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Flame Resistant Protective Clothing Fabrics

CLEANING AND MAINTENANCE GUIDE

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DESCRIPTION OF INDURA® ULTRA SOFT® AND INDURA® FABRICS

Since 1987, garments made of INDURA fabrics have been used by various industries for personal protection against thermal exposures from molten ferrous metals, flash fire, electrical arc and other exposures in the workplace. The INDURA line of fabrics include:

- **INDURA® 100% Cotton**
- **INDURA® Ultra Soft® 88% Cotton/12% High Tenacity Nylon Blends**

The flame resistance of these fabrics is achieved by a treatment process proprietary to Westex Inc. This finish has been designed to withstand the most rigorous industrial laundering conditions anticipated for proper cleaning of work clothing. A flame retardant polymer is embedded in the fabric in a fashion that is durable to multiple launderings normally required of such garments. 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. Even though the original fabric is fully flame resistant as measured by standard test protocols, flammable contaminants on the garments can ignite, will burn until consumed and thereby increase heat transfer to the wearer and lead to flame resistance failure.

The procedures described in this bulletin have been utilized effectively for removing industrial soiling and other contaminants from the garments while maximizing use life. Users of INDURA Ultra Soft and INDURA garments should ensure that the techniques they use achieve similar results, by performing their own tests and/or working with Westex.

COMMERCIAL LAUNDERING INDURA® ULTRA SOFT® AND INDURA® GARMENTS

Detergent and Supplemental Chemicals

Washing Detergent Supplies

A variety of commercial and industrial detergent formulations are available for processing cotton and cotton rich garments and have been used for a number of years. A list of suppliers of these chemicals is given in **Appendix I**. In recent years detergents designed for use at wash temperatures of 140°F (60°C) or less such as high surfactant, low alkalinity products have gained some popularity, and have no adverse effect on the INDURA Ultra Soft and INDURA fabrics. It is important to use a detergent and wash temperature that is sufficient to thoroughly clean the soiled clothing even considering supplemental alkalinity and higher wash temperatures where appropriate. Use of a detergent with a phosphate builder has proved highly beneficial for laundering INDURA Ultra Soft and INDURA flame resistant fabrics. The best results in cleaning and utilization of detergent supplies are obtained when using softened water. INDURA Ultra Soft and INDURA fabrics can be washed at temperatures up to 165°F (75°C).

Alkalinity

Detergents used commercially have pH values ranging from 9–13 and in most instances are effective in removing dirt and oil from soiled garments. In instances requiring more aggressive soil and oil removal, higher wash temperatures and supplemental alkalinity should be considered. If softened water is not available we recommend against the use of silicate supplemented detergents. INDURA Ultra Soft and INDURA fabrics are not adversely affected by high pH, however, the effect on colorfastness of garments should be checked to maintain an acceptable balance between cleanliness and color retention.

Softeners

We recommend against the use of a supplemental softener except in unique circumstances that are specifically described to us and that are tested for impact on flame resistance.

Starch

We recommend against the use of Starch or other hand builders except in unique circumstances that are specifically described to us and that are tested for impact on flame resistance.

Detergents and Supplemental Chemicals to Avoid

Chlorine Bleach

Chlorine bleach (sodium hypochlorite) must not be used on INDURA Ultra Soft and INDURA garments either separately or in detergents. Review of various laundry advisories generally recommends against the use of chlorine bleach for protective fabrics of any fiber composition.

Hydrogen Peroxide Bleach

Hydrogen Peroxide, which is an oxygen bleach, must not be used on INDURA Ultra Soft and INDURA garments either separately or in detergents. The presence of metals with hydrogen peroxide can catalyze the decomposition of the INDURA polymer.

Soaps

The use of soaps (salts of fatty acids) is not recommended for laundering INDURA Ultra Soft and INDURA garments. Soaps can form insoluble scums with hard water that are deposited on the fabric. Soap scums may be flammable themselves and they can adversely affect the thermal protection performance of the garment if they burn.

Recommended Washing/Drying Procedures

Washing Procedures General Formula

The formula in **Appendix II** provides complete operational steps for commercially laundering INDURA Ultra Soft and INDURA garments. The actual conditions used should be selected from this formula based on the degree of soiling and other factors to be considered for the garments being processed. Not all steps need be used for lightly soiled garments. To improve soil removal and minimize redeposition a “multi add” procedure is recommended. Consult with the chemical supplier (**Appendix I**) for assistance with the quantity of supplies and specific conditions to be used for your specific case.

Loading Washer

INDURA Ultra Soft and INDURA garments can be washed in a variety of wash formulations depending on the degree and type of soil. INDURA Ultra Soft and INDURA garments should be washed with other INDURA Ultra Soft and INDURA garments. Be sure that INDURA Ultra Soft and INDURA garments are clearly identifiable. Care should also be exercised in mixing light and dark colors as well as heavy and light soil items in the load.

Normal washer loads are generally set at 80% of washer capacity for 100% cotton garments, however, loading at 65% will provide better cleaning for heavily soiled items.

Wash Temperature

The range of wash temperatures suggested take into account various degrees of soiling. The higher the temperatures, the better the cleaning for heavily soiled garments. However, compatibility of wash temperature with the detergent used should be checked.

Colorfastness of Garments

Wash temperatures higher than 165°F (74°C) may affect the washfastness (color loss) of certain colors. Likewise, the presence of sodium perborate in the wash system will significantly affect the shade of certain naphthol dyes.

Rinsing

As for all washed garments, INDURA Ultra Soft and INDURA garments must be adequately rinsed to remove wash chemicals and to lower the pH to that of the water supply. To minimize washer-induced wrinkles, water temperature is reduced in each succeeding rinse cycle until the last operation (sour) where it should be 100°F (38°C) or lower.

Sour

When laundering INDURA Ultra Soft and INDURA garments, the use of a sour operation after thorough rinsing is strongly recommended. The primary effect of sour is to reduce the fabric's pH from the alkaline detergents used for cleaning for the clear benefit of reducing the possibility of dermatological reactions from high pH. No adverse effect on flame resistance results from the use of acid sour.

Residual alkalinity in any garment can cause skin irritation and other problems. To ensure that all traces of wash chemical alkalinity are neutralized, sour can be added to the final rinse cycle in the wash wheel. Garments should not be rinsed further after the sour is added. Overuse of sour should be avoided because it will result in highly acidic fabrics. Any standard or buffered sour is acceptable for use with INDURA Ultra Soft and INDURA garments.

Drying and Finishing

INDURA Ultra Soft and INDURA garments can be dried and finished using normal methods for cotton fabrics available to laundries. It is important from the viewpoint of garment shrinkage that cotton garments not be overdried in any step of the operation. Overdrying has been determined to be the main cause of excessive garment shrinkage.

Tumble Dry Conditioning/Finishing

In many instances tumble dry conditioning is the only finishing necessary for INDURA Ultra Soft and INDURA garments. Tumble dry conditioning can be done prior to wet-on-dry tunnel finishing (see Section below) or pressing. For best results tumble driers should not be overloaded. Garments should be dried efficiently at stack temperatures between 140°F (60°C) and 165°F (74°C). Garment temperature measured in the basket should not exceed 280°F (138°C). Do not overdry garments or excessive shrinkage will occur. If possible remove garments from dryer when slightly damp (about 10% moisture) and hang to dry or tunnel process. Garments should not remain in a hot tumbler when not in motion.

Wet-to-Dry Type Tunnel Drying/Finishing

Wet garments from the wash wheel or partially dry tumble dried garments can be finished by hanging on hanger, and passing through a tunnel containing forced air supplied at 300°F (149°C) dry bulb and 190°F (80°C) wet bulb at a rate just sufficient to completely dry the garments. Garment temperature should not exceed 280°F (138°C). Again do not overdry.

Dry-to-Dry Type Tunnel Drying/Finishing

This process is not recommended for INDURA Ultra Soft and INDURA garments. Should the operational flow of your plant require passage through the tunnel we recommend using the wet-to-dry procedure or passing fully tumble dried garments through the tunnel at ambient air temperature.

Pressing

If pressing is required, the conditions employed for pressing all-cotton fabrics are acceptable for INDURA Ultra Soft and INDURA garments.

HOME LAUNDERING INDURA® ULTRA SOFT® AND INDURA® GARMENTS

General Guidelines

INDURA Ultra Soft and INDURA garments can be washed and dried by any conventional home method, followed by hand ironing if necessary. No special technology is needed for home laundering INDURA Ultra Soft and INDURA garments. However, home procedures may not remove the last traces of very heavy, widespread or ground-in soils, which may be flammable and could adversely affect the performance of INDURA Ultra Soft and INDURA garments.

If home laundering does not remove contaminants or contaminant build-up, garments can be periodically dry cleaned or commercially laundered. When garments are contaminated by hazardous materials, only commercial or on-site laundering should be used with the appropriate wastewater treatment techniques.

The following procedures can help provide optimum cleaning and maintenance of protective apparel:

Detergents and other Laundry Products

Washing Detergent Supplies

A wide variety of detergents are available in supermarkets and other stores for household use. A list of detergents acceptable for use with INDURA Ultra Soft and INDURA garments is given in **Appendix III**. It is important to use a detergent and wash temperature that is sufficient to thoroughly clean soiled clothing.

Washing detergent supplies not recommended for use with INDURA Ultra Soft and INDURA fabrics are listed in **Appendix IV**.

Other Laundry Products

Laundry products such as fabric softeners and hand builders (starch) present a complex situation relative to use with all flame resistant garments washed at home. Since it is impossible to examine and control each product and procedure that might be used, we recommend that such products not be used.

Use of Softened Water

For best cleaning results and the preservation of protective characteristics an adequate supply of soft water is required for laundering INDURA Ultra Soft and INDURA garments. Hard water contains salts, such as calcium and magnesium that combine with other salts and fatty based soaps to form insoluble deposits, film, scum and curd in the wash process and can deposit on the fabric. These contaminants are difficult to rinse from the fabric and may mask the flame resistance. Using soft water reduces detergent consumption, improves the quality of washing and avoids adverse effects on flame retardancy. For more specific details see **Appendix V** for information about water hardness and its effect on home laundering.

Detergents and Supplemental Chemicals to Avoid

Chlorine Bleach

Chlorine bleach (sodium hypochlorite must not be used on INDURA Ultra Soft and INDURA garments, either separately or in detergents). Review of various laundry advisories generally recommends against the use of chlorine bleach for protective fabrics of any fiber composition.

Hydrogen Peroxide

Hydrogen peroxide, which is an oxygen bleach, must not be used on INDURA Ultra Soft and INDURA garments, either separately or in detergents. The presence of metals with hydrogen peroxide can catalyze the decomposition of the INDURA polymer.

Soaps

The use of soaps (salts of fatty acids) is not recommended for laundering INDURA Ultra Soft and INDURA garments. Soaps can form insoluble scums with hard water that are deposited on the fabric. Soap scums may be flammable themselves and they can adversely affect the thermal protection performance of the garment if they burn.

Washing/Drying Procedure

Sorting

INDURA Ultra Soft and INDURA garments should be sorted by color; light washed with light colors and dark with dark to avoid dye transfer. INDURA Ultra Soft and INDURA garments should be washed with other INDURA Ultra Soft and INDURA garments.

Pretreating

Stains, as well as deep soil lines on the collars and cuffs of garments, are more readily removed if pretreated. Stains should be pretreated at the earliest opportunity and sufficient time allowed for the pretreatment material to penetrate and loosen the soil. The heavily soiled or stained areas should be rubbed with a full-strength, heavy-duty liquid detergent or any off-the-self laundry pretreatment product. Such pretreatment products should not contain bleach or hydrogen peroxide either separately or in combination with detergent.

Load Size

When laundering INDURA Ultra Soft and INDURA garments, it is important not to overload the machine. To ensure a cleaner wash and avoid setting wash wrinkles, the load size must permit clothes to move freely through the wash water and rinse cycle. Regardless of the machine's rated capacity in pounds, bulk—not weight—should be the limiting factor. For optimum performance wash garments inside out.

Wash Temperature

Wash INDURA Ultra Soft and INDURA garments that are heavily soiled using the “hot” water temperature setting. Garments with lesser degrees of soil can be laundered with lower water temperatures, which also will be beneficial in retaining garment color.

Tumble Drying

INDURA Ultra Soft and INDURA garments can be tumble dried or air dried following washing. For tumble-drying, drying time should be carefully controlled so that garments are removed from the drier immediately when dry or when slightly damp. Overdrying will result in excessive shrinkage. Drying times will vary depending on the load size and the relative weight of the garments being dried. Use of the “Permanent Press” setting on the dryer provides a beneficial cool down cycle.

Ironing

Depending on individual preferences, INDURA Ultra Soft and INDURA garments may require pressing. A steam or dry iron may be used on the cotton setting. Ironing has no adverse effect on flame resistance properties of INDURA Ultra Soft and INDURA garments.

DRY CLEANING

Dry cleaning of INDURA Ultra Soft and INDURA garments is desirable for effective removal of greases and oils that are not easily removed by home or commercial laundering. Dry cleaning will not adversely affect flame resistance of INDURA Ultra Soft and INDURA garments. Care should be taken to maintain the solvent in a clean condition to avoid soil redeposition. Thorough removal of all traces of dry cleaning solvent from garments is recommended. Dry cleaning is not recommended for denim garments for reasons of color loss. A further caution that dry cleaning may not be as effective as washing in removing body soils and odors should be noted. After 5 dry cleanings, a water wash is recommended to offset this problem.

MAINTENANCE OF INDURA® ULTRA SOFT® AND INDURA® GARMENTS

In order to perform its protective function, a garment must be maintained in its original condition. Rips, tears and abrasion to the fabric are normal consequences of use and they should be repaired as soon as possible. For advice on proper repair techniques contact your uniform service provider or clothing manufacturer.

SUPPLIERS LIST: LAUNDRY SUPPLIES

(From Laundry and Supplier Directory and Buyer Guide, 2000/2001, Industrial Launderer)

Diamond Chemical Co., Inc.

Union Ave. & DuBois St.
P.O. Box 7428
E. Rutherford, NJ 07073
(201) 935-4300
Fax: (201) 935-6997

Dober Group

14461 S. Waverly
Midlothian, IL 60445
(708) 388-7700
Fax: (708) 388-9344

Ecolab Inc., Textile Care Division

Ecolab Center
370 N. Wabasha
St. Paul, MN 55102
(800) 553-8683
Fax: (651) 225-3185
www.ecolab.com

Gurtler Chemicals, Inc.

15475 South LaSalle St.
South Holland, IL 60473
(800) 638-7300
(708) 331-2550
Fax: (708) 331-9087
www.gurtler.com

Norchem Corp.

5649 Alhambra Ave.
Los Angeles, CA 90003
(323) 221-0221
(800) 442-4360
Fax: (323) 227-8733
www.norchemcorp.com
norchemcorp@norchemcorp.com

Washing Systems, Inc.

1865 Summit Road
Cincinnati, OH 45237
(513) 821-8333
Fax: (513) 679-6283
www.washingsystems.com
sales@washingsystems.com

Note: Listing of suppliers in this appendix does not indicate a Westex endorsement.

Other suppliers not listed in this appendix may also have acceptable products for washing INDURA Ultra Soft and INDURA garments. For additional information contact the Uniform and Textile Service Association; 1300 North 17th St., Suite 750, Arlington, VA 22209.

GENERALIZED WASH PROCEDURE* FOR INDURA® ULTRA SOFT® AND INDURA® GARMENTS

OPERATION	WATER LEVEL	WATER TEMPERATURE	TIME (MIN)	SUPPLIES**
Flush	high	140–165° F (60–75° C)	3	
Break***	low	140–165° F (60–75° C)	10–20	2.5–3 lbs (1.1–1.4 kg) Detergent****
Carry over	low	140–165° F (60–75° C)	3–5	
Suds	low	140–165° F (60–75° C)	5–7	1.25–1.5 lbs (0.5–0.7 kg) Detergent****
Rinse	high	140–165° F (60–75° C)	2	
Rinse	high	135° F (57° C)	2	
Rinse	high	120° F (49° C)	2	
Rinse	high	105° F (41° C)	2	
Sour Ammonium	low	100° F (38° C)	5	1–4 oz Silicofluoride or Sodium Silicofluoride

*Load size 65%–80% of capacity

**Consult chemical suppliers (Appendix I) for acceptable supplies for flame resistant garments.

Supply quantities stated for 100 lb (45 kg) of Garments

***Best results are obtained with softened water. When softend water is not available we recommend against the use of silicate supplemented detergents.

****Where possible the use of a detergent with a phosphate builder has proved beneficial for laundering INDURA Ultra Soft and INDURA flame resistant fabrics.

COMMON DETERGENTS AVAILABLE IN STORES

The following products are acceptable for use with INDURA Ultra Soft and INDURA garments.

DETERGENTS	SPOT CLEANERS
All	Shout
Arm & Hammer	Spray and Wash
Cheer	Zout
Era	
Gain	
Purex (Powder & Tablets)	
Select Ultra	
Surf	
Tide, Tide with Bleach Alternative (Powder, Liquid & Tablets)	
Wisk	
Xtra	

Note: Best cleaning results are obtained with soft water.

*Note: This is not complete list of all detergents that are acceptable for use with INDURA Ultra Soft and INDURA garments. Additional brands are acceptable provided they **do not** contain chlorine bleach or hydrogen peroxide.*

DO NOT USE THESE PRODUCTS WITH INDURA® AND INDURA® ULTRA SOFT® GARMENTS

Tide with Bleach (Liquid)

Chlorox II (Liquid)

Vivid (Liquid)

Note: These products contain either chlorine bleach or hydrogen peroxide. This list is not a complete list of all products containing either chlorine bleach or hydrogen peroxide. Therefore, it is important to check the ingredients of all products before using with INDURA Ultra Soft and INDURA garments.

ADDITIONAL INFORMATION ON THE EFFECT OF WATER HARDNESS

Water Hardness

Calcium and magnesium are the primary minerals that contribute to water hardness. The greater the concentration of these minerals, the harder the water. Hard water does not clean as effectively as soft water.

Hardness is measured in grains per gallon (gpg) or parts per million (ppm). Water containing less than 3.5 gpg is considered soft, whereas water with more than 7 gpg is considered hard. (See Table 1 for the American Society of Engineers' water hardness classifications.)

Water Hardness Classification

	GRAINS PER GALLON	PARTS PER MILLION
Soft	0 to 3.5	0 to 60
Moderate	3.6 to 7	61 to 120
Hard	7.1 to 10.5	121 to 180
Very Hard	More than 10.5	More than 180

Hard water affects laundering in several ways. Incomplete soil removal is common in hard water. As unremoved soil deposits accumulate, fabrics feel harsh and stiff.

There are three ways to help control water hardness when doing the laundry.

- Use adequate amounts of an appropriate detergent.
- Use water as hot as recommended for the fabric.
- Install a water-softening unit in your home.



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