sure the testing is conducted at independent laboratories. This will help ensure that unbiased and scientifically valid data is being produced. While it is often helpful and interesting to witness testing conducted by a company that has a vested interest in the FR business, there is no substitute for information generated at an independent laboratory.

NON-FLAME RESISTANT CLOTHING VS. INDURA® Ultra Soft® 10 SECONDS AFTER A 3 SECOND FLASH FIRE EXPOSURE.



NON-FLAME RESISTANT CLOTHING



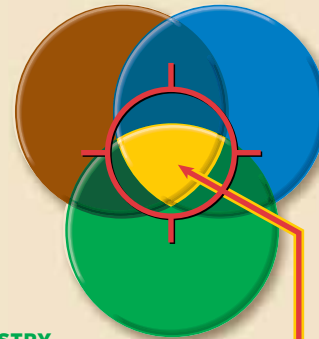
INDURA® Ultra Soft®

POTENTIAL HAZARD EXAMPLES:

- Electric Arc Flash
- Flash Fire
- Molten Metal Splash

INDEPENDENT LABORATORY EXAMPLES:

- Kinectrics (Electric Arc)
- University of Alberta (Flash Fire)



INDUSTRY CONSENSUS STANDARD EXAMPLES:

- ASTM F1959, NFPA 70E (Electric Arc)
- NFPA 2112, ASTM, F1930 (Flash Fire)

RELEVANT & NON-BIASED INFORMATION TO COMPARE PROTECTIVE PERFORMANCE

SPECIFY FR FABRICS BY BRAND NAME

It is important to recognize that industry consensus standards only provide minimum performance criteria for flame resistant fabrics. While these standards typically provide a fair basis for comparing protective properties, they do not adequately address other important performance characteristics that are critical to achieve long-term success in an FR clothing program. Many unproven and/or generic FR fabrics promote the fact that they "meet the standards"; however they often experience quality problems including, but not limited to, inconsistent FR durability to laundering, poor shrinkage control, stiff feel, excessive color fading and UV degradation. Investigating a fabric's performance in the real-world and evaluating the experience and expertise of the company producing the product has become a necessary step in a global marketplace. Like many products in the safety category, the majority of companies specify FR fabrics by brand name to ensure compliance and a long-term successful FR program.



ELECTRIC ARC FLASH PROTECTION

“ARC FLASH” DEFINED; NFPA 70E ANNEX K-3

“When an electric current passes through air between ungrounded conductors or between ungrounded conductors and grounded conductors, the temperatures can reach 35,000°F. Exposure to these extreme temperatures both burns the skin directly and causes ignition of clothing, which adds to the burn injury. The majority of hospital admissions due to electrical accidents are from the arc-flash burns, not from shock. Each year more than 2,000 people are admitted to burn centers with severe arc-flash burns. Arc flashes can and do kill at distances of 10 ft.”



ELECTRIC ARC FLASH PROTECTION



ARC FLASH EXPOSURES

An electric arc flash is a dangerous release of energy created by an electrical fault that contains thermal energy, pressure waves, acoustical energy and debris. The intense energy and very short duration of an electric arc flash represents a very unique exposure. The NFPA 70E standard says that the temperature of an electric arc flash can reach 35,000°F and states:

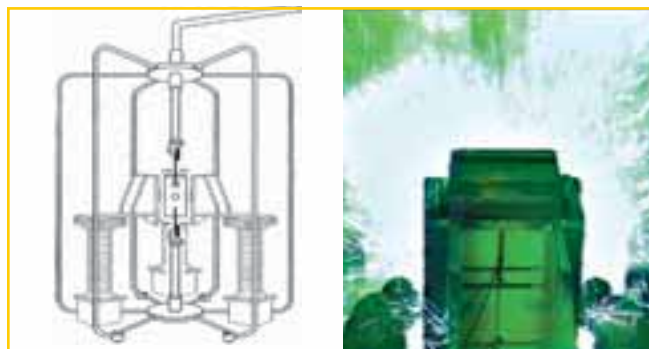
“Exposure to these extreme temperatures both burns the skin directly and causes ignition of clothing, which adds to the burn injury. The majority of hospital admissions due to electrical accidents are from arc-flash burns, not from shocks. Each year more than 2,000 people are admitted to burn centers with severe arc-flash burns. Arc-flashes can and do kill at distances of 10ft.”

The thermal energy released in an electric arc flash is expressed in calories per centimeter squared (cal/cm²). A typical electric arc flash can release energy levels from 4 cal/cm² to 30 cal/cm² and exposures between 30 cal/cm² and 60 cal/cm² are not uncommon. **Everyday work clothes made from regular cotton or poly/cotton fabrics can be readily ignited at exposure levels as low as 4-5 cal/cm² and once ignited will continue to burn adding to the extent of injury sustained from the arc alone.**

Many people consider non-flame resistant 100% cotton as an acceptable option for protection from an electric arc flash because there is not a synthetic component that can melt, drip and adhere to the skin. However non-flame resistant 100% cotton can ignite just as easily as poly/cotton fabric in an electric arc flash. While 100% cotton will not melt and drip, it burns hotter than poly/cotton fabrics and typically is heavier allowing it to burn longer and making it harder to extinguish. Go to www.westexinc.com to see videos of both 100% cotton and poly/cotton in Live Arc Flash testing.

ASTM 1506

ASTM F1506 (*Standard Performance Specification for Textile Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Arc and Related Thermal Hazards*) was developed to give minimum performance specifications for protective clothing. The major requirement of this specification was that the fabric used in garments is flame resistant and has been tested to ASTM F1959 to receive an Arc Rating or ATPV (Arc Thermal Performance Value). ASTM F1959; *Standard Test Method for Determining the Arc Rating of Materials for Clothing* exposes panels of flame resistant fabrics to electric arc flashes of varying energies. Both the heat transmission through the fabric and the energy released by the electric arc is measured. The data is evaluated against the Stoll Curve (or second degree burn curve) through logistic regression techniques to determine the probability of burn injury. The arc rating of the fabric or fabric system is then determined. The table on page 14 highlights single-layer ATPV results of INDURA® Ultra Soft® and INDURA® fabrics. The table on page 15 highlights multi-layer ATPV results.



ASTM F1959 standard test method for determining the Arc Rating of Materials for Clothing

Actual test performed according to ASTM F1959 test method

NFPA 70E General Industry Page 12



ELECTRIC UTILITIES OSHA 1910.269 & NESC Page 13





ELECTRIC ARC FLASH PROTECTION

NFPA 70E

The National Fire Protection Association (NFPA) published the latest edition of the NFPA 70E Standard (*Standard for Electrical Safety Requirements for Employee Workplaces*) in 2004 and the next edition is scheduled to be published in 2009. NFPA 70E states, "employees shall wear FR clothing wherever there is a possible exposure to an electric arc flash." This requires employees working on or near energized parts and equipment to wear flame resistant clothing that meets the requirements of ASTM F-1506 and is appropriate to the potential energy of the hazard. Employers are required to perform a flash hazard analysis to determine the potential energy of the hazard and the flash protection boundary. A flash hazard analysis can be performed by calculating the potential incident energy of a piece of equipment or using Hazard/Risk Category Classifications. Protective clothing must meet the calculated incident energy or the corresponding Hazard Risk Category that has an arc rating of at least the value listed in the "Protective Clothing Characteristics" section of the standard (See table below).

The vast majority of major companies in the U.S. have some employees that work on or near energized parts and equipment. OSHA considers the NFPA 70E standard a "recognized industry practice."

SIMPLIFY COMPLIANCE TO NFPA 70E

Many companies have decided to simplify compliance to NFPA 70E by implementing everyday uniform programs using INDURA® Ultra Soft® garments that meet the requirements of NFPA 70E Hazard Risk Categories (HRC) 0, 1 and 2 as a single-layer (chart listed below). This can alleviate employer concerns about leaving the difficult decision of determining whether a specific routine electrical task is HRC 0, 1 or 2 in the hands of the employee. Please refer to NFPA 70E Annex H Simplified; Two Category, Flame Resistant (FR) Clothing Approach. To supplement everyday uniforms, arc flash suits and hoods in double-layer INDURA® Ultra Soft® combinations are available for higher energy HRC 3 & 4 level tasks.



NFPA 70E states, "employees shall wear FR clothing wherever there is a possible exposure to an electric arc flash."

LIVE ARC FLASH TESTING

Westex conducted a series of tests to create "real-life" arc flashes using common 480 volt equipment to help companies better understand the magnitude of the arc flash hazards that exist in nearly every facility in the world and highlight the importance of complying with the NFPA 70E standard. This video clearly demonstrates that if you work on or near energized parts and equipment, wearing market proven flame resistant clothing and other PPE can and does dramatically reduce injury and save lives. Please go to www.westexinc.com to view the video in it's entirety.

STANDARD FOR NFPA 70E SAFETY REQUIREMENTS FOR EMPLOYEE WORKPLACES; 2004 EDITION (Table 130.7 (C) (III) Protective Clothing Characteristics [abbreviated])

HAZARD RISK CATEGORY	CLOTHING DESCRIPTION (Typical Number of Clothing Layers in Parentheses)	REQ. MIN. ARC RATING (ATPV or Ebt) (cal/cm ²)	NFPA 70E; ANNEX H SIMPLIFIED 2-CATEGORY FR CLOTHING SYSTEM
			"Everyday Work Clothing" Arc Rating ≥ 8
0	Non-melting, flammable materials (1)	N/A	INDURA® Ultra Soft® Single-Layer Style 301 Shirt/Lt. Wt. Coverall Style 451 Pant/Coverall Style 130 T-Shirt/Henley/Polo Knit Meet HRC's 0, 1, & 2.
1	FR Shirt and FR Pants or FR Coverall (1)	4	
2	Cotton Underwear Plus FR Shirt and FR Pants (1 or 2)	8	
			Electrical "Switching" Clothing Arc Rating ≥ 40
3	Cotton Underwear Plus FR Shirt and FR Pants Plus FR Coverall, or Cotton Underwear Plus two FR Coveralls (2 or 3)	25	INDURA® Ultra Soft® Style 801, 13 oz. (440 g/m ²) <u>Over</u> Style 341, 5.5 oz. (186 g/m ²) Meet HRC's 3 & 4.
4	Cotton Underwear Plus FR Shirt and FR Pants Plus Multilayer Flash Suit (3 or more)	40	

ELECTRIC ARC FLASH PROTECTION



Con Edison of New York has specified INDURA® Ultra Soft® by brand as the fabric of choice for their electrical workers.

ELECTRIC UTILITIES

OSHA

OSHA (Occupational Safety & Health Administration) in the United States has confirmed that garments which meet the requirements of ASTM F1506 are in compliance with OSHA 29 CFR 1910.269 Electrical Power Generation, Transmission and Distribution, with regard to garments not contributing to burn severity. ASTM F1506 is a minimum industry standard.

By utilizing flame resistant garments utilities can comply with OSHA requirements and avoid potentially more serious burn injuries from garment ignition.

NATIONAL ELECTRICAL SAFETY CODE (NESC)

The National Electrical Safety Code (NESC) covers workers during the installation, operation or maintenance of electric supply and communication lines and associated equipment. The 2007 version now contains rules that cover the use of flame resistant clothing.

Effective on January 1, 2009, employers must perform a hazard risk analysis for employees that work on or near energized parts or equipment. If the assessment determines that energies available are over 2 cal/cm², then protective clothing (or clothing systems) shall be worn that has an arc rating equal to or greater than the anticipated level of energy.

THE CON EDISON STORY

Con Edison of New York recently spent multiple years and several million dollars doing testing to examine the protective performance of a wide variety of safety equipment including protective clothing and equipment. Con Edison's testing was revolutionary in that they performed testing outside of laboratory conditions and were able to simulate real world underground vault and overhead scenarios. Con Edison opened the doors of the testing facility and information generated for other electric utility companies, energy companies and electrical contractors to learn and help become educated on the dangers of an electric arc flash and how to better protect their employees.

This unprecedented test series was a major advancement forward in starting to understand the severe nature of an electric arc flash and all of the additional elements not seen in laboratory testing including underground confined exposures, overhead exposures and molten metal exposure from equipment.



Con Edison Live Overhead Arc Flash Testing Manikin in a Bucket

Visit westexinc.com for additional Con Edison videos.



ELECTRIC ARC FLASH PROTECTION



**NFPA 70E
HRC 2 COMPLIANT**

SINGLE-LAYER ATPV FABRIC DATA

INDURA® Ultra Soft® 88% Cotton 12% High Tenacity Nylon Woven Fabrics				
STYLE	WEIGHT	WEAVE	ATPV (cal/cm ²)	NFPA 70E HAZARD RISK CATEGORY (HRC)
301 Shirt/ Lt. Wt. Coverall Twill	7oz (237 g/m ²)	Twill	8.7	2
451 Pant/Coverall Twill	9 oz (305 g/m ²)	Twill	12.4	2
331 Chambray Denim Shirting	5.5 oz (186 g/m ²)	Twill	6.0	1
341 Lightweight Shirting Twill	5.5 oz (186 g/m ²)	Twill	6.1	1
881 Basketweave	8 oz (270 g/m ²)	Basketweave	9.8	2
391 Denim	13 oz (440 g/m ²)	Denim Twill	19.5	2
801 Heavyweight Sateen	13 oz (440 g/m ²)	Sateen	21.0	2
961 Duck	11 oz (372 g/m ²)	Duck	12.7	2

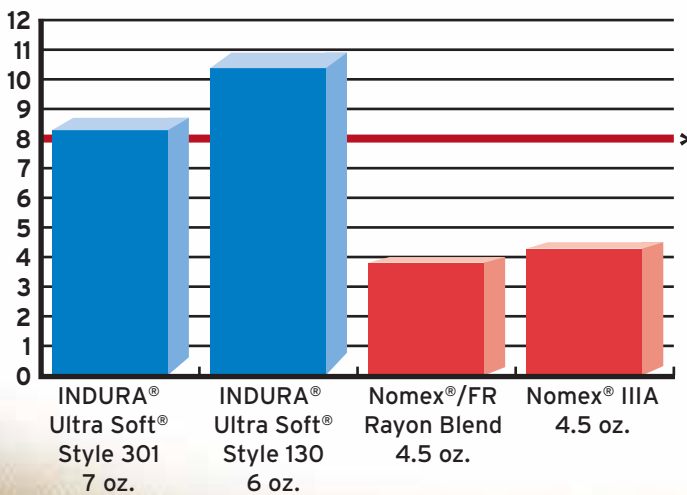
INDURA® Ultra Soft® 88% Cotton 12% High Tenacity Nylon Knit & Fleece Fabrics				
STYLE	WEIGHT	WEAVE	ATPV (cal/cm ²)	NFPA 70E HAZARD RISK CATEGORY (HRC)
130 Interlock Knit	6 oz (203 g/m ²)	Interlock Knit	10.9	2
131* Rib Knit	6.5 oz (220 g/m ²)	Rib Knit	12.1	2
180 Fleece	11 oz (372 g/m ²)	Fleece	21.8 (Ebt)	2
181* Rib Knit	10.5 oz (355 g/m ²)	Rib Knit	24.7	2

* Content = 86% cotton 12% high tenacity nylon 2% spandex

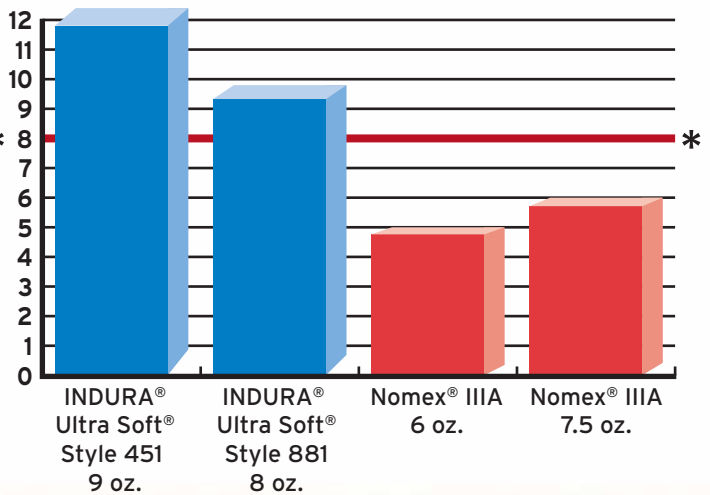
INDURA® 100% Cotton Wovens				
STYLE	WEIGHT	WEAVE	ATPV (cal/cm ²)	NFPA 70E HAZARD RISK CATEGORY (HRC)
30 Shirting Twill	7 oz (237 g/m ²)	Twill	7.7	1
45 Twill	9 oz (305 g/m ²)	Twill	10.8	2
85 Sateen	9 oz (305 g/m ²)	Sateen	11.5	2
306 Denim	12 oz (406 g/m ²)	Denim Twill	14.4	2
308 Denim	14 oz (474 g/m ²)	Denim Twill	18.3	2
315 USS Whipcord	12 oz (406 g/m ²)	Whipcord	12.9	2

All ATPV results based on independent tests conducted at Kinectrics per ASTM F1959

ATPV SHIRT/LIGHTWEIGHT COVERALL FABRICS



ATPV PANT/COVERALL FABRICS



*Minimum of 8 for HRC 0, 1 & 2.

ELECTRIC ARC FLASH PROTECTION



WESTEX INC.
COMPANY PROFILE

INDURA® Ultra Soft®
AND INDURA® OVERVIEW

INDURA® Ultra Soft®
TECHNOLOGY

FLAME RESISTANT
CLOTHING BASICS

ELECTRIC ARC FLASH
PROTECTION

FLASH FIRE
PROTECTION

WHY SPECIFY
INDURA® Ultra Soft®?

MULTI-LAYER ATPV FABRIC DATA

In addition to testing single layer fabrics for arc ratings, Westex has tested over 100 combinations of INDURA® Ultra Soft® fabrics that could be used in layers. Layering could be used for cold weather comfort with multiple shirts, sweatshirts or insulated outerwear. Layering can also be effective in protecting to higher incident energies, such as NFPA 70E Hazard Risk Categories 3 & 4, that cannot be protected against with single layer garments.

Following are some common combinations. All 100+ combinations can be found at www.westexinc.com.

INDURA® Ultra Soft® Multi-Layer Shirt Combinations		
OUTER LAYER	UNDER LAYER	ATPV
301 7oz Shirt/Lt Wgt Coverall Twill	130 6oz Knit	28.7
341 5.5oz Light Weight Shirt	130 6oz Knit	23.5
130 6oz Knit	130 6oz Knit	26.9
180 11oz Fleece	301 7oz Shirt Twill	45.2
180 11oz Fleece	341 5.5oz Light Weight Shirt	38.9 (Ebt)
180 11oz Fleece	130 6oz Knit	38.8



INDURA® Ultra Soft® Outerwear Combinations		
SHELL	LINER	ATPV
301 7oz Shirt/Lt Wgt Coverall Twill	751 3M Thinsulate™ FR 120 g	37.2
	752 3M Thinsulate™ FR 150 g	37.6
	753 3M Thinsulate™ FR 200 g	44.1
	710 Moda Quilt® 10oz	35.8
	709 Moda Quilt® 12oz	37.2
451 9oz Pant/Jacket/Coverall Twill	751 3M Thinsulate™ FR 120 g	41.0
	752 3M Thinsulate™ FR 150 g	44.6
	753 3M Thinsulate™ FR 200 g	48.0
	710 Moda Quilt® 10oz	40.6
	709 Moda Quilt® 12oz	41.8
961 11oz Duck	751 3M Thinsulate™ FR 120 g	46.5
	752 3M Thinsulate™ FR 150 g	47.5
	753 3M Thinsulate™ FR 200 g	50.7
	710 Moda Quilt® 10oz	47.0
	709 Moda Quilt® 12oz	49.5



INDURA® Ultra Soft® Coverall Layering Combinations		
OUTER LAYER	UNDER LAYER	ATPV
301 7oz Shirt/Lt Wgt Coverall Twill	301 7oz Shirt Twill Shirt	27.2
	341 5.5oz Light Weight Shirt	26.7
	451 9oz Twill Pant	31.6
451 9oz Pant/Jacket/Coverall Twill	301 7oz Twill Shirt	36.2
	341 5.5oz Light Weight Shirt	33.8
	451 9oz Twill Pant	38.7
801 13oz Heavy Weight Sateen	301 7oz Twill Shirt	51.5
	341 5.5oz Light Weight Shirt	51.1
	451 9oz Twill Pant	51.3



**NFPA 70E
HRC 4 COMPLIANT**

INDURA® Ultra Soft® Arc Flash Suits		
OUTER LAYER	UNDER LAYER	ATPV
801 13oz Heavy Weight Sateen	341 5.5oz Light Weight Shirt	51.1
	301 7oz Twill Shirt	51.5
	451 9oz Twill Pant	51.3



FLASH FIRE PROTECTION

FLASH FIRE DEFINED; NFPA AND CGSB

"A rapidly moving flame front which can be a combustion explosion. Flash fire may occur in an environment where fuel and air become mixed in adequate concentrations to combust...flash fire has a heat flux of approximately 84kW/m² for relatively short periods of time, typically less than 3 seconds."



PROTECTION FROM FLASH FIRE EXPOSURES

In the oil, gas, chemical and petrochemical industries the threat of flash fire exposures has necessitated the use of flame resistant clothing. Flame resistant clothing will minimize burn injury and provide the worker a few seconds escape time. Non-flame resistant clothing can ignite in a flash fire exposure providing an additional fuel source dramatically increasing the burn injury percentage and severity well beyond that of the initial exposure. INDURA® Ultra Soft®, INDURA® and Nomex will all provide far more protection than non-flame resistant garments.

To compare the protective capabilities of INDURA® Ultra Soft® and INDURA® in relation to Nomex IIIA, thermal instrumented manikin tests were conducted at The University of Alberta.

The University of Alberta has one of the very few completely independent flash fire manikin laboratories in the world. It has been in service since 1989, and has conducted thousands of tests for hundreds of clients. A manikin is exposed to a flash fire created by propane burners, and the resultant heat rise is measured by 110 thermocouples. Heat fluxes are precisely controlled to applicable standards and a computer collects the data and, by comparison to the Stoll curve, is able to predict the extent, severity and location of 2nd and 3rd degree body burn.

This testing reported here is, to the best of our knowledge, the largest and most comprehensive independent series ever conducted and published. All aspects of the protocol were strictly controlled to ensure maximum reliability and repeatability of results. All coveralls were commercially available, produced by a major manufacturer and sourced off-the-shelf in the same size and style. All were identically laundered and conditioned to full applicable standards prior to testing. All testing was conducted to the ASTM F1930 Standard Test Method, and all data points reflect the average of at least three replicates or more. The computer generated body burn results highlighted on the next page are individual determinations of NFPA 2112 testing and are representative of the average. This three second exposure data along with a complete burn curve are included on page 18.

The comparative weights offered in the marketplace for shirts and pants constructed with INDURA® Ultra Soft® and INDURA® are 7 oz/yd² (237 g/m²) and 9 oz/yd² (305 g/m²) compared to 4½ oz/yd² (153 g/m²) and 6 oz/yd² (203 g/m²) Nomex IIIA fabric respectively. Therefore, **the manikin tests were conducted segregating categories of "Shirting" and "Pant/Coverall" weights to accurately represent the garments that are commercially available.**

FLASH FIRE PROTECTION



WESTEX INC. COMPANY PROFILE
 AND INDURA® Ultra Soft® OVERVIEW
 INDURA® Ultra Soft® TECHNOLOGY
 FLAME/RESISTANT CLOTHING BASICS
 ELECTRIC ARC FLASH PROTECTION
 FLASH FIRE PROTECTION
 WHY SPECIFY INDURA® Ultra Soft®?



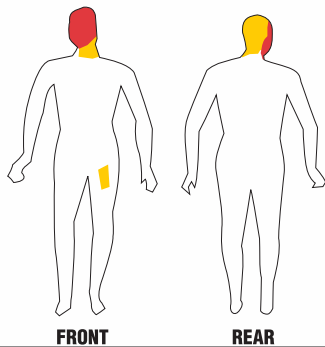
COMPARING FLASH FIRE PERFORMANCE

What is Relevant for Secondary Protective Clothing?

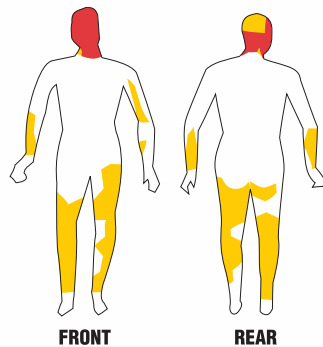
- NFPA 2112 Test Exposure is set at 3 Seconds.
- Secondary Protective Clothing is Designed to Provide the Worker "A Few Seconds Escape Time".
- CGSB and NFPA define a Flash Fire as "Typically 3 Seconds or Less".
- NFPA 2112 sets failure above 50% Total Body Burn.

Pant/Coverall Weight Comparison

INDURA® Ultra Soft®



Nomex® IIIA



THE UNIVERSITY OF ALBERTA
 Protective Clothing and
 Equipment Research Facility
 Fire Protective Clothing Evaluation System
 5-15-2007 451 INDURA® Ultra Soft®
 9 oz

THE UNIVERSITY OF ALBERTA
 Protective Clothing and
 Equipment Research Facility
 Fire Protective Clothing Evaluation System
 4-24-2007 Nomex® IIIA
 6 oz

Test Type	Flash Fire Simulation
Exposure Time	3.06 sec.
Measurement Time	60.0 sec.
◆ 2nd Degree Burn	5.15%
◆ 3rd Degree Burn	4.00%
TOTAL BURN	9.15%
BURN NUMBER	00964

Test Type	Flash Fire Simulation
Exposure Time	3.06 sec.
Measurement Time	60.0 sec.
◆ 2nd Degree Burn	28.65%
◆ 3rd Degree Burn	6.80%
TOTAL BURN	35.45%
BURN NUMBER	00505

Note: 88% is the maximum possible since the hands and feet are excluded. All figures include 7% for the head.



INDURA® Ultra Soft® and Nomex® IIIA garments before 3 second flash fire exposure.



INDURA® Ultra Soft® and Nomex® IIIA garments after 3 second flash fire exposure.



Close-up views of INDURA® Ultra Soft® and Nomex® IIIA garments after 3 second flash fire exposure.

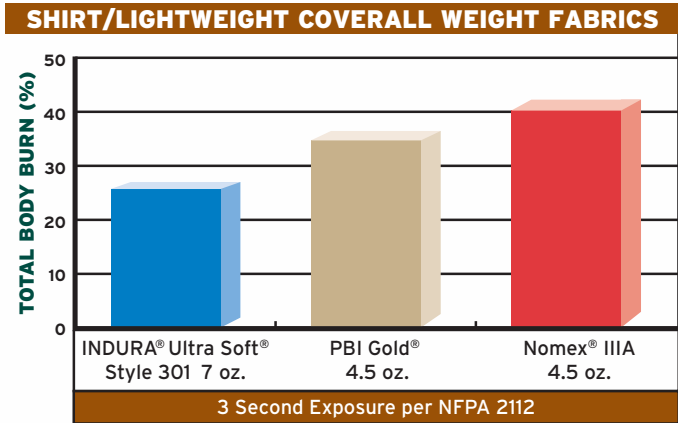
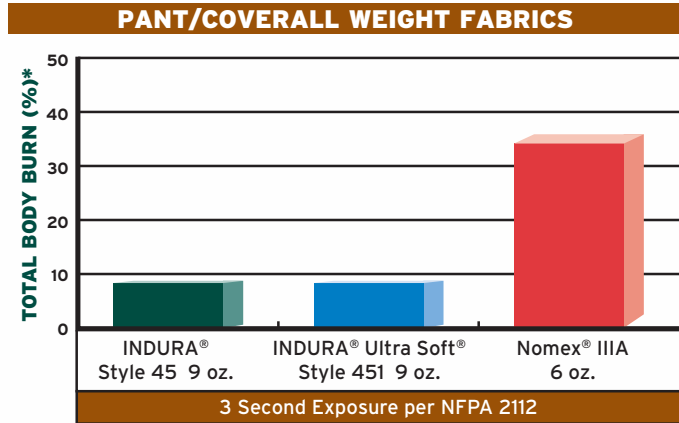


FLASH FIRE PROTECTION

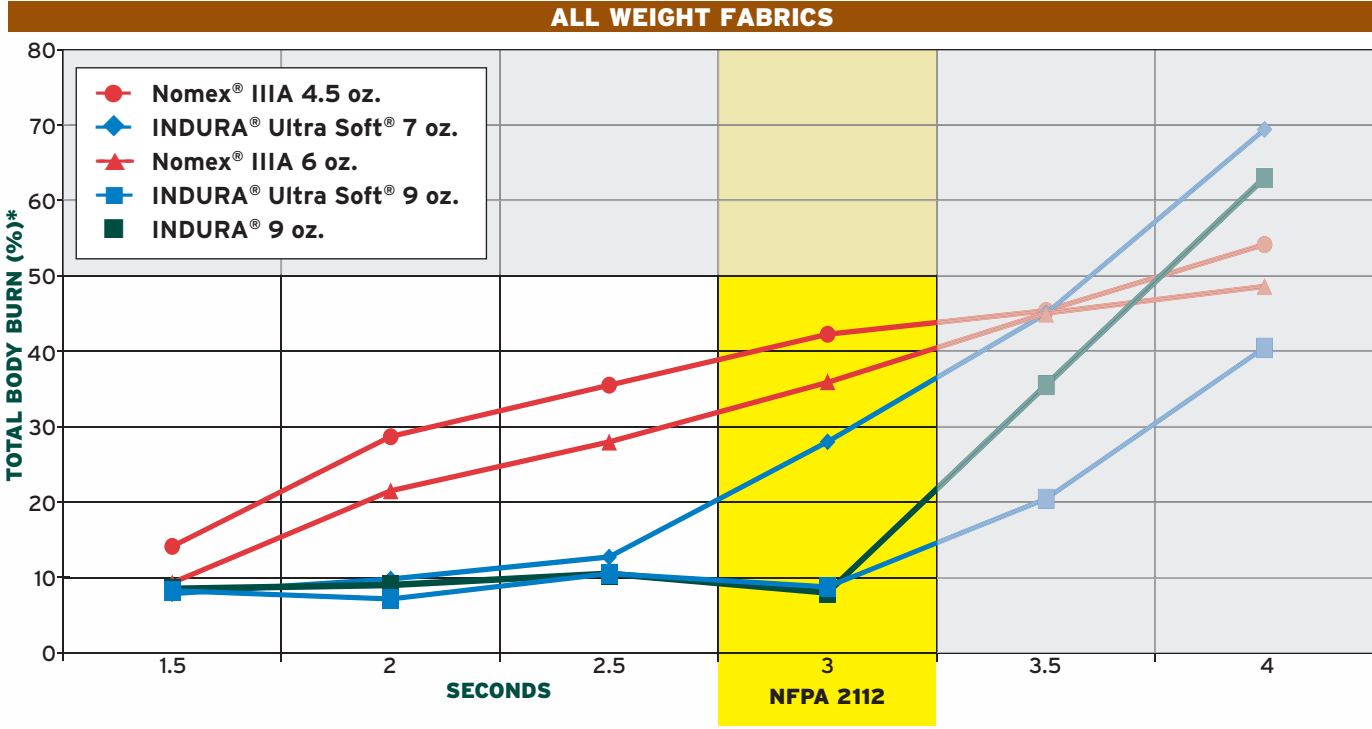
PROTECTION FROM FLASH FIRE EXPOSURE: CHART DATA

LABORATORY TESTING PROTOCOL

- Independent University Laboratory Testing
- Adherence to ASTM F1930 Standard Test Method
- Identically Sized and Styled 42 Regular Coveralls
- All Coveralls Tested over 100% Cotton T-Shirts and Briefs



*Note: 88% is the maximum possible since the hands and feet are excluded. All figures include 7% for the head.



*Note: 88% is the maximum possible since the hands and feet are excluded. All figures include 7% for the head.

Although 3 seconds has been established as the time frame to analyze the performance of secondary protective clothing, additional exposure times in the range of 1.5 to 4 seconds were examined to more completely profile fabric protective performance. The charts are highlighted up to 3 seconds and below 50% body burn in accordance with NFPA and CGSB standards and definitions. Within these parameters, **INDURA® Ultra Soft® has a protective advantage over Nomex® IIIA throughout the entire range of the burn curve.** The issue of relevance in comparing secondary protective clothing fabrics above these levels should be carefully considered. If your exposure potential is 4 to 5 seconds or produces body burns near to or over 50%, Westex highly recommends protective clothing systems of multiple flame resistant layers or primary protective clothing such as turnout gear.

MOLTEN FERROUS METAL SPLASH PROTECTION



PROTECTION FROM FERROUS METAL & WELDING EXPOSURES

For over 40 years, heavyweight flame resistant cotton fabrics have been utilized by the steel industry for secondary protective clothing for workers doing routine tasks in steel processing. Secondary protective clothing is defined as "protective clothing for continuous wear during work activities in designated locations in which intermittent exposure to molten substance splash, radiant heat and flame sources is possible".

The essence of protection in this category rests in two critical factors:

1. The fabric must be flame resistant so that it will not ignite and continue to burn when the heat source is removed.
2. In the specific instance of exposure to molten ferrous metal, the fabric must demonstrate the ability to shed molten metal from its surface without sticking.

INDURA® Ultra Soft® and INDURA® fabrics have the unique ability to shed molten ferrous metals. While some charring may occur, the flame resistant properties of INDURA® Ultra Soft® and INDURA® will preclude ignition and continued combustion. Non-flame resistant cotton may shed ferrous metals and welding, however the potential for ignition and continued combustion is very high, thus increasing the injury potential.

When evaluating fabrics for molten metal applications, it is imperative that fabrics be evaluated on site in the form of testing and wear trials. Because different work sites handle different alloys, a trial with the specific metal must be made. Additionally, it should be recognized that worker protection from second degree burn in ferrous metal processing is highly dependent on the quantity of metal exposed to and the number of layers and weight of fabric worn; therefore different fabric weights should be evaluated. A minimum weight of 9 oz/yd² (305 g/m²) fabrics is typically recommended for light welding/cutting operations and 12 oz/yd² (407 g/m²) or heavier fabrics for most other foundry and molten metal applications. In general, heavier weights will provide better insulation from heat transfer but the end-user must determine the most appropriate weight for their application.

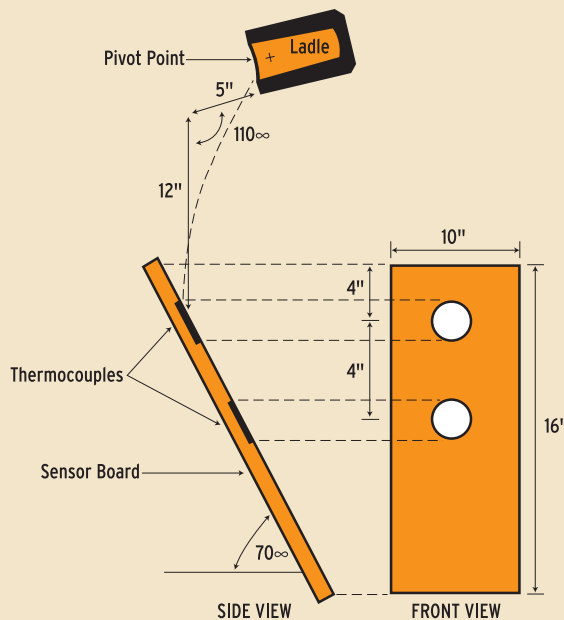
Nomex® fabrics are inappropriate for molten metal splash exposures since molten metals adhere to aramid fabrics.

Please note that INDURA® Ultra Soft® and INDURA® are not intended for use near molten aluminum.

Please contact Westex for information about Vinex® flame and aluminum splash resistant fabrics.



SCHEMATIC OF TEST APPARATUS FOR ASTM F955



ASTM F955 covers the standard test method to determine fabric performance using the test apparatus illustrated above.



THE FABRIC BRAND MATTERS

WHEN SAFETY IS INVOLVED, THE FABRIC BRAND MATTERS

Many companies have made large investments in flame resistant clothing to keep their employees safe. Since the FR fabric is a critical factor in determining the amount of protection the garment will afford the wearer, end-users should take an active roll in investigating & specifying the brand of fabric that is used to produce the finished garment. After all, the safety of your employees is too important to let just anyone make the fabric decision for you, so specify the fabric brand first. This will help ensure that a marginally lower up-front investment on a generic/off-brand product doesn't lead to employee injuries, program dissatisfaction or significant additional costs downstream.

WHY WESTEX INC.?

Generic/off-brand FR fabrics often claim they are "as good as" Westex fabrics but our consistent performance proves there is no substitute for the original. There are multiple reasons why Westex is a world leader in flame resistant protective clothing fabrics and the largest manufacturer of durable flame resistant cotton and cotton blend fabrics.

• EXTENSIVE EXPERIENCE

Established in 1919, Westex has been setting the standard for high quality flame resistant fabrics for decades.

• CONSISTENT QUALITY

Years of R & D coupled with custom engineered equipment and proprietary technology gives Westex fabrics superior performance characteristics.

• INDUSTRY LEADERSHIP

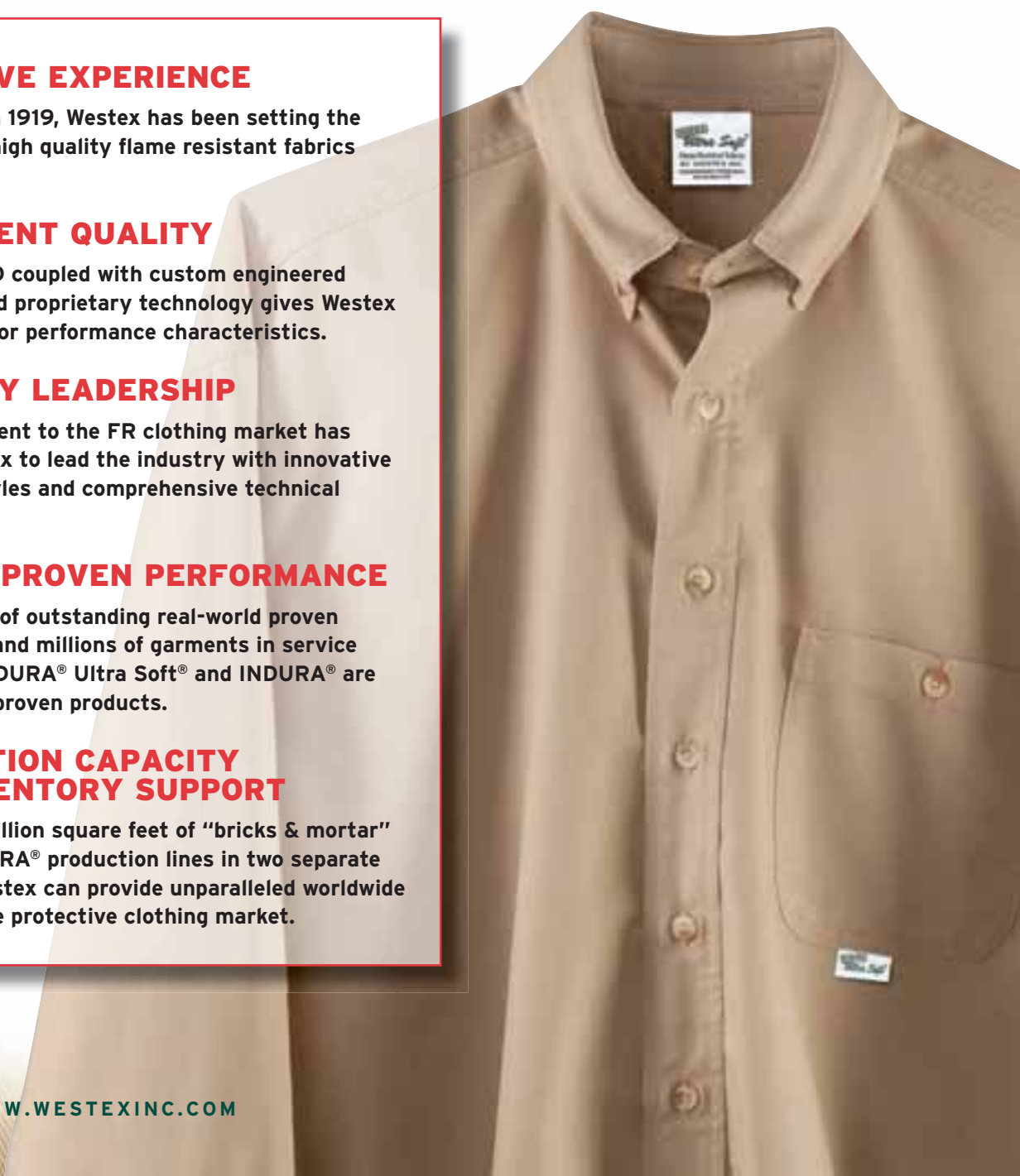
Our commitment to the FR clothing market has allowed Westex to lead the industry with innovative new fabric styles and comprehensive technical support.

• MARKET PROVEN PERFORMANCE

With decades of outstanding real-world proven performance and millions of garments in service worldwide, INDURA® Ultra Soft® and INDURA® are truly market proven products.

• PRODUCTION CAPACITY AND INVENTORY SUPPORT

With over 1 million square feet of "bricks & mortar" and five INDURA® production lines in two separate locations, Westex can provide unparalleled worldwide support to the protective clothing market.



WHY SPECIFY INDURA® Ultra Soft®?



AN EXCELLENT BALANCE OF PROTECTION, COMFORT & VALUE.

For over a decade, INDURA® Ultra Soft® flame resistant fabrics have been specified by brand name at thousands of end-user companies around the world. Millions of garments made with INDURA® Ultra Soft® have been installed into some of the harshest climates & conditions and they consistently provide a superior balance of protection, comfort and value.

PROTECTION

- **Guaranteed Flame Resistant for the Life of the Garment**
- **Excellent Multi-Purpose Protection**
 - Electric Arc Flash
 - Flash Fire
 - Molten Metal/Welding

COMFORT

- **Comfort of Cotton**
- **Soft & Breathable**
- **Cool in the Summer**
- **Warm in Winter**

VALUE

- **Enhanced Abrasion Resistance**
- **“Double-Shrunk” Technology**
- **75%+ Extended Wear Life**
- **Excellent Value Equation**



LOOK FOR THE LABEL!

Westex requires all customers to sign a Sales & Trademark License Agreement which requires, in part, for the garment manufacturer to sew an INDURA® Ultra Soft® or INDURA® label into the garment to allow the end-user to easily identify the brand of fabric that was used to produce the garment.

Westex has a team of marketing & technical professionals available to answer questions or assist in the evaluation of flame resistant protective clothing programs.

866-4-WESTEX (866-493-7839)

773-523-7000



This information in this brochure is based on testing conducted by or conducted on behalf of Westex and represents our analysis of the test results. It is not intended to substitute for any testing that may be unique and necessary for your facility for you to determine the suitability of our products for your particular purpose. Since we cannot anticipate all variations in end-user conditions, Westex makes no warranties and assumes no liability whatsoever in connection with any use of this information. All test results reported are based on standard laboratory tests related to exposure to arcs, flames and heat. Manikin tests yield laboratory predictions of relative burn injury based on factors such as fabric type, fabric weight, garment styling and fit, laundering, exposure energy and exposure time. The results reported should not be used to predict garment performance in actual fire situations. For maximum maintenance of the protective properties of garments made from flame resistant fabrics, garments should be properly cleaned for the thorough removal of greases, oily soil and other contaminants that may affect flame resistance of the fabric. Consult with the fabric supplier, garment manufacturer and launderer for recommendations of proper cleaning techniques.

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Nomex® IIIA is a registered trademark of the DuPont Company.

Thinsulate™ is a trademark of 3M Company
PBI Gold® is a registered trademark of PBI Performance Products Inc.

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Garments Manufactured by

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INDUSTRIES INC.
LONDON, CANADA

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A WORLD LEADER IN FLAME RESISTANT FABRICS

www.westexinc.com • 866-4-WESTEX (866-493-7839)
Westex Inc. • 2845 West 48th Place • Chicago, IL 60632
773-523-7000 • fax 773-523-0965