



# Bulwark Product Care Guide

## WHAT KINDS OF PROTECTION DOES BULWARK OFFER?

Bulwark's FR protective work apparel is secondary protective clothing, which is designed for continuous wear in designated areas where intermittent exposure to flame or heat is possible. It is to be used in conjunction with primary protective clothing for activities where significant exposure to flame or heat is likely, such as molten substance splash.

### PERFORMANCE REQUIREMENTS

All Bulwark garments meet the requirements specified by:

- ASTM International Standard F2302-08 for labeling protective clothing as heat and flame resistant
- National Fire Protection Association (NFPA) Standard 70E
- Electrical Safety Requirements for Employee Workplaces, 2009 Edition
- ASTM Standard F1506-02a, Flame Resistant Materials for Wearing Apparel for Use by Electrical Workers Exposed to Momentary Electric Arc and Related Thermal Hazards
- Because these fabrics are flame resistant, they are also acceptable under the Occupational Safety & Health Administration (OSHA) Final Rule 1910.269, Final Rule on Electrical Protective Equipment.

Where appropriate, Bulwark garments have been certified by Underwriters laboratories to the requirements of NFPA 2112, Standard on Flame Resistant Garments for Protection of Industrial Personnel Against Flash Fire and Canadian General Standards Board (CGSB) Standard 155.20, Workwear for protection against Hydrocarbon Flash Fire.

### CARING FOR EACH TYPE OF FLAME-RESISTANT FABRIC

Each type of Flame-Resistant fabric requires special safety and care considerations.

**Inherently FR Fibers** Inherently flame-resistant fibers are defined as having flame-resistance as an essential characteristic of the fiber.

**Treated Fabrics** Treated fabrics are treated with a flame retardant chemical to make them flame-resistant. The fibers used in these fabrics, such as cotton, are not normally considered protective and become flame-resistant because of the treatment.

**Treated Fibers** Fabrics made from treated synthetic fibers, which are extruded with a flame retardant chemical in the fiber-forming process, become flame-resistant for the life of the garment because the flame retardant cannot be removed by wear or laundering.

**Blends:** Some fabrics are blends of treated and inherently FR fibers.

# **GARMENTS MADE OF FLAME RESISTANT FIBERS PRODUCT CARE**

These garments are made from fabrics that are heat resistant and permanently flame resistant. Inherently flame resistant fibers are blended with modacrylic, rayon, nylon and other fibers. The fabrics may also incorporate fibers that are antistatic or have other characteristics. Regardless of the blend, in static-sensitive environments proper grounding procedures must be observed.

Any flame resistant garments should be removed immediately and replaced with clean FR apparel if they become fouled with flammable material.

These garments should be washed using soft water (less than 4.0 grains). Hard water adversely affects cleaning, resulting in increased detergent usage. Hard water contains mineral salts that can form insoluble deposits on the surface of fabrics. Sufficient buildup can negate the flame resistant characteristics of the garment, and may serve as fuel if garments are exposed to an ignition source.

Laundry temperatures up to 140°F are best for good colorfastness. Processing in hotter formulas may be required to remove soils but could affect color and shrinkage. These garments can also be dry cleaned in perchloroethylene or petroleum.

Important considerations are temperature control in washing and drying and removing flammable soils or chemicals that can overwhelm or mask the FR properties.

## **INDUSTRIAL LAUNDRY**

Process separately from other types of garments throughout the entire operation to prevent accumulation of lint and minimize pilling.

Sort by shade to reduce staining or color transfer which may occur.

Use low temperature (140°F max.), low alkalinity surfactant chemistry for water washing. Higher pH products and elevated wash temperatures accelerate color loss.

Washing at hotter temperatures and higher levels of alkalinity may be necessary to remove soils. This will not damage the fabric or degrade the FR properties but may affect color. Removing flammable soils is more important than color retention.

Use a multiple add procedure (break and second suds) where necessary due to soil levels.

Do not use chlorine bleach. This will weaken the fabric and accelerate color loss. Use of oxygen bleach is acceptable where necessary. Do not use starch or fabric softeners as they can coat fibers and mask FR performance and/or serve as fuel in the event of garment ignition.

Temperature step-downs between baths should not exceed 15°F. Cool to 100°F or less before extraction to minimize wrinkling.

Rinse well and sour properly.

Short extraction at low levels should be sufficient and will help reduce wrinkling improving finished appearance.

Condition at 140°-160°F stack temperature so fabric temperatures measured in the basket do not exceed 280°F. This fabric will dry rapidly. Do not over dry. Excessive heat will cause color loss. Cool down to 100°F or less and remove promptly from the dryer.

Shrinkage similar to 100% cotton fabrics can be expected.

Tunnel finishing will improve fabric smoothness but may cause hanger impressions. If creases in pants are desired, pressing will be required. Do not exceed 280°F fabric temperature.

## **HOME WASH**

Wash and dry separately to prevent accumulation of lint.

Pre-treat greasy stains and do not overload the washer to help insure removal of soils.

Wash in hot water (up to 140°F) using any typical home laundry detergent. Do not use tallow soap.

Do not use chlorine bleach. Do not use starch or fabric softeners as they may coat fibers and mask FR performance and/or serve as fuel in the event of garment ignition.

Do not over dry.

For maximum flame resistance, greases and oils must be thoroughly removed. If home procedures do not accomplish this, commercial laundering or dry cleaning is recommended.

## **DRY CLEANING**

Either perchloroethylene or petroleum solvent can be used. In cases of heavy, oily soil, this may be the preferred approach. With petroleum, it is necessary to ensure all solvent has been completely dried from the garment.

## **REPAIR AND MENDING**

ASTM International has developed two standards for repair and maintenance of FR garments. Standard F 1449 Guide for Industrial Laundering of Flame, Thermal and Arc Resistant Clothing, covers maintenance of garments by industrial laundries. Newly adopted Standard F 2757 Guide for Home Laundering Care and Maintenance of Flame, Thermal and Arc Resistant Clothing provides information for home care and maintenance of flame resistant protective garments.

Essentially, all repairs must be made with materials equivalent to the original materials in the garments. In other words, Nomex® sewing thread and FR mending fabrics equal to the materials used in the original garment. Heat seal FR patches are available and are often used to make small repairs. Bulwark Customer Care can assist in providing repair kits for individuals and material sources for organizations.

Bulwark does not have a specific guideline on repairs except to follow the ASTM standards. This would also apply to zippers and any other trim or findings item that needs to be replaced. Technical Bulletins that provide detailed laundry and dry cleaning recommendations are available for each type of fabric used in Bulwark garments.

## **Removal of Stains**

If garments become contaminated with flammable substances, they should be removed immediately and replaced with clean flame resistant apparel. Either home or industrial laundering may successfully remove most types of both flammable and non flammable soils. However, home laundry detergents may not successfully remove some types of soil found in industry, especially heavy greases and oily soils. If flammable soils are not completely removed, the flame resistance of the garment may be compromised.

Flammable materials are for the most part volatile substances that dissipate into the atmosphere, for example, gasoline. Stains remaining after laundering on the other hand are either unremoved contaminants or, more likely, simply discoloration of the fabric.

It may be difficult to determine that flammable soils have been completely removed, but indicators would include the presence of stains and/or odors after laundering. However staining alone is not an indication that the soil has not been adequately removed. If it appears that the garments may still be contaminated after home wash, laundering at a local commercial or industrial laundry may be required. Dry cleaning may be used to remove oils and greases. Finally, if questions remain Bulwark will conduct flame resistant testing of the garment in question to determine its flame resistance. Please be aware that this is a destructive test and the garment will be destroyed.

## **NOMEX® AND COOLTOUCH NOMEX® BLENDS PRODUCT CARE**

Laundering NOMEX® and Cool Touch® NOMEX® Blend Garments at Home Wash

1. Can I wash these garments at home?

Yes. As long as washing recommendations are followed and the garments are not soiled with contaminants you would not want to mix with your family wash, they may be combined in loads.

2. Are there any special instructions?

Pre-treat oily, greasy stains with products like "Shout®" or "Spray 'N Wash®". Separate light colors from dark colors as staining can occur. Do not overload the washer. Garments need room to move in the wash for proper cleaning and good wrinkle recovery.

3. What wash cycle and water temperature should I use?

Wash in soft water with less than 4.0 grains of hardness. Hard water contains mineral salts that can form insoluble deposits on the surface of fabrics that can negate the flame resistant characteristics or serve as fuel if garments are exposed to an ignition source. Use the Permanent Press cycle in water temperature up to 140°F. Use any typical home laundry detergent. Do not use "tallow soap" as it can leave a film on the fabric.

4. Can I use chlorine bleach?

No. Chlorine bleach will weaken the fabric and accelerates color loss. Oxygen bleaches may be used if necessary. Oxygen bleach is found in some home laundry detergents such as Tide with Bleach®.

5. What about other laundry aids?

Starch, fabric softeners, and other laundry additives can coat the fiber and mask the flame resistant performance. They may also serve as fuel in case of combustion. Their use is not recommended. NOMEX® has a static dissipative fiber in the blend to reduce nuisance static.

6. What about drying?

Tumble dry on Permanent Press cycle with proper cool down. Do not overdry. This fabric is synthetic and should dry quickly. Remove promptly and hang or fold. Do not line dry in direct sunlight.

7. Can I iron or press these garments? These are not durable press garments and may wrinkle in laundering. Press with a warm iron on the Permanent Press setting. If creases in pants are desired, pressing will be required.

8. Can these garments be dry cleaned?

Yes. Either petroleum solvent or perchloroethylene can be used. In cases of heavy, oily soil, this may be the preferred approach.

9. How do I repair these garments?

Minor repairs that do not affect the integrity of the garment may be made by either sewing on NOMEX® fabric patches or by darning small holes with NOMEX® thread.

10. Can the FR properties be removed?

No. NOMEX® is inherently flame resistant. This property cannot be degraded or diminished by laundering. However, it is critical to remove greases, oily soils, and other flammable contaminants as they can burn independently and overwhelm the FR properties of the fabric. If home laundering does not provide adequate cleaning, professional care may be required.

## **EXCEL FR® & COMFORTOUCH FR® COTTON & COTTON BLENDS PRODUCT CARE**

Bulwark Excel-FR™ durable "Flame Resistant" ("FR") 100% cotton and Excel-FR ComforTouch™ 88% cotton/12% nylon blend garments are made from fabrics treated with a durable flame retardant finish.

These garments can be laundered at temperatures normal to cottons. With the exception of FR denim, they can also be dry cleaned. Do not dry clean 100% cotton denim as the indigo dye system will fade and bleed into the solvent.

Flame resistant garments should be removed immediately and replaced with clean FR apparel if they become fouled with flammable materials.

Flame resistant apparel should be washed using soft water (less than 4.0 grains). Hard water adversely affects cleaning, resulting in increased detergent usage. Hard water contains mineral salts that can form insoluble deposits on the surface of fabrics. Sufficient buildup can negate the flame resistant characteristics of the garment, and may serve as fuel if garments are exposed to an ignition source.

These garments should not be worn where contact with strong oxidizers (e.g., >10% sodium hypochlorite, NaOCl) or reducing agents (e.g., sodium hydrosulfite, NaS<sub>2</sub>O<sub>4</sub>) is a consideration.

### **INDUSTRIAL LAUNDRY**

It is important that formulas are developed using detergents and wash temperatures (up to 165°F) adequate to thoroughly clean all contaminants from garments.

Use non-ionic formulas. Do not use natural soaps (anionic or tallow soap) or silicate supplemented detergents. Soft water is recommended. Hard water precipitates soaps. It also contains calcium and magnesium salts. These products can build up on the fiber surfaces, coating the fabric and masking FR properties.

Chlorine bleach (sodium hypochlorite) and hydrogen peroxide (oxygen bleach), whether separate or contained in detergents, must be avoided. Repeated exposure to bleach can destroy the FR polymer and make the garments nonprotective.

Starch, fabric softeners, and other laundry additives can coat the fiber and mask the FR performance or serve as fuel in case of garment ignition. Therefore their use is not recommended. Garments should be soured to a pH between 5.5 and 6.5.

If garments are heavily soiled with particulate or abrasive soils, a flush at the beginning of the cycle will help reduce abrasion in the wash wheel. Wash formulas and load sizes should be set up to minimize redeposition and fabric abrasion.

Extract by methods typically used for regular 100% cotton garments.

Condition at a stack setting of 165°F so fabric temperature measured in the basket does not exceed 280°F. Normal shrinkage of 5 % to 6% can be expected. As with any 100% cotton fabric, excessive shrinkage may occur if overdried.

If desired, garments may be pressed using normal cotton pressing techniques.

## **HOME WASH**

Use any typical home laundry detergent. Powdered home wash detergents containing sodium perborate and other "color safe" bleach alternatives will not affect the flame resistance of the garments.

Do not use chlorine bleach, liquid nonchlorine bleach or detergents that contain hydrogen peroxide. These include but are not limited to liquid Tide with Bleach®, liquid Clorox II®, and liquid Vivid®.

It is important that all potentially flammable soils and other contaminants are completely removed from garments during the wash process. This may require the use of stain removal products, such as Shout®, Spray 'n Wash®, or Zout®; or presoaking garments prior to washing. The use of hot water can often make detergents more effective in soil removal. If all contaminants cannot be removed in home care, you should obtain professional help in getting your FR garments clean.

The use of conditioned or soft water can help improve removal of contaminants from garments. Hard water precipitates soaps and can result in the build-up of calcium and magnesium salts. These can serve as fuel in the event they are exposed to a source of ignition.

Starch, fabric softeners, and other laundry additives are not recommended because they can coat fibers and mask FR performance, or serve as fuel in case of garment ignition.

Do not over dry garments. If desired, you may press with an iron on the normal cotton setting.

We recommend you turn garments inside out to help reduce streaking that can occur due to abrasion in the washer.

## **DRY CLEAN**

Either perchloroethylene or petroleum solvent can be used. With petroleum, it is necessary to ensure that all solvent has been completely dried from the garments. Do not dry clean indigo dyed FR denim.

## **REPAIR & MENDING**

Minor repairs that do not affect the integrity of the garment may be made with like materials by either heat sealing or sewing on patches or darning small holes.

## Laundering Bulwark™ Excel-FR™ Flame Resistant 100% Cotton & Excel FR Comfortouch™ 88% Cotton/12% Nylon Garments At Home

### 1. What wash cycle and water temperature should I use?

Wash in a Normal or Cotton cycle at any water temperature. FR cotton and cotton blend fabrics have the same shrinkage expected in regular cotton. Hotter water temperatures generally cause greater shrinkage, but may be required to remove oily soils. It is important to remove flammable soils possible as they can serve as fuel.

### 2. How do I wash these garments?

Use soft water (less than 4.0 grains). Hard water contains mineral salts that can form insoluble deposits on the surface of fabrics that can negate the flame resistant characteristics or serve as fuel if garments are exposed to an ignition source. Use any typical home laundry detergent. Do not use tallow soap. Home wash products are clearly labeled. For example, "Tide® detergent" or "Dial® soap" is stated on the package. Stains may be treated with any of the commercial stain removal products. Do not use chlorine bleach or liquid non-chlorine bleaches.

### 3. Do I have to wash these garments separately?

As long as washing recommendations are followed and the garments are not soiled with contaminants you would not want mixed with your family wash, they may be combined in wash loads.

### 4. Why "No bleach"?

Repeated chlorine bleaching destroys the FR polymer. Removing the polymer reduces the flame resistance of the garments. Chlorine bleach will also remove dye causing accelerated color loss. Powdered home wash detergents containing perborate and other "color safe" bleach alternatives, either liquid or powder, will not affect the flame resistance of the garment. Do not use home wash detergents containing hydrogen peroxide.

### 5. What about other laundry aids?

Starch, fabric softeners, and other laundry additives can coat the fiber and mask flame resistant performance. They may also serve as fuel in case of combustion. Their use is not recommended.

### 6. What about drying and ironing?

Do not overdry. If dried either too long or too hot you may get excessive shrinkage (more than 5%). If desired, iron with normal cotton settings. Do not use starch.

### 7. Any other suggestions?

Turn the garments inside out before wash to reduce streaking from abrasion of stiff new fabric. Use correct water levels and do not overload the machine.

### 8. Can these garments be dry cleaned?

Yes, all of the FR cotton and cotton blend garments can be dry cleaned with exception of the FR denim jeans. Either petroleum solvent or perchloroethylene can be used. Do not dry clean indigo dyed FR denim as the dye will bleed into the solvent and the denim will fade.

9. How do I repair these garments?

Minor repairs that do not affect the integrity of the garment may be made using the repair kits available from Bulwark Customer Care.

10. How long will the FR properties last?

When washed by the prescribed laundry procedures, the durability of the flame resistance of these garments is guaranteed for the useful wear life of the garment.

## **FLAME RESISTANT HIGH VISIBILITY PRODUCT CARE**

Bulwark flame resistant (FR) high visibility garments are made from an inherently FR blend of synthetic and natural fiber. These garments must be laundered separately at temperatures not to exceed 140°F (60°C) and may also be dry cleaned.

Flame resistant garments should be removed immediately and replaced with clean FR apparel if they become fouled with flammable materials.

### **INDUSTRIAL LAUNDRY**

Wash separately from other garments to avoid damaging the luminescent effect.

Flame resistant apparel should be washed using soft water (less than 4.0 grains). Hard water adversely affects cleaning, resulting in increased detergent usage. Hard water contains mineral salts that can form insoluble deposits on the surface of fabrics. Sufficient buildup can negate the flame resistant characteristics of the garment, and may serve as fuel if garments are exposed to an ignition source.

It is important that formulas are developed using detergents and wash temperatures (up to 140°F) adequate to thoroughly clean all contaminants from garments.

Use non-ionic formulas. Do not use natural soaps (anionic or tallow soap). Soft water is recommended. Hard water precipitates soaps and contains calcium and magnesium salts. These can build up on the fiber surfaces, coating the fabric and masking luminescent or FR properties.

Chlorine bleach (sodium hypochlorite) must be avoided. Repeated exposure to bleach can destroy the luminescent effect.

Starch, fabric softener, and other laundry additives can coat the fiber and mask the FR performance or serve as fuel in case of combustion. Therefore their use is not recommended. Garments should be soaped to a pH between 5.5 and 6.5.

If garments are heavily soiled with particulate or abrasive soils, a flush at 105°F (40°C) at the beginning of the cycle will help reduce abrasion in the wash wheel. Wash formulas and load sizes should be set up to minimize redeposition and fabric abrasion.

Use a short extract time to prevent setting wrinkles.

Do not over dry. Condition at a stack setting of 165°F so fabric temperature measured in the basket does not exceed 280°F.

Tunnel finishing will improve appearance. Tunnel temperature must not exceed 280°F on the fabric.

Proper cool down to 100°F or less in conditioning is essential for best appearance.

If desired, garments may be pressed using a short cycle. Do not exceed a fabric temperature of 280°F under the press head.

## **HOME WASH**

Wash separately in a Normal or Cotton cycle at any water temperature up to a maximum of 140°F (60°C). Use any typical home laundry detergent. Do not use soap (tallow soap containing animal fats).

Do not use chlorine bleach or liquid nonchlorine bleach.

Turn garments inside out before wash to reduce streaking from abrasion. Fill the washer no more than 2/3 full and use high water level.

It is important that all soils and other contaminants are completely removed from garments during the wash process. This may require the use of stain removal products, such as Shout®, Spray 'n Wash®, or Zout®; or presoaking garments prior to washing. The use of hot water can often make detergents more effective in the removal of soils. If all contaminants cannot be removed in home care, garments should be dry cleaned.

The use of conditioned or soft water can help improve removal of contaminants from garments. Hard water precipitates soaps and can result in the build-up of calcium and magnesium salts. These can serve as fuel in the event they are exposed to a source of ignition.

Starch, fabric softeners, and other laundry additives are not recommended because they can coat fibers and mask FR performance, or serve as fuel in case of garment ignition.

Do not over dry garments. If desired, you may press with an iron on the Permanent Press/Low setting.

## **DRY CLEAN**

Either perchloroethylene or petroleum solvent may be used.

## **REPAIR & MENDING**

Minor repairs that do not affect the integrity of the garment may be made with like materials by either heat sealing or sewing on patches or darning small holes.

## **LAUNDERING BULWARK® FLAME RESISTANT HIGH VISIBILITY GARMENTS AT HOME**

1. What wash cycle and water temperature should I use?

Wash in a Normal or Cotton cycle at any water temperature up to a maximum of 140°F (60°C). Hotter water temperatures may be required to remove oily soils. It is important to remove flammable soils as soon as possible as they can serve as fuel.

## 2. How do I wash these garments?

Use soft water (less than 4.0 grains). Hard water contains mineral salts that can form insoluble deposits on the surface of fabrics that can negate the flame resistant characteristics or serve as fuel if garments are exposed to an ignition source. Use any typical home laundry detergent. Do not use tallow soap. Home wash products are clearly labeled. For example, "Tide® detergent" or "Dial® soap" is stated on the package. Stains may be treated with any of the commercial stain removal products. Do not use chlorine bleach or liquid non-chlorine bleaches.

## 3. Do I have to wash these garments separately?

Wash Bulwark flame resistant high visibility garments separately to avoid damaging the luminescent effect.

## 4. What about other laundry aids?

Starch, fabric softeners, and other laundry additives can coat the fiber and mask luminescent and flame resistant performance. They may also serve as fuel in case of combustion. Their use is not recommended.

## 5. What about drying and ironing?

Do not overdry. Dry on Permanent Press or Low setting. If dried either too long or too hot you may get excessive shrinkage. If desired, iron on Permanent Press/Low settings. Do not use starch.

## 6. Any other suggestions?

Turn the garments inside out before wash to reduce streaking from abrasion of stiff new fabric. Load the washer no more than 2/3 full with garments and use the high water level setting.

## 7. Can these garments be dry cleaned?

Yes, these garments can be dry cleaned by either petroleum solvent or perchloroethylene.

## 8. When is dry cleaning recommended?

If garments are heavily soiled with oil or grease, dry cleaning is recommended because this is more effective in removing these type contaminants.

## 9. How do I repair these garments?

Minor repairs that do not affect the integrity of the garment may be made using the repair kits available from Bulwark Customer Care.

## 10. Can the flame resistant properties be removed?

When washed by the prescribed laundry procedures, the durability of the flame resistance of these garments is guaranteed for the useful wear life of the garment.

# FR HI-VISIBILITY RAINWEAR PRODUCT CARE

Bulwark flame resistant high visibility rainwear is constructed from a blend of NOMEX and KEVLAR fibers coated with PVC. These garments have welded seams for waterproof performance and provide limited protection from incidental chemical splash. Where major chemical exposure is a concern, appropriate specialized barrier garments should be selected.

Flame resistant garments should be removed immediately and replaced with clean FR apparel if they become fouled with flammable materials.

Bulwark flame resistant high visibility rainwear meets the requirements of ASTM F1891-2002 for arc and flame resistant rainwear and ISEA/ANSI 107-2004 for high visibility. When worn separately, the jacket is rated ANSI Class 2, Level 2. When worn with the matching bib, the ensemble rates Class 3, Level 2.

These garments can be wiped clean using a damp cloth or home laundered in cold water using the gentle cycle. Hang to dry.

## **INDUSTRIAL LAUNDRY**

Bulwark FR high visibility rainwear should be home washed only.

## **HOME WASH**

Hand or machine wash cold (104°F, 40°C) on gentle cycle using mild detergent. Do not use solvents or abrasive cleaners. Hang to dry. Do not use any type of bleach. Do not use fabric softeners. Do not iron.

## **DRY CLEAN**

Do not dry clean.

## **REPAIR & MENDING**

These garments may not be repaired. Any Bulwark rainwear that is torn, ripped, or exposed to flames or electric arcs, must be removed from service and replaced.

## **MOLTEN METAL SPLASH RESISTANT GARMENTS PRODUCT CARE**

The highly engineered fabric in these garments provides a soft, lightweight feel, but protects against molten metal splash, radiant heat, flame and other smelting hazards. Because the fabric is permanently flame resistant, laundering cannot degrade this property.

Providing protection from both red and white molten splash, Bulwark molten metal splash resistant garments also provide protection from cryolite ( $\text{Na}_3\text{AlF}_6$ ), a catalyst used in aluminum smelters or pot rooms.

Flame resistant garments should be removed immediately and replaced with clean FR apparel if they become fouled with flammable materials.

Flame resistant apparel should be washed using soft water (less than 4.0 grains). Hard water adversely affects cleaning, resulting in increased detergent usage. Hard water contains mineral salts that can form insoluble deposits on the surface of fabrics. Sufficient buildup can negate the flame resistant characteristics of the garment, and may serve as fuel if garments are exposed to an ignition source.

These garments can be dry cleaned or laundered in home or industrial-type equipment at reduced wash and drying temperatures. Tunnel finishing may result in excessive shrinkage and is not recommended. Because of the wide variety of equipment and methods used for laundering garments, it is recommended that in-house trials be conducted to confirm that these garments can be successfully laundered in a particular environment. Shrinkage of up to 6.5% may be expected; size garments accordingly.

## **INDUSTRIAL LAUNDRY**

Heavily soiled garments or garments with oily stains may be pretreated. Dry cleaning may be more effective on these type stains.

High surfactant, low alkalinity (pH of 6 to 8) detergents are recommended for best cleaning, color retention and shrinkage control. Do not wash in hot water. Wash temperatures of 105°F or less are recommended. Avoid long wash and rinse cycles. Reduce cycle times to the minimum needed for adequate soil removal. Use high water levels during washing and rinsing. Rinse thoroughly in cold water.

Do not rotate the washer load between draining and filling to avoid stretching wet garments.

Do not use natural soaps (anionic or tallow soap). Soft water is recommended.

Do not bleach. Bleach may damage the garments. Do not use starch or fabric softeners as these products may coat fibers and mask FR performance and/or serve as fuel in the event of garment ignition.

Extract at low speed only (less than 100 "G's") for as short a time as necessary to remove free water.

Condition at a stack setting not to exceed 150°F. Condition to about 35% moisture retention. Steam heated dryers are recommended. No not over dry. Normal shrinkage of up to 6.5 % can be expected.

A maximum fabric temperature of 250°F is recommended at conditioning, tunnel finishing, and pressing.

## **HOME WASH**

Use any typical home laundry detergent. Do not use tallow soap (anionic detergent).

Do not use bleach. Do not use starch or fabric softeners as these may coat fibers and mask FR performance and/or serve as fuel in the event of garment ignition.

Wash on Permanent Press or Gentle cycle with warm or cold water. Water temperatures of 105°F or less are recommended.

Tumble dry low/delicate and remove promptly.

## **DRY CLEAN**

Either perchloroethylene or petroleum solvent can be used. With petroleum, ensure all solvent has been completely dried from the garments.

## **REPAIR & MENDING**

Minor repairs not affecting the integrity of garments may be made with like materials by either heat sealing or sewing on patches or darning small holes.

# PBI/KEVLAR® PRODUCT CARE

The flame resistant characteristics of PBI/Kevlar® are inherent in the fibers and unaffected by washing.

Avoid storing PBI/Kevlar® garments in direct sunlight or under artificial lighting. Fabric colors will fade on exposure to ultraviolet lighting. Store garments in lockers, drawers, or in closets.

Flame resistant garments should be removed immediately and replaced with clean FR apparel if they become fouled with flammable materials.

Flame resistant apparel should be washed using soft water (less than 4.0 grains). Hard water adversely affects cleaning, resulting in increased detergent usage. Hard water contains mineral salts that can form insoluble deposits on the surface of fabrics. Sufficient buildup can negate the flame resistant characteristics of the garment, and may serve as fuel if garments are exposed to an ignition source.

## INDUSTRIAL LAUNDRY

Wash PBI/Kevlar® garments separately from other apparel to avoid lint contamination that may contribute to pilling.

Use non-ionic formulas. Do not use natural soaps (anionic or tallow soap) or silicate supplemented detergents. Use soft water. Hard water precipitates soaps. It also contains calcium and magnesium salts. These products can build up on the fiber surfaces, coating the fabric and masking the FR properties.

Do not wash at bath temperatures exceeding 140°F. Use high surfactant, low alkaline wash chemistry with a pH not exceeding 10. Repeated launderings at temperatures higher than 140°F, especially in combination with pH levels above 10, can result in increased fabric shrinkage and reduced garment durability.

Chlorine bleach (sodium hypochlorite), whether separate or contained in detergents, must be avoided. The Kevlar® aramid fiber will be degraded by exposure to chlorine bleach.

Starch, fabric softeners, and other laundry additives can coat the fiber and mask the FR performance or serve as fuel in case of garment ignition. Therefore their use is not recommended. Garments should be appropriately soured to a pH level of 5.5 to 6.5.

If garments are heavily soiled with particulate or abrasive soils, a flush at the beginning of the cycle will help reduce abrasion in the wash wheel. Wash formulas and load sizes should be set up to minimize redeposition and fabric abrasion.

Temperature step-downs between baths should not exceed 15°F. Cool to 100°F or less prior to extraction at low speed to help minimize wrinkling.

Condition at a stack setting of 160°F or less so fabric temperatures measured in the basket do not exceed 210°F to avoid excessive shrinkage levels. Cool to 100°F or less prior to removal from the dryer. Do not over dry garments.

Garments constructed from PBI/Kevlar® may be tunnel finished, however settings must be lower than typical for other type apparel. The measured fabric temperature must not exceed 210°F while in the tunnel to avoid excessive fabric shrinkage.

If garments are pressed, the maximum temperature on fabrics must not exceed 210°F.

## **HOME WASH**

Wash and dry separately to avoid accumulation of lint that may contribute to pilling.

Pre-treat greasy, oily stains and do not overload the washer to help insure removal of soils. If home procedures do not completely remove all potentially flammable soils, commercial laundering or dry cleaning should be considered.

Wash in hot (120°F) or warm (105°F) water using any typical home laundry detergent. Follow the manufacturer's recommendations for usage. Do not use tallow soaps.

Do not use chlorine bleach or detergents that contain chlorine bleach. Do not use fabric softeners or starch on any flame resistant apparel as these can coat fibers and mask the FR performance.

The use of conditioned or soft water can help improve removal of contaminants from garments. Hard water precipitates soaps and can result in the build-up of calcium and magnesium salts. These can serve as fuel in the event they are exposed to a source of ignition.

Do not over dry garments. If pressing is desired, use only a warm setting such as permanent press.

## **DRY CLEAN**

Either perchloroethylene or petroleum solvent can be used. With petroleum, it is necessary to ensure that all solvent has been completely dried from the garments.

## **REPAIR & MENDING**

Minor repairs that do not affect the integrity of the garment may be made using like materials by either heat sealing or sewing on patches or darning small holes.

## **NOTICE**

The information in this bulletin is based on the results of testing in our laboratory and information from the fabric vendor. It is provided for your guidance and knowledge. As of the publication date, this bulletin contains up to date information on care and cleaning. Please visit our website at [www.bulwark.com](http://www.bulwark.com) for the latest information.