
TECHNICAL BRIEF

WESTEX

PROBAN®/FR-7A®

FLAME RESISTANT 100% COTTON Fabrics

Garments Manufactured by

AGO
INDUSTRIES INC.

London, Ontario

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Specialty and Flame Resistant By Western Piece Dyers and Finishers

For further information on PROBAN/FR-7A
fabrics by WESTEX, call (773) 523-7000.

PROBAN is a registered trademark of Albright & Wilson Ltd.,
a Tenneco company

FR-7A is a registered trademark of Westex Inc.

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The Companies

Western Piece Dyers & Finishers, Inc. was one of the first finishing plants in the United States to produce durable flame resistant fabrics. More than half a century of experience with these specialty products has made us the most knowledgeable and largest producer today. Our technical support activities from our testing laboratory and new product development work provide our industrial customers with the necessary backup to select the proper product for their protective apparel.

Our marketing and sales company Westex Inc. - is readily available to supply WESTEX PROBAN®/FR-7A® fabrics of wide variety in quantities and with schedules geared to our customers specific needs.

Albright and Wilson manufacturers PROBAN flame retardant chemicals . . . Albright and Wilson, is the leader in phosphorous flame retardant chemicals for use on cotton fabrics.

Albright and Wilson licenses the use of its PROBAN trademark and label on cotton fabrics which have been treated with PROBAN chemicals by the ammonia cure process and tested to exacting requirements for flame resistance and durability by both Westex and Albright and Wilson. Comfort, durability and industrial performance of PROBAN fabrics have brought recognition to the label throughout the world as a quality product.

Albright and Wilson first offered the PROBAN ammonia cure process in 1960. There has been continuous technical and commercial development of the process since that time through Albright and Wilson's licensees in support of the flame resistant fabric industry. Western Piece Dyers & Finishers has been licensed by Albright and Wilson since 1985 to use the PROBAN trademark and label in the USA. Combination of FR-7A fabric identification with the PROBAN label today provides the strongest professional and technical base of support for flame and thermal resistant cotton fabrics.

Flame resistant (FR) cotton fabrics offer a favorable balance of properties for secondary protective apparel for people who work in flame and thermal risk situations.

The Product

Based on the classic PROBAN technology and modified by more than twenty years of finishing experience, cotton fabrics, from one of the earliest fibers known to man, have been modified so that they will not continue to burn and contribute to worker injury when exposed to and removed from an ignition source.

Secondary protective garments are intended to provide a few seconds reaction or escape time in actual severe fire exposures (see later discussion). We caution end users that garments from this fabric should not be utilized as fire entry suits.

FR Cotton fabrics match the performance characteristics in secondary protective work clothing of competitive products at a fraction of the cost. The apparel characteristics - comfort, capacity for modification, styling and versatility - that make cotton a preferred consumer fabric today are not compromised by the finishing process.

The Westex PROBAN FR-7A process works like this: The PROBAN chemical is applied to the fabric, then is chemically polymerized with ammonia gas to produce a long chain polymer imbedded into the very core of the cotton fibers of each yarn. This polymer is then chemically oxidized to make it even more durable to washing, so that it meets the certified wash durability requirements to qualify it for the PROBAN label. Finished fabrics are properly preshrunk to provide acceptable wash performance for work-wear fabrics. Samples of finished fabrics from each lot are tested in our laboratory and by Albright and Wilson to ensure rigorous quality control.

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The Fabric Properties

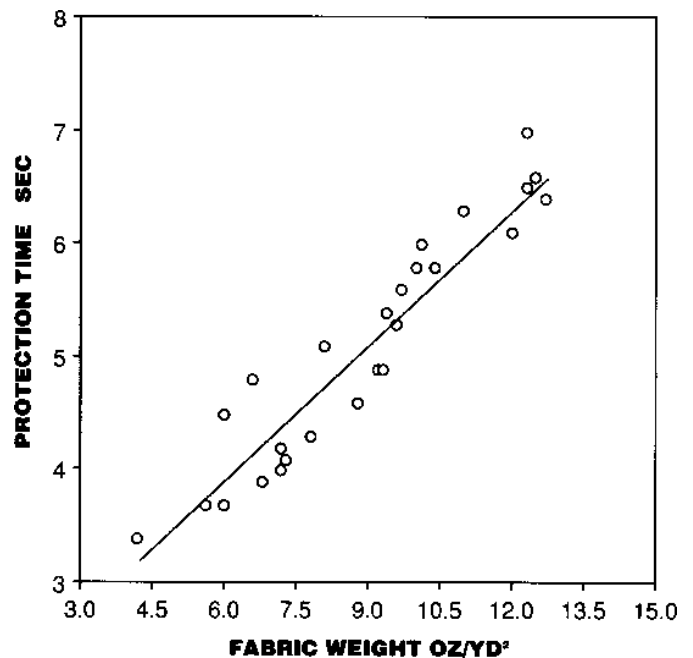
Flame Resistance - This property relates to a fabric's ability to self extinguish when exposed to flame or thermal ignition sources. It is an important characteristic for fabrics used for protective workwear so that burn injury from burning clothing is minimized. PROBAN/FR-7A flame resistant cotton fabrics, when exposed to an ignition source, will not continue to burn after the ignition source is removed; nor will they shrink, melt or drip molten residue.

Flame resistance is meaningful only when applied to the specific test method used to measure the characteristic. We employ Federal Test Method Standard 191A, Method 5903.1, a standard vertical flammability test generally accepted by military and industrial users. In this test a vertically suspended sample 2 3/4 inches wide by 12 inches long is exposed at the bottom raw edge to a standard gas flame. Char length, after-flame and after-glow times are measured as part of the test and the end user sets the specifications for acceptance, usually not more than 6 inches char length, 2 seconds after-flame and 5 second after-glow time. This test is applicable to original fabrics, to fabrics that have been subjected to multiple washes and to samples removed from used garments. Using only the vertical flammability test one cannot predict protective characteristics in actual fire situations which are more unpredictable and varied than a laboratory test. Additional information can be obtained by measuring insulative protection capacity of fabrics by the following method.

Thermal Protective Performance (TPP) - The TPP test method rates textile materials for thermal resistance and insulation when exposed to a mixture of convective and radiant energy from a thermal source of 2.0 cal/cm² sec. It is applicable to woven, knit, battings or non-woven fabrics intended for use as clothing for protection against a short exposure of open flames and radiant energy. By using calculation techniques published in the literature, the results of test exposure can be used to predict second degree burns in human skin.*

The TPP test method is best suited to a comparison of the properties of materials such as illustrated in Figure 1. In this study, twenty eight FR cotton fabrics of weights ranging from 4.5 oz/yd to 13.5 oz/yd** were exposed to the test conditions and the time to second degree burn (protection time) was calculated for each sample represented by a point on the graph. The results show with a high degree of correlation that increasing fabric weight increases protection time from 2 seconds to 7 seconds in to the test exposure.

FIGURE 1
PROTECTION TIME VS FABRIC WEIGHT
2.0 CAL/CM² SEC



This test simulates significant heat and flame exposure as might occur in actual conditions. At the higher heat exposure the test fabric is effectively destroyed. The fabric itself, not the flame retardant treatment, provides the insulative protection. Increasing fabric weight and multiple fabric layers provide protection in actual situations. This data is used to compare candidate fabrics' insulative capacity. The test relates to real-life hazards only to the degree that the actual hazard is identical to the test conditions. Because the time span of TPP testing is so short (less than 10 seconds) and the destruction level of test so severe, we are concerned about attempts to extrapolate such test data to an assessment of flash fire protection capacity for a protective garment.

* Stoll, A.M. and Chianta, M.A., Aerospace med., 40 (11), 1232-1237, 1969.

** From "Thermal Insulative Performance of Single And Multiple Layer Fabric Assemblies," Baitinger, W., and Konopasek, L., F-23 International Symposium on Performance of Protective Clothing, July 16-20, 1984, Raleigh, N.C.

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Our Customers

Durability of Flame Resistance to Washing . . . The durability of flame resistance to either home washing at 140°F or industrial washes up to 165°F is evaluated by appropriate laboratory tests for samples from each lot of Westex PROBAN FR-7A fabric. PROBAN/FR-7A fabrics are certified by Westex to retain their original flame resistance through fifty (50) home washes or twenty-five (25) industrial washes under the conditions mentioned above. These fabrics should not be bleached with hypochlorite (chlorine) bleaches because repeated bleaching not only may remove the finish, but will be destructive to the fabric and its color.

Although laboratory testing of fabric flame resistance is an essential control measure, it has understandable limitations in relating to all possible conditions to which a garment may be subjected in actual use. Such testing is carried out on samples that are neither worn or soiled, therefore in our certification level consideration must be given to factors over which we have no control. When laundry or use conditions representing extremes apply we recommend consideration of INDURA® PROBAN treated fabrics by Westex for which the wash durability of flame resistance is guaranteed for the service life of the garment. In either event we are ready to work with our customers, the users and laundries to develop the best system for cleaning and maintaining flame resistance properties of treated fabrics.

Westex PROBAN/FR-7A fabrics have developed a broadly-based use. Among significant customers we number U.S. Steel and major segments of the ferrous and non-ferrous metals industry, fire fighters in several major U.S. cities, the U.S. Navy for utility uniform clothing and NASA Space Shuttle Crews. More diverse uses include mattress ticking, and protective uniforms for utilities and petrochemicals.

In our textile testing laboratory, we thoroughly examine each lot of fabric before shipment to meet applicable industrial and government standards for flammability, as well as to meet the physical properties required by our industrial users. We are actively participating with uniform manufacturers and users in standards setting activities with ASTM, NFPA and the Army and Navy Research Laboratories.

We are constantly adding new and improved products through our research and development program by working with both the end-user and our fabric suppliers to provide the right fabric for the intended use. Through our engineered fabric development program, we are flexible as to fabric type and weight, a wide range of cotton colors and special finishes to suit particular needs. We are not motivated just by sales, but by the desire to perform a service function to provide the right fabric for our customers both in this country and international markets. That's why it's important for you to call us for the right answer to fit your particular problem.

Protective fabrics are our primary business.



PROBAN is a trademark of Albright and Wilson.
FR-7A & INDURA are trademarks of Westex Inc.