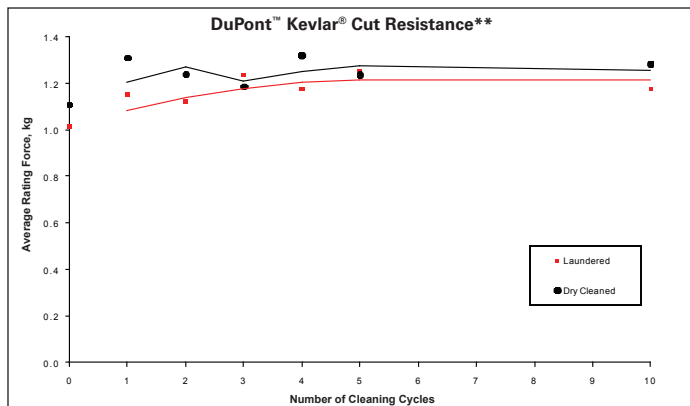
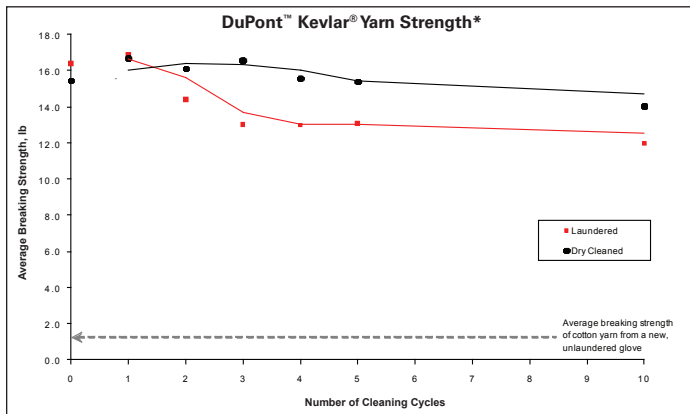


# DuPont™ Kevlar® Laundering Guide for Cut Resistant Apparel

This guide discusses the cleaning of cut resistant apparel made with DuPont™ Kevlar® brand fiber using standard industrial cleaning practices, including the impact of cleaning on performance. This information is applicable to other types of apparel manufactured with Kevlar® fiber. Before initiating a cleaning program, consult the protective apparel supplier regarding any special cleaning requirements for the products under consideration.

## Effect of Laundering and Dry Cleaning on Glove Performance

Laundering and dry cleaning have no significant impact on the cut resistance of gloves made of 100% DuPont™ Kevlar® even after 10 consecutive cleaning cycles. A typical glove is expected to undergo less than ten cleaning cycles due to normal wear and tear. Shrinkage, weight loss, changes in yarn tensile strength and changes in color related to staining from soil or the cleaning method may be observed. Although the strength of Kevlar® yarns used in protective apparel, e.g. gloves, gradually decreases with successive cleaning cycles, the cut resistance is not impacted, as illustrated in the charts below.



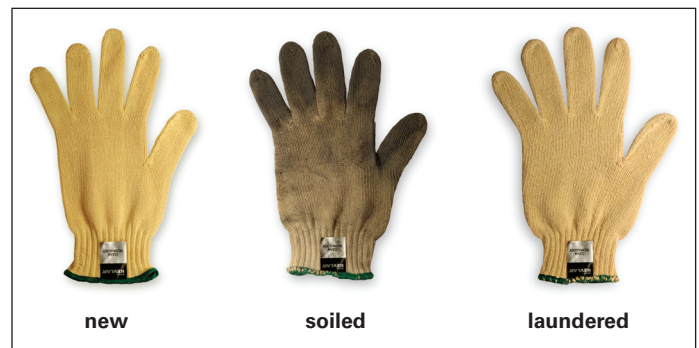
\* Yarn samples for strength testing were extracted from gloves after the number of cleaning cycles specified.

\*\* Cut resistance measured in accordance with ASTM F1790-05 using the CPPT instrument. Gloves were not used in any industrial application prior to or between cleaning cycles.

On average, the typical glove shrinkage observed is 3% or less over 10 cleaning cycles when laundering or dry cleaning gloves made of 100% Kevlar® brand fiber. Shrinkage is primarily due to the knit structure and the gloves will expand back to normal size when placed on the hand.

Cleaning procedures can usually be developed to remove most industrial soils. In some applications protective apparel can become contaminated with epoxies, adhesives, paint, or other materials that are difficult to remove. A standard for retiring gloves due to soiling or contamination should be established.

## Example of Gloves Before and After Cleaning



## Effect of Bleach on Kevlar® Glove Performance

Kevlar® brand fibers are resistant to many chemicals and solvents. However, strong acids, bases, and certain oxidizers, like chlorine bleach\* (sodium hypochlorite), cause rapid degradation of the fiber. Although chlorine bleach (e.g. Clorox® Regular Bleach) cannot be used with Kevlar®, oxygen bleaches such as sodium perborate (e.g. OxiClean®) can be used without issue. The table on the following page shows the impact of both chlorine and oxygen bleach on the yarn strength and cut resistance of Kevlar® gloves.

\* Chlorine bleach or chlorine generating chemicals should not be used with Kevlar®.



**Kevlar®**

# DUPONT™ KEVLAR® LAUNDERING GUIDE

## Effect of Bleach on DuPont™ Kevlar®

Number of Laundering Cycles	Chemicals Used	Average Breaking Strength, lb	Strength Retention %	Average Rating Force, g
0	N/A	18.1	—	1393
6	Detergent only	17.6	97	1372
6	Detergent + chlorine bleach	2.2	12	1398
6	Detergent + oxygen bleach	16.9	94	1376

Tests run on 20 oz/yd<sup>2</sup> gloves produced from spun Kevlar® yarns. Yarn samples for strength testing were extracted from gloves after the cleaning process specified. The oxygen bleach used in this test was OxiClean® (sodium perborate-based bleach).

When gloves are laundered repeatedly with chlorine bleach, DuPont™ Kevlar® yarn loses the majority of its strength and the fabric can be torn by hand. When oxygen bleach is used, the yarn loses less than 10% of its original strength. Under these conditions, the Kevlar® product performs in a similar fashion to what is observed when laundering without bleach. As illustrated in the charts on page 1, changes in Kevlar® yarn strength have little impact on the cut resistance of the product.

## Gloves Incorporating Other Materials

It is important to note that while apparel made of 100% DuPont™ Kevlar®, Kevlar® Clean, and Kevlar® Armor brand fibers can be laundered or dry cleaned without issue, products incorporating other materials such as companion yarns, coatings, cuff elastic, etc. may require special care. Rubbers, plastics, and elastic material used in gloves and other protective apparel may be sensitive to some detergents, cleaning additives, or dry cleaning solvents. This may result in hardening or the loss of other functional properties after repeated cleaning. Selection of the correct cleaning process is vital to maximize the useful life of your protective apparel. Consult your supplier or cleaning professional to determine whether or not the products you are using have special cleaning requirements.

## Life Cycle of Protective Apparel Made with Kevlar®

Gloves made of Kevlar® fiber are highly resistant to cut damage from sharp edges on objects such as sheet metal and glass. As with any protective apparel, damage due to wear may occur with normal use. The average service life of protective apparel made from Kevlar® is determined by several factors including: fabric basis weight, article construction, nature of the hazard during use, the cleaning/repair program, and the standard for keeping gloves in service, which is established by the user. Protective apparel made with Kevlar® can often be repaired by mending the damaged area with thread or patches made of Kevlar® brand fiber.

## Effective Glove Programs

An effective glove cleaning program requires a good control system to ensure that dirty gloves are properly accounted for and recycled or replaced after cleaning. Simple measures, such as trading used gloves for clean or new gloves, can be taken to implement this. An agreement should also be established with your cleaning service regarding the cleaning procedures used, cleanliness level required, inspection/repair services provided, and the process for removing damaged apparel from service. In addition, outlets exist for recycling the 100% Kevlar® fiber content of protective apparel when the items are no longer fit for intended use. However, this recycled fiber should not be used for protective apparel applications.

*When protective apparel is used every day, as it should be in a protective apparel program, any damage or excessive wear can compromise the safety expected from its use. Protective apparel should be examined closely by each employee prior to donning to confirm fitness for use. Damaged items should be replaced and either discarded or repaired.*

## DuPont Personal Protection

### Customer Service:

Canada 1-800-387-9326

Mexico (52) 55 57 22 1222

United States 1-800-931-3456

[www.PersonalProtection.DuPont.com](http://www.PersonalProtection.DuPont.com)



*The miracles of science™*

**Product safety information is available upon request.** This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own determinations. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. It is the user's responsibility to determine the level of risk and the proper protective equipment needed for the user's particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DUPONT MAKES NO WARRANTIES AND ASSUMES NO LIABILITY IN CONNECTION WITH ANY USE OF THIS INFORMATION. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any trademark or patent right.

Copyright © 2007 DuPont. The DuPont Oval Logo, DuPont™, The miracles of science™, and Kevlar® are registered trademarks or trademarks of E.I. du Pont de Nemours and Company or its affiliates. All rights reserved.

Clorox® is a registered trademark of The Clorox Company.

OxiClean® is a registered trademark of Church & Dwight Co., Inc.

K-17038 (08/07) Printed in the U.S.A.