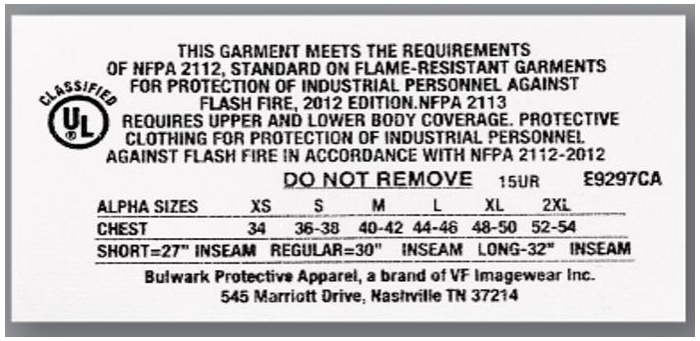
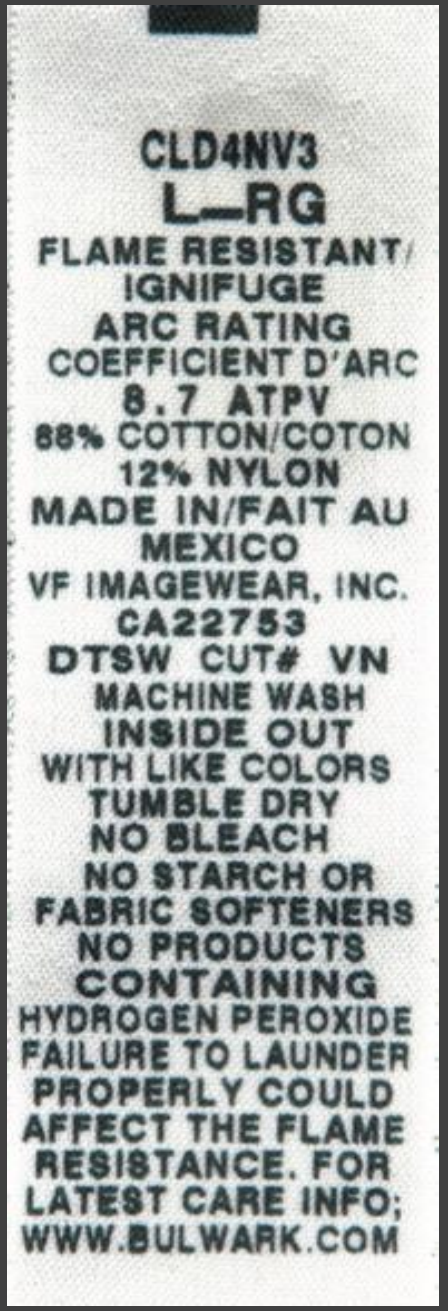
WEST CENTRAL SAFETY COUNCIL

A helpful guide to understanding Fire Resistant PPE by Sophia Dixon



Bulwark® FR



What is Flame Resistant Clothing?

- Clothing made from fabrics that self-extinguish.
- Fabrics may be natural or synthetic Designed to limit (not eliminate) burn injury.
- **Everyday fabrics can ignite, burn and possibly melt when exposed to an electric arc or flash fire,** cotton, polypropylene, acetate, polyester, nylon – this will **increase the extent of a worker's injury.**

HOW DO YOU KNOW IF YOU NEED FR: 1910.132

Knowing your hazard and/or hazards by conducting a hazard assessment and matching the appropriate regulations and standards.

1910.132 (d) (1) - The employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE). If such hazards are present, likely to be present, the employer shall:

1910.132(d)(1)(i)

Select, and have each affected employee use, the types of PPE that will protect the affected employee from the hazards identified in the hazard assessment;

1910.132(d)(1)(ii)

Communicate selection decisions to each affected employee; and,

1910.132(d)(1)(iii)

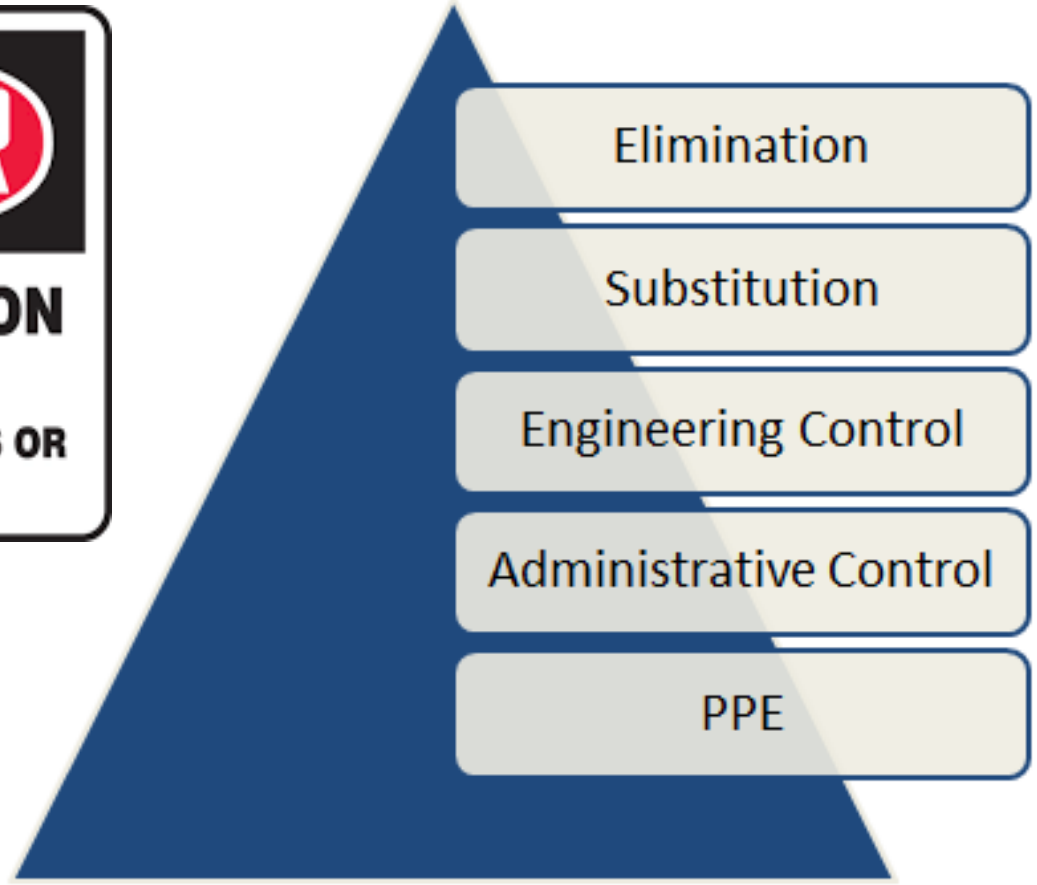
Select PPE that properly fits each affected employee

BulwarkFR®

HAZARD Example: Visibility & Flash Fire Hazard

EFFECTIVENESS

Hierarchy of Controls



- No Pedestrian traffic
- Separate doors
- Mirrors
  Motion sensor
- Training
- **HVSA**
  FR

OSHA cited both companies for failing to ensure that employees wore High-Visibility vests while working at night

OSHA News Release - Region 4

U.S. Department of Labor

November 6, 2018

U.S. Department of Labor Cites Employers at Georgia Distribution Center

SAVANNAH, GA – The U.S. Department of Labor's Occupational Safety and Health Administration (OSHA) has cited U.S. Xpress Inc. and Dollar Tree Distribution Center Inc. for exposing workers to struck-by and other hazards after a powered industrial truck fatally struck an employee at the distribution center in Savannah, Georgia. Dollar Tree Distribution Center Inc. and U.S. Xpress Inc. face penalties of $130,112 and $12,934 respectively.

OSHA cited both companies for failing to ensure that employees wore high-visibility vests while working at night inside the center. OSHA also cited Dollar Tree Distribution Center Inc. for using a vehicle with a non-functioning headlight, failing to guard a nip point on a conveyor discharge belt, and storing unstable materials on racks.

"This tragedy could have been prevented had the employer assessed the workplace for hazards, and taken action to eliminate the safety risks to employees," said OSHA Savannah Area Office Director Margo Westmoreland.

The companies have 15 business days from receipt of the citations and proposed penalties to comply, request an informal conference with OSHA's area director, or contest the findings before the independent Occupational Safety and Health Review Commission.

Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to help ensure these conditions for America's working men and women by setting and enforcing standards, and providing training, education, and assistance. For more information, visit https://www.osha.gov.

Arc Flash Incident – Chicago April 18, 2004

abc7chicago.com

michigan

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ABC7 BIOS

NEWS HEADLINES

print story | email story last updated: 4/18/2004

Man working at school dies of injuries from fire

April 18, 2004 — A Berwyn man is dead six days after being burned in a fire at Chicago's Wright Elementary School. Pedrag Djakovic, 34, was doing electrical work at the school on North Harding Avenue.

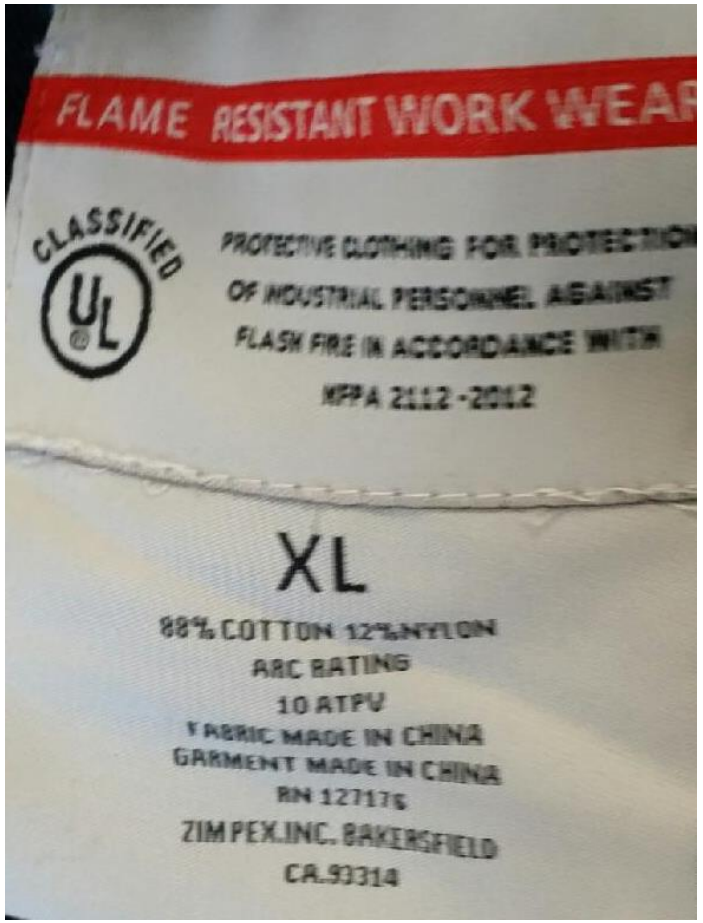
According to the Cook County medical examiner, the wire he was working on sparked setting his clothing on fire. He died at Stroger Hospital yesterday afternoon.

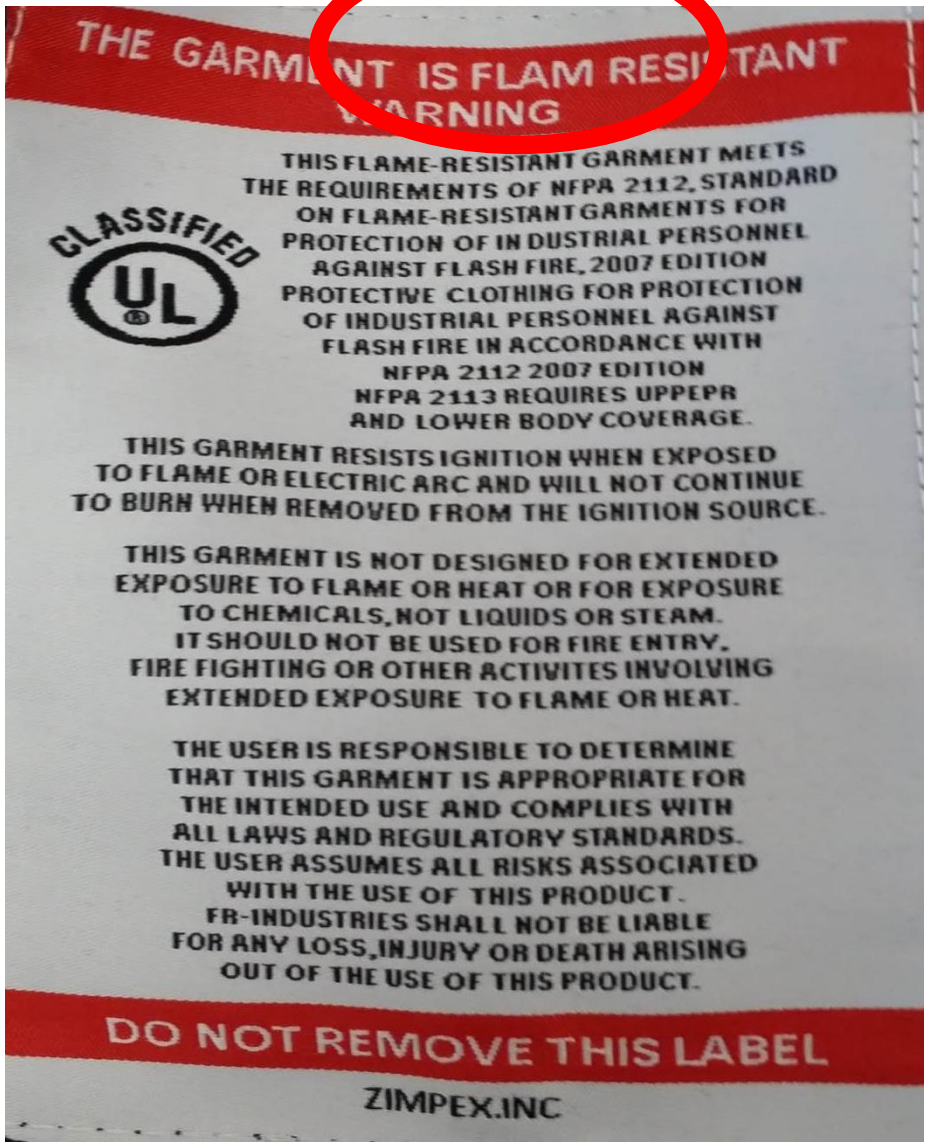
Wright will remain closed for repairs for the rest of the school year.

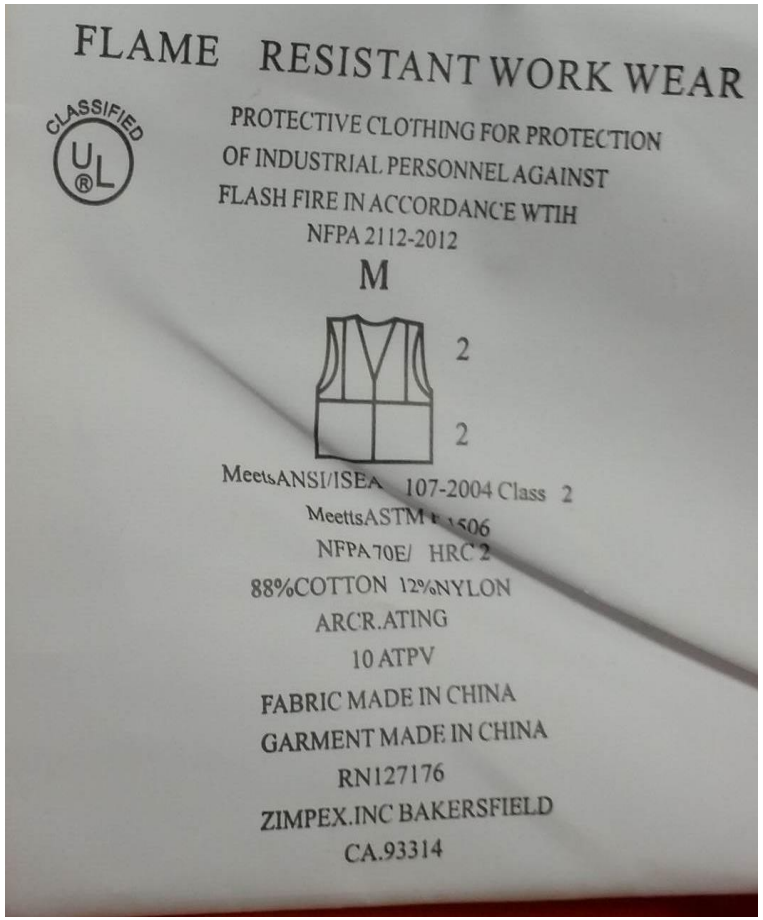
RELATED LINKS

SEARCH FOR RELATED ITEMS

Bulwark UNIVERSITY


FLAME RESISTANT WORK WEAR
CLASSIFIED
UL
PROTECTIVE CLOTHING FOR PROTECTION
OF INDUSTRIAL PERSONNEL AGAINST
FLASH FIRE IN ACCORDANCE WITH
NFPA 2112 -2012
XL
88% COTTON 12%NYLON
ARC RATING
10 ATPV
FABRIC MADE IN CHINA
GARMENT MADE IN CHINA
RN 127176
ZIMPEX.INC. BAKERSFIELD
CA.93314


THE GARMENT IS FLAM RESISTANT
WARNING
CLASSIFIED
UL
THIS FLAME-RESISTANT GARMENT MEETS
THE REQUIREMENTS OF NFPA 2112, STANDARD
ON FLAME-RESISTANT GARMENTS FOR
PROTECTION OF IN DUSTRIAL PERSONNEL
AGAINST FLASH FIRE, 2007 EDITION
PROTECTIVE CLOTHING FOR PROTECTION
OF INDUSTRIAL PERSONNEL AGAINST
FLASH FIRE IN ACCORDANCE WITH
NFPA 2112 2007 EDITION
NFPA 2113 REQUIRES UPPEPR
AND LOWER BODY COVERAGE.
THIS GARMENT RESISTS IGNITION WHEN EXPOSED
TO FLAME OR ELECTRIC ARC AND WILL NOT CONTINUE
TO BURN WHEN REMOVED FROM THE IGNITION SOURCE.
THIS GARMENT IS NOT DESIGNED FOR EXTENDED
EXPOSURE TO FLAME OR HEAT OR FOR EXPOSURE
TO CHEMICALS, NOT LIQUIDS OR STEAM.
IT SHOULD NOT BE USED FOR FIRE ENTRY.
FIRE FIGHTING OR OTHER ACTIVITES INVOLVING
EXTENDED EXPOSURE TO FLAME OR HEAT.
THE USER IS RESPONSIBLE TO DETERMINE
THAT THIS GARMENT IS APPROPRIATE FOR
THE INTENDED USE AND COMPLIES WITH
ALL LAWS AND REGULATORY STANDARDS.
THE USER ASSUMES ALL RISKS ASSOCIATED
WITH THE USE OF THIS PRODUCT.
FR-INDUSTRIES SHALL NOT BE LIABLE
FOR ANY LOSS, INJURY OR DEATH ARISING
OUT OF THE USE OF THIS PRODUCT.
DO NOT REMOVE THIS LABEL
ZIMPEX.INC


FLAME RESISTANT WORK WEAR
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OF INDUSTRIAL PERSONNEL AGAINST
FLASH FIRE IN ACCORDANCE WTIH
NFPA 2112-2012
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2
2
MeetsANSI/ISEA 107-2004 Class 2
MeettsASTM F1506
NFPA70E/ HRC 2
88%COTTON 12%NYLON
ARC RATING
10 ATPV
FABRIC MADE IN CHINA
GARMENT MADE IN CHINA
RN127176
ZIMPEX.INC BAKERSFIELD
CA.93314

Burn Injury Costs

Burn treatment requires approx.

1.5 days hospitalization per % burn

Average hospitalization is 19 days,

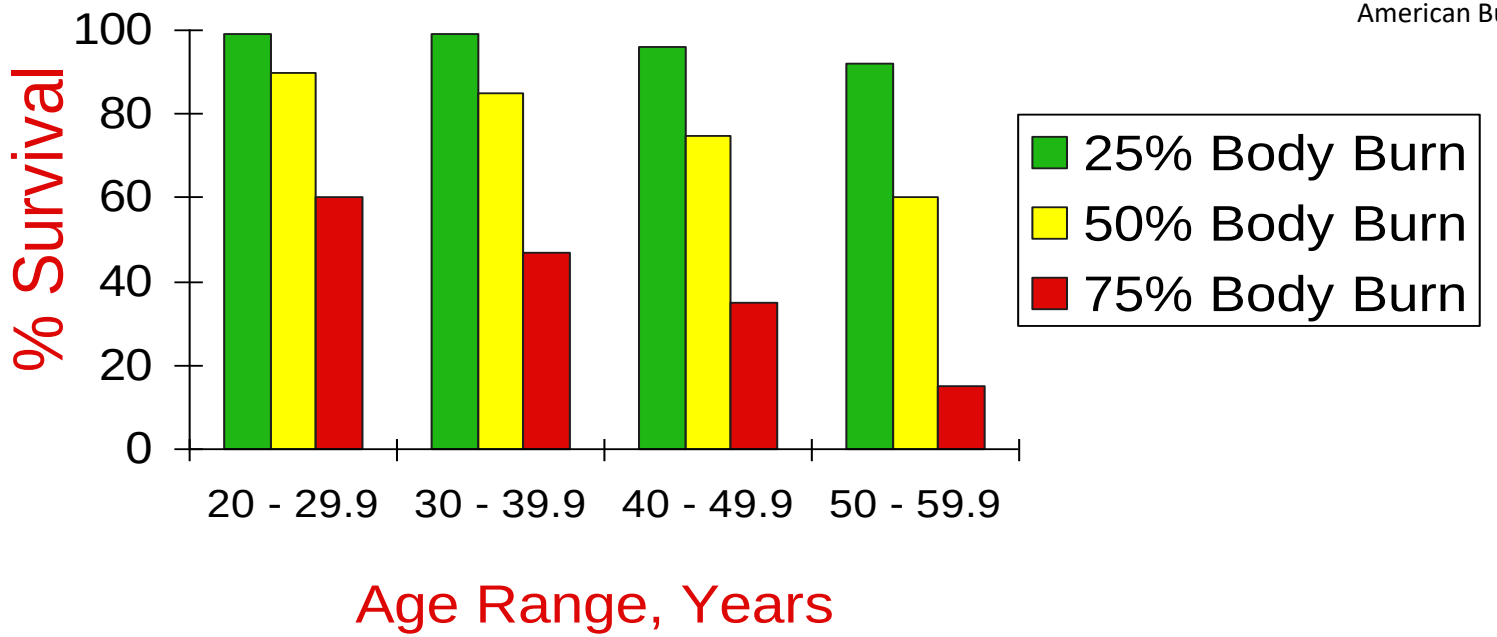
at costs exceeding $25,000/day

Total hospitalization cost typically ranges from **$200,000 to $750,000, with many**

over $1,000,000 USD

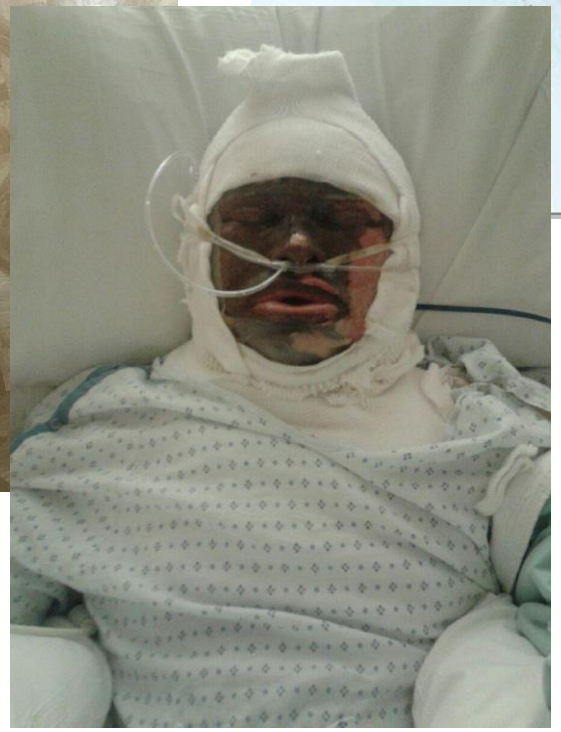
Lifetime Costs can exceed $10,000,000.00

Burn Injury – Chances of Survival



American Burn Association 2000 - 2009

CONSEQUENCES OF USING THE WRONG PRODUCT



OSHA General Duty Clause – OSH Act 1970

Is it employer's responsibility to choosing FR?

SEC. 5. Duties

(a) Each employer --

(1) shall furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees;

OIL & GAS – FLASH FIRE

In the Oil & Gas industry, which includes exploration, drilling, field services, refinement, and chemical production, the **primary known hazard is flash fire, a rapidly moving flame front that expands through diffuse fuel without creating blast pressure**.

NFPA® 2112 and NFPA® 2113 are the "go-to" industry consensus standards that address flash fire. **NFPA® 2112 lays out the standards that FR garments must meet in order to enter the market** (covering everything from the capabilities and characteristics of the fabrics, to construction of the garment, the types of closures to be used, and comfort). **NFPA® 2113 focuses on how organizations and employers—as well as individual wearers—should choose the correct garment based on certain criteria**.

Once they have identified their hazard and determined that FR is necessary, safety managers can identify appropriate garments based on other factors like comfort, range-of-motion, durability, and laundering options.

WHAT SHOULD BE ON A LABEL?

ASTM F1506 6.3 requires that garments should be labelled with:

6.3.1 Tracking identification code system

6.3.2 Meets requirements of Performance Specification F1506

6.3.3 Manufacturer's name

6.3.4 Size and other associated standard labeling,

6.3.5 Care instructions and fiber content

6.3.6 Arc rating (ATPV) or arc rating (EBT).

6.3.6.1 When garments are made with a different number of fabric layers in different areas of the garment, the arc rating for each area shall be designated. Pockets, trim, closures, seams, labels, and heraldry shall not be considered as extra layers.

Garments shall be labeled with:

6.3.1 Tracking identification code system – Bulwark has total traceability; inspected across 60 manufacturing touchpoints.

6.3.3 Manufacturer's name

Bulwark® BULLETIN

Bulwark is the North American market leader in durable flame resistant protective garments. We are part of VF Corporation, the world's largest publicly traded apparel company. In our position as market leader we offer a variety of options in flame resistant protection and always seek to place our customers first in everything we do.

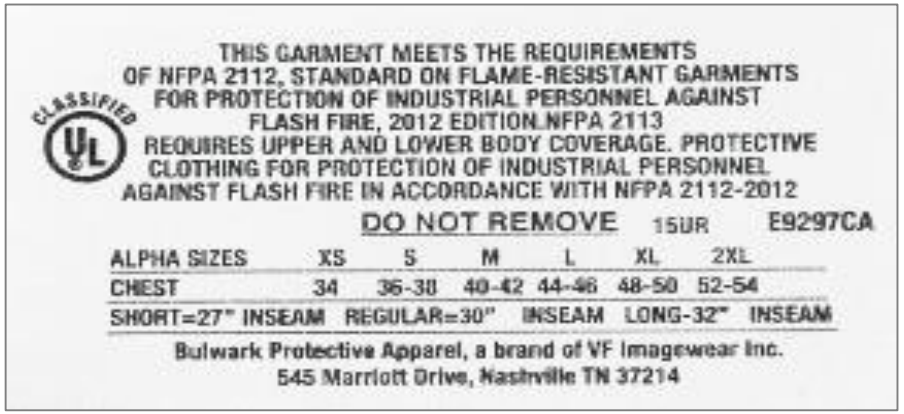
The warranty of Bulwark Protective Apparel is stated in our conditions of sale. We will ship the goods ordered and they will be free of fabric or manufacturing defects. Bulwark will repair of replace any garment that has a manufacturing defect. No other warranty is made, either expressed or implied, including no guarantee of fitness for a particular use or purpose.

The responsibility of Bulwark is that flame resistant apparel carrying our label will meet the performance requirements of the specifications and standards as stated on the garment labels and in our product literature. As long as our laundry instructions are followed, the flame resistance of Bulwark garments is guaranteed for the life of the garment.

Bulwark garments are designed for continuous wear. They meet the requirements specified in ASTM International Standard F2302-03 for labeling protective clothing as heat and flame resistant. They also meet the performance requirements of National Fire Protection Association (NFPA) Standard 70E, Electrical Safety Requirements for Employee Workplaces, 2004 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 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.

Bulwark is proud of the flame resistant protective apparel we offer and of the leadership we provide to the market. Please advise if you have any questions or need additional information.



6.3.2 Meets requirements of Performance Specification F1506

ASTM F1506 6.3 requires:

Garments shall be labeled Arc rating (ATPV) or arc rating (EBT)

Value attributed to materials performance to exposure to electrical arc.

The arc rating is expressed in cal/cm2 and is derived from
the determined value of the arc thermal performance value (ATPV)
or energy of breakopen threshold (EBT)
(should a material system exhibit a breakopen response below the ATPV value).

When is this helpful?

1. **Are you meeting the minimum**
2. **Layering -** https://bulwark.com/Calculator

Hazard/Risk Categories defined……

PPE Category	Clothing Description	Req'd Min ATPV (cal/cm^2)
1	Arc-rated FR shirt and FR pants or FR coverall	4
2	Arc-rated FR shirt(s) and FR pants or FR coverall	8
3	Arc-rated FR shirt and pants or FR coverall and arc flash suit selected so that the system arc rating meets the required minimum	25
4	Arc-rated FR shirt and pants or FR coverall and arc flash suit selected so that the system arc rating meets the required minimum	40

FR/AR Layering

In an Arc Flash the threat of break open is real (the AR garment reaches it's performance threshold and begins to fail exposing either the naked skin or the light weight Non AR undershirt to thermal energy causing injury or worse potential ignition adding to the injury.

FR/AR Base layers buy into the overall goal of your AR Clothing program which is to minimize injury.

Baselayers also eliminates the two major problems:

1. Meltable under garments and
2. the need to police underwear

Why is it necessary to have proper AR/FR PPE?

Arc-rated clothing protects the wearer from burn injury in two distinct, measurable ways!

1. **The first is the thermal barrier the fabric provides.**

2. **The strength of the fabric's ability to remain intact and not**

NFPA70E Annex M - Total System Arc Rating.

M.3.1 The total system arc rating is the arc rating obtained when all clothing layers worn by a worker are tested as a multilayer test sample.

M.3.2 It is important to understand that the total system arc rating cannot be determined by adding the arc ratings of the individual layers.

The only way to determine the total system arc rating is to conduct a multilayer arc test on the combination of all the layers assembled as they would be worn.

Hi-Viz FR Labels

ANSI 107-2015

FR LABEL

XYZ Company
ANSI/ISEA 107-2015
100% Modacrylic
Model #: ABC
Size: Large

Type R
Class 2
FR: ASTM F2302

FR: ASTM F1506
ATPV 9.0 cal/cm²

Washing Instructions:

Machine wash warm, 40 °C (105 °F)
Max washings – 50X
Do not bleach
Tumble dry low
Do not iron
Do not dry clean
Made in USA

"NOT FR"

XYZ Company
ANSI/ISEA 107-2015
100% Polyester
Model #: ABC
Size: Large

Type R
Class 2
Not FR

This garment is not flame resistant as defined by ANSI/ISEA 107-2015 Section 10.5.

Washing Instructions:

Machine wash warm, 40 °C (105 °F)
Max washings – 50X
Do not bleach
Tumble dry low
Do not iron
Do not dry clean
Made in USA

- Must state that garment meets ANSI 107-2015
- Must contain pictogram showing HVSA type Type R, Type O, Type P
- If FR, must include specific standard used to evaluate flame resistance
  - ASTM1506, 2733, 1891
  - NFPA 1977, 2112
- If not FR, must state "Not FR" and site ANSI 107-2015 standard

6.3.5 Care instructions & fiber content

CARE LAUNDRY TIPS

1. Do not use any kind of bleach or peroxide

2. Do not use any additive that could build up and impede FR performance

3. Wash FR/AR garments separately

4. Turn FR/AR garments inside out to help color retention and preserve appearance

5. Use liquid detergent for best results

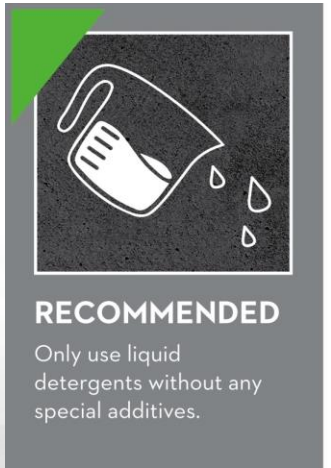
6. Avoid the hottest temperature to reduce the impact of shrinkage

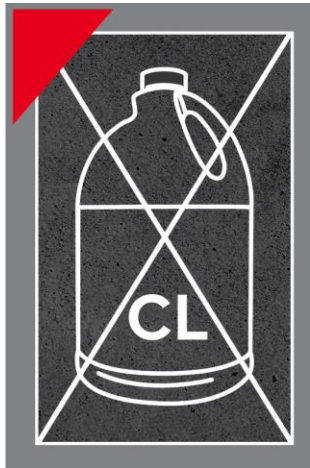
7. For tough stains, soak garments in liquid detergent or non-bleach, non-peroxide pre-wash stain removers

8. For even tougher stains, Bulwark® FR garments may be dry cleaned

9. Tumble dry on low setting and do not over dry

10. Rewash garments with lingering odor.





WHAT CAN YOU USE?

IMPORTANT TO READ THE LABEL – DO NOT USE -

SOILED GARMENTS

Discoloration/stains alone are not an indicator of reduced protection.

Monitor the accumulation of secondary accelerants on your garments throughout the day.

After laundering make sure accelerants are removed. SNIFF!!

Rewash the garment until the odor is gone.

REPAIRING OR REPLACING

Beyond proper cleaning, the efficient and safe care and maintenance of FR depends on regular and thorough inspection along with appropriate repair and/or replacement.

Regular inspections should look for:

Correct fit - shrinkage can cause a garment to fit too tightly

Garment integrity - this means tears, rips, loose seams, holes, etc.

Stains - particularly the oily, sticky, or smelly ones.

REPAIRING OR REPLACING

Repairs must be made with fabric and findings that match the protection level of the original garment.

Garments that cannot be safely repaired must be removed from service.

OSHA

1910.132(b)

Employee-owned equipment. Where employees provide their own protective equipment, the employer shall be responsible to assure its adequacy, including proper maintenance, and sanitation of such equipment.

DOES SIZE OF LOGO MATTER?

Annex A Explanatory Material

N A.7.1.2.1 If non-flame-resistant emblems are attached to the exterior of a garment, the maximum number should be five with no individual emblem covering an area greater than 103 cm2 (16.0 in.2) or total area from all these emblems covering an area greater than 258 cm2 (40 in.2).

The definition exists in the Annex and is not a part of the requirements of this NFPA document but is included for informational purposes only. This annex contains explanatory material, numbered to correspond with the applicable text paragraphs.

INHERENT VS TREATED

Even though the most popular FR garments worn today utilize a combination of the 3 **engineering** methods, the terms remain:

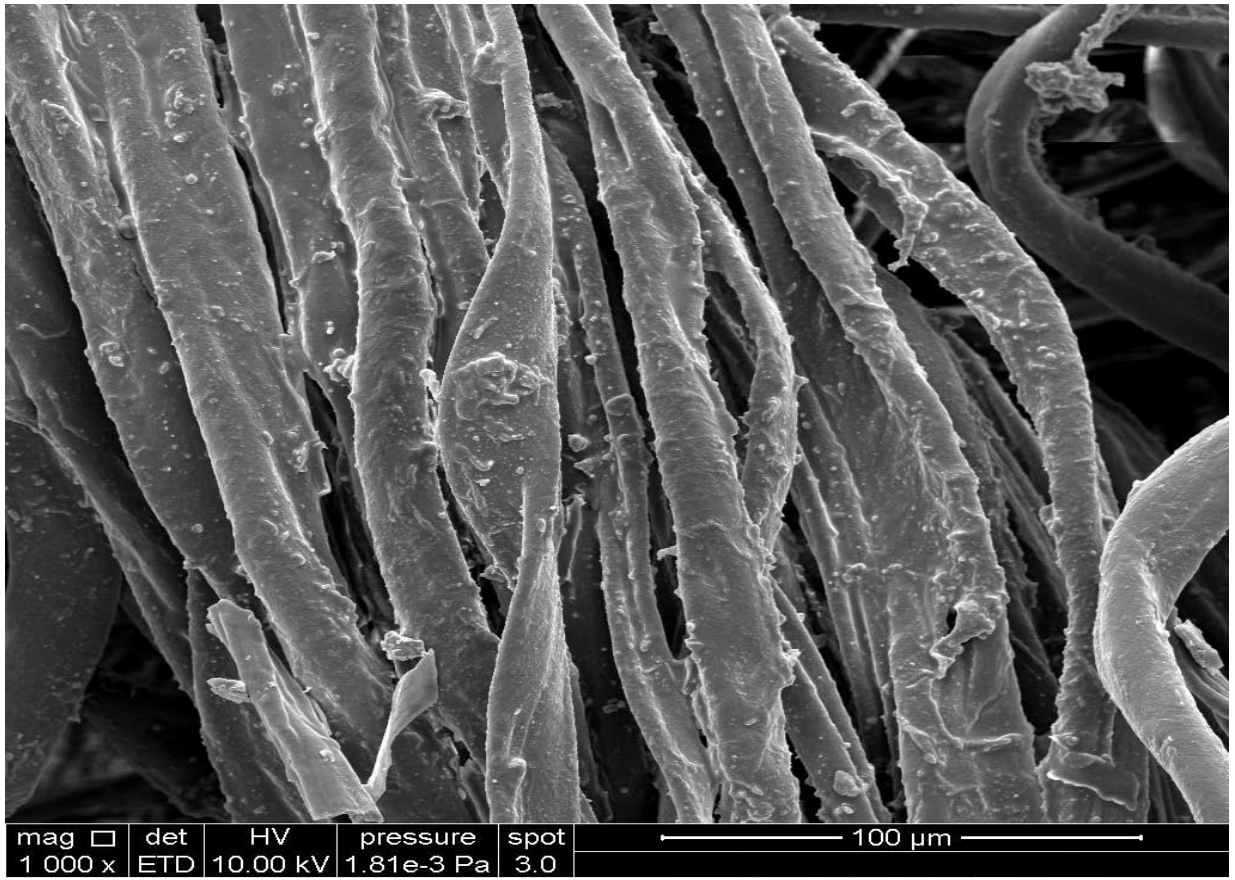
Inherent: With slight variations, the consensus definition is “by its very nature, as a core property,” it’s FR without any additional finishing.

Treated: Refers to chemical engineering that imparts FR properties not previously present.

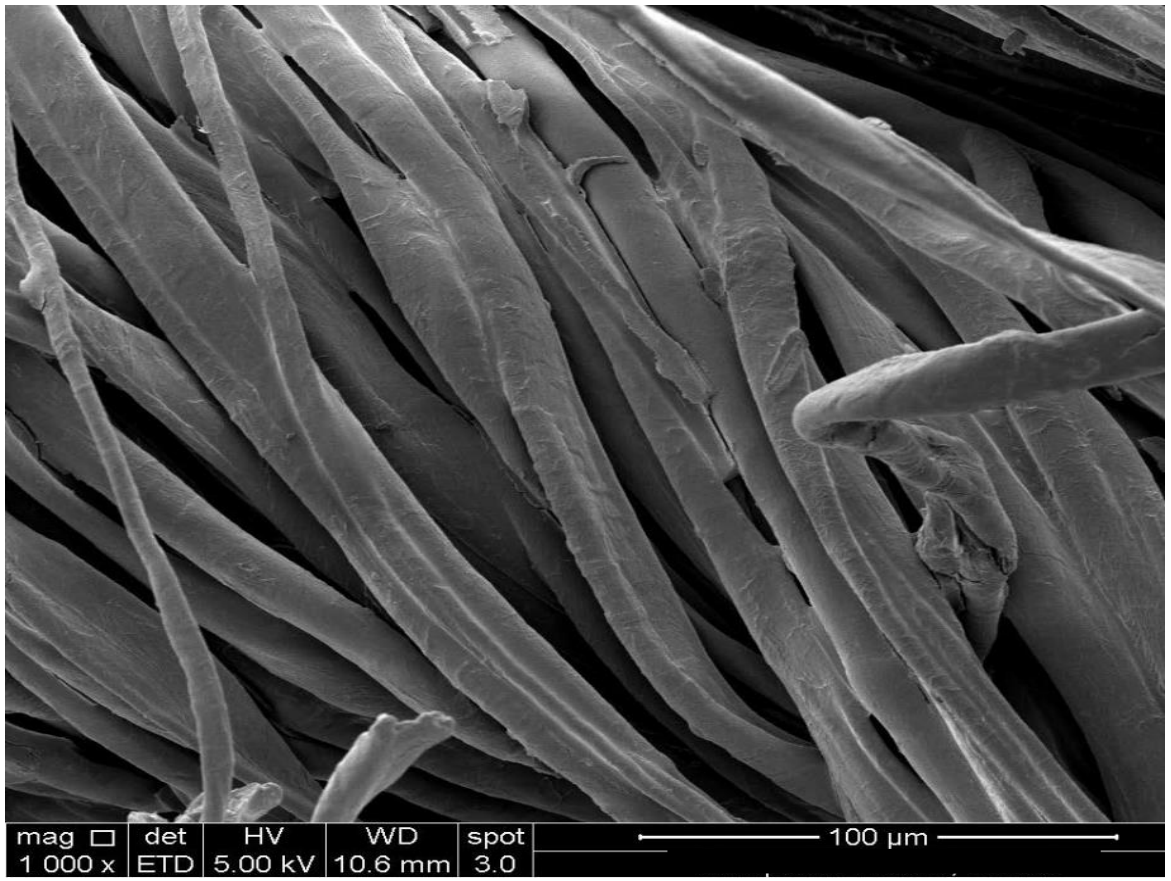
Originally, these terms were meant to differentiate permanent FR properties from FR chemical applications that eventually wore out.

LOOK A LITTLE CLOSER - IT'S ALL ABOUT THE BUBBLES:

iQ chemistry uses phosphorous with a higher ratio of nitrogen. The more nitrogen, the more bubbles form on char surface. More bubbles = more protection.



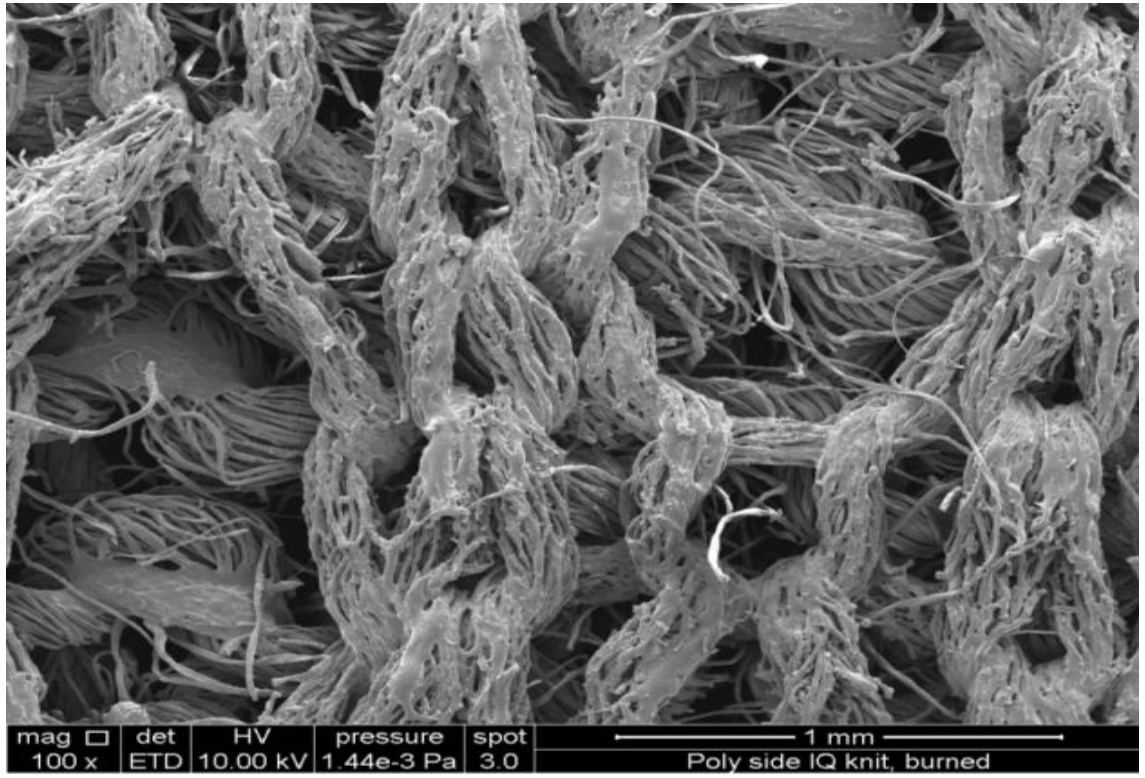
Microscopic imagery of a competitor's FR knit, using traditional ammoniated phosphorous-based chemistry.

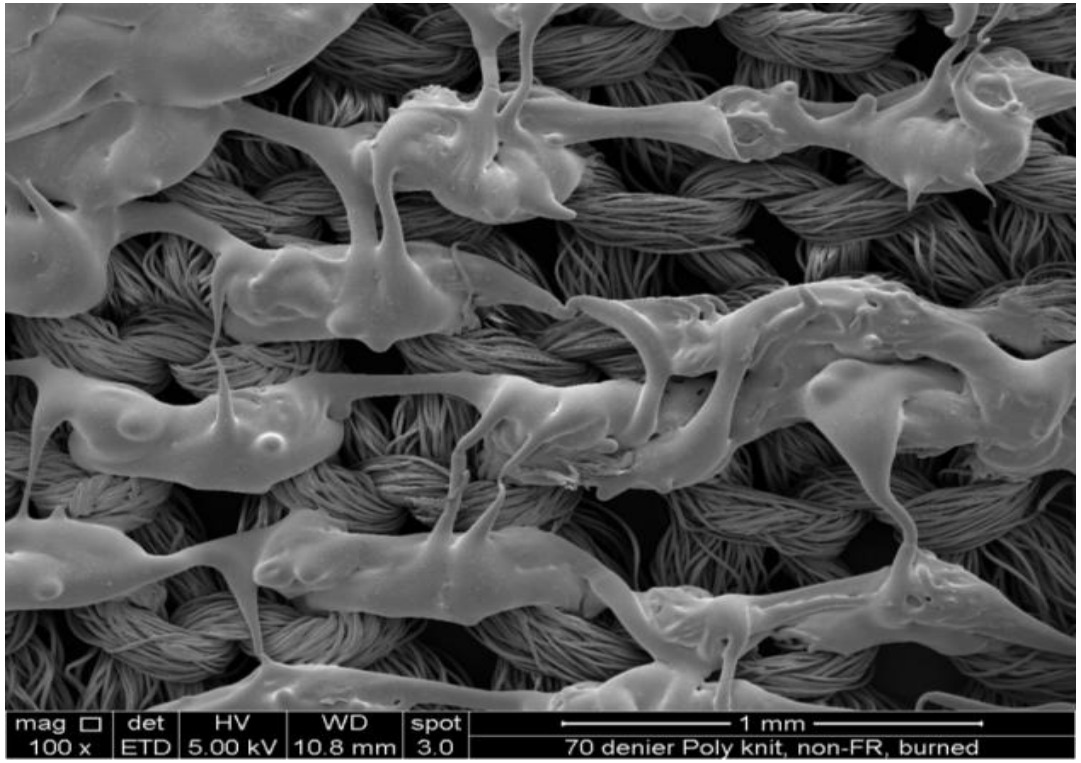


G^2 CHEMISTRY PROTECTS POLYESTER FROM MELTING

Polyester yarn in iQ Comfort Knit stays intact for more stable fabric – providing consistent protection.

In un-treated iQ knit fabric, polyester fibers melt when exposed to temperatures > 250º C.





ARAMID FIBER	COTTON/LYOCELL	NYLON	MODACRYLIC
Strength	**Strength**	**Strength**	**Strength**
Thermal Stability	Easy to Dye	Easy to Dye	Inherent Flame Resistant
High Strength	Comfortable	Tough	Easy to Dye
Superior Toughness	Wicking Performance	Strong	Tough
	Lower Price	Lower Price	Strong
			Lower Price
Weakness	**Weakness**	**Weakness**	**Weakness**
Poor Wicking	Non-FR	Non-FR	High Shrinkage * low dryer
High Price	Relatively Weak	Meltable	Uncomfortable
Difficult to Dye	Lack Durability	Uncomfortable	
Degraded by UV Light			
Nomex, Conex, Kevlar, Twaron, Technora, Kermel			

Taber Abrasion Compared to CT2

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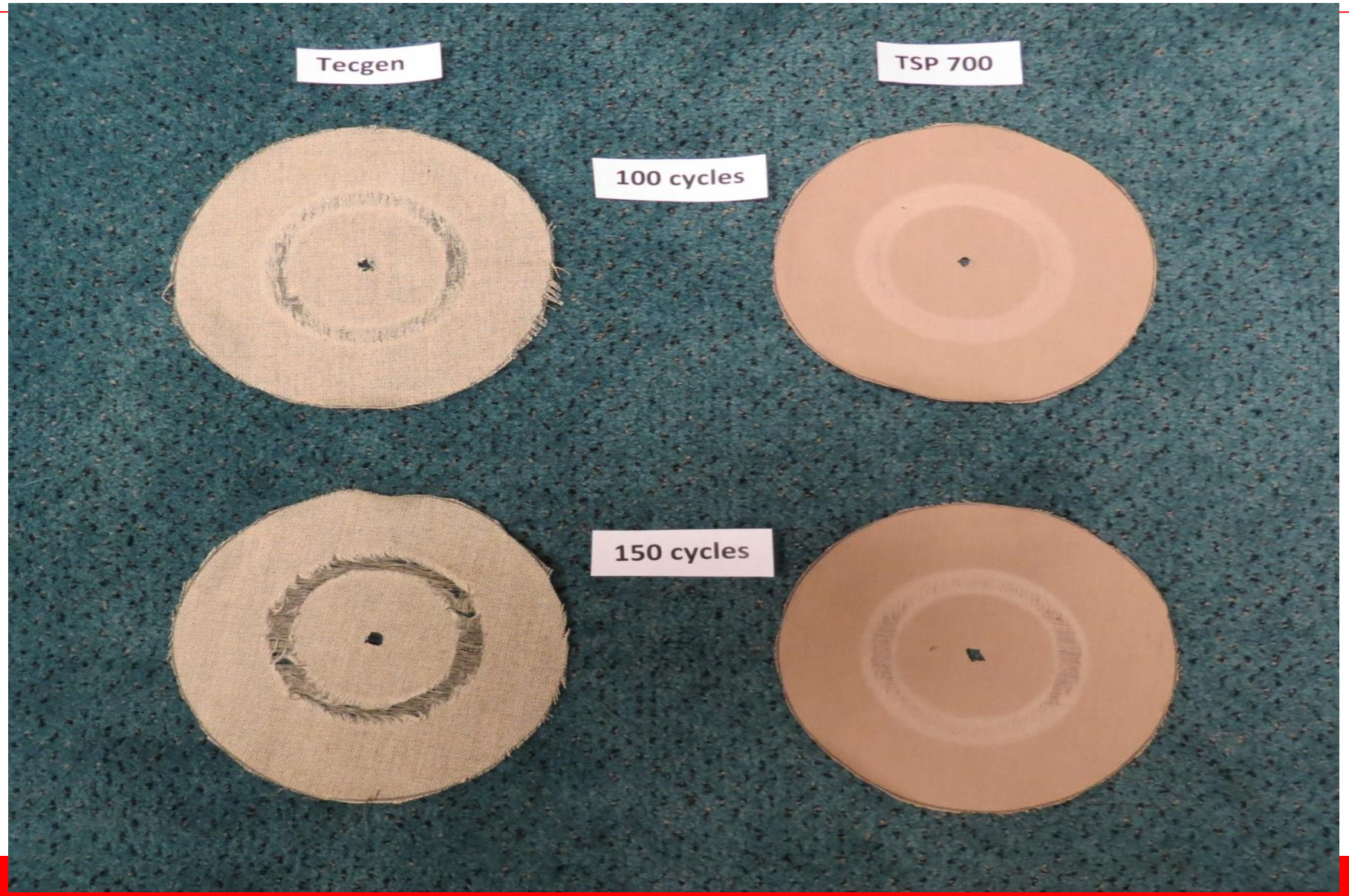
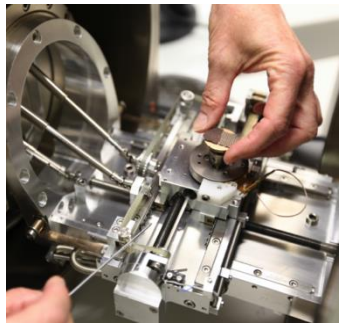


Fabric delivers DURABILITY + COMFORT




BETTER DURABILITY
LOOK BETTER LONGER

WIN WIN

MORE COMFORTABLE
FEEL BETTER LONGER

How:
- Abrasion resistance
- Color retention
- After-wash appearance

How:
- Air Permeability
- Moisture Management
- Fabric Weight

MELTING UNDERGARMENTS

In addition to assessing the workplace for flame and electric-arc hazards and estimating the heat energy that an electric arc might expose a worker to, employers must ensure that the employee wears flame-resistant protective clothing with an arc rating that matches the potential threat and that won't melt, ignite, or continue to burn when exposed to flames or electric arc heat energy.

IMPLEMENTATION: USING PPE CORRECTLY AND EFFECTIVELY IN THE FIELD

Even the best PPE is pointless if workers don't know how to correctly use the things that are meant to protect their lives. That's why training and instruction in proper use, as well as "do's and don'ts," is critical to an FR program's success.

TRAINING

Employers implementing a PPE program are required by OSHA 1910.132(f)(1)10 and all industry consensus standards to provide training to each employee.

According to OSHA, each employee who is required to wear PPE should at least know when it is necessary, what exactly is necessary, how to don and doff and adjust it, what its limitations are, and how to properly care for it.

In addition to the requirement that employees be trained to use PPE properly, OSHA points to other specific industry consensus standards that provide even more specific details, such as NFPA® A.5.1.1.

THANK YOU

Bulwark® UNIVERSITY

Incidents & Accidents Happen

“Street Clothing” can and does worsen injury

You Can’t Rely on “It’s Not Going to Happen to Me”

You Can Do Something About Your Clothing

DO NOT BUY USED FR CLOTHING

Sophia Dixon 614-546-9555