

DuPont Protective Apparel
Canadian Healthcare
Engineering Society

Manitoba Chapter

Education Day April 24/18



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Agenda

- Overview of our 3 major brands of Worker PPE.
- Not all white suits are the same
 - Proshield (SMS)
 - Proshield 50 (Microporous Film)
 - Tyvek® Line of offerings
 - Tyvek® difference
- NEW PRODUCT!!!
- Where do you get this stuff
- Product Information and specification sheets.
 - Hazard Matrix Reference Sheet
 - SafeSPEC™ & Mobile App
 - Industry Specific Marketing Collateral

DuPont Protective Apparel

Global Category-leading, finished-product business



Non-hazardous liquids and particulate



Hazardous particulate & light chemical splash



Chemical, biological, and thermal hazards



Let's start with a question...

Duh#d0#z k l h#x l w² #fuhdwhg#htxd0

Have you seen this before?



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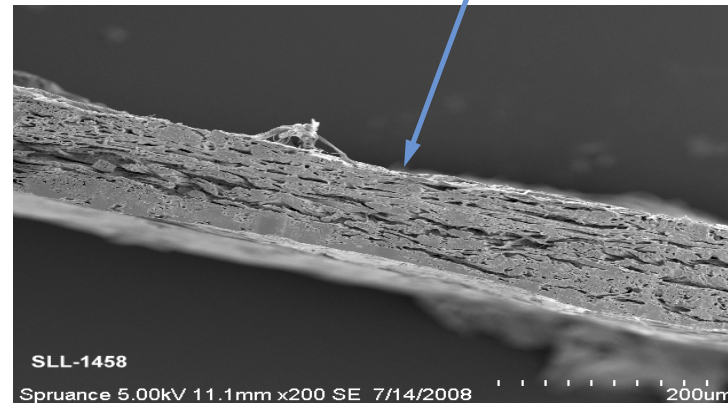
What is DuPont™ Tyvek®?



- High-density polyethylene (HDPE)
- Flashspun and bonded using heat and pressure
- Continuous filaments formed into a sheet
- Fibers randomly distributed, non-directional
- Anti-stat treatment – to reduce nuisance static
- Only made by DuPont

Porous for breathability

Tough, continuous fibers create a tortuous path for superior barrier properties



Tough, continuous fibers for strength and puncture resistance

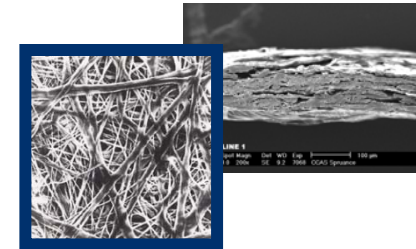


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There are many different Fabric Technologies

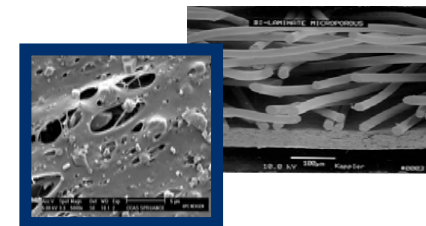
High Density Polyethylene (Tyvek®)

- 100% flashspun polyethylene fibers entangled into a fabric
- Inherent protection and durability; no fillers or thin films to wear away



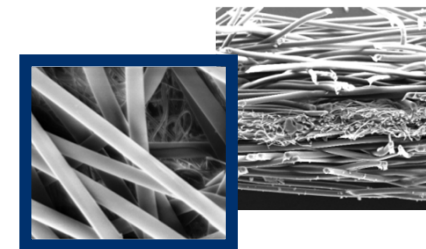
Microporous Films (SF or MF)

- Bi-laminate fabric with thin microporous film and spun-bonded polypropylene non-woven
- Limited durability protection; once the film layer is gone barrier protection is lost



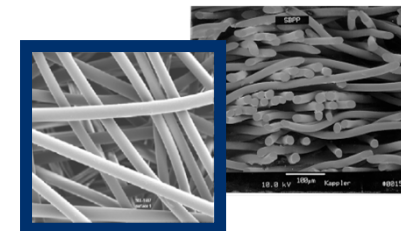
Spunbonded/Meltblown/Spunbonded (SMS)

- Open structure
- Tri-laminate polypropylene fabric with a meltblown polypropylene layer in the middle that acts as the main filter for particulates



Spunbonded Polypropylene (SBPP)

- Highly open fabric
- Negligible barrier protection



Increasing Fabric Performance

*Photographs are magnified

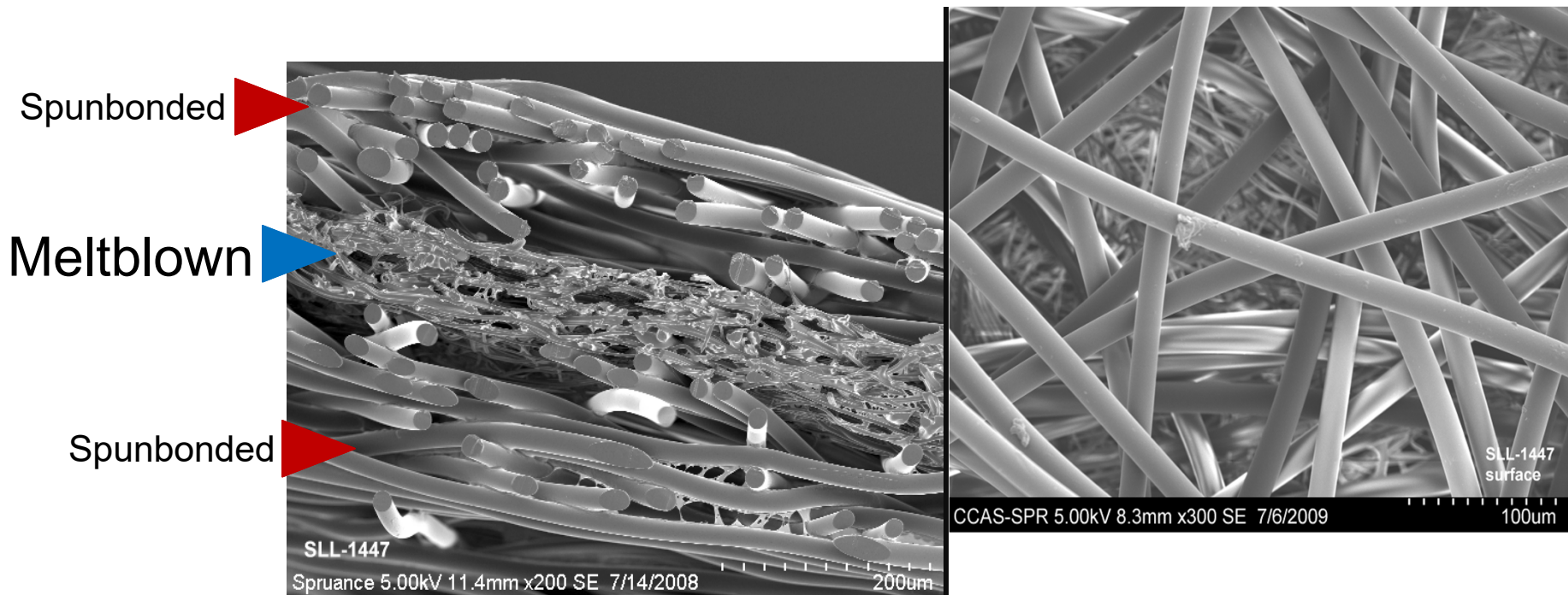


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SMS Fabric Overview

“SMS” (**S**punbonded-**M**eltblown-**S**punbonded)

Tri-laminate polypropylene fabric with a meltblown layer (fine fibers) between two spunbonded layers (coarse fibers)



Fabric Barrier Comparison

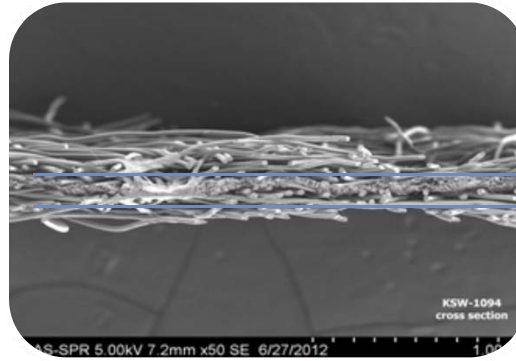
Cross-sections View (50X Magnification)

ProShield® Basic

1.3 oz/yd²

Thickness: 12 mils

Barrier: meltblown layer

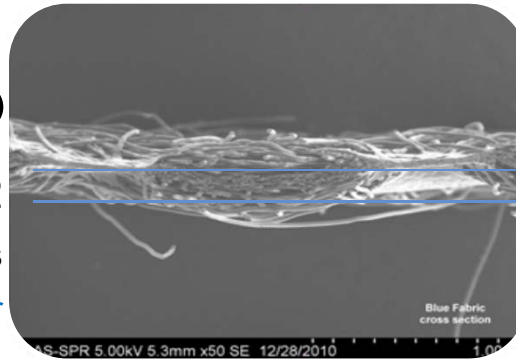


ProShield®

1.8 oz/yd²

Thickness: 12 mils

Barrier: meltblown Layer

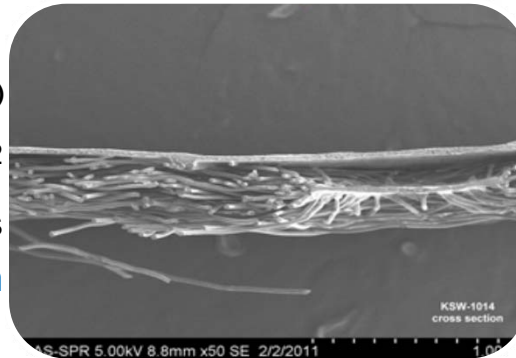


ProShield®NexGen®

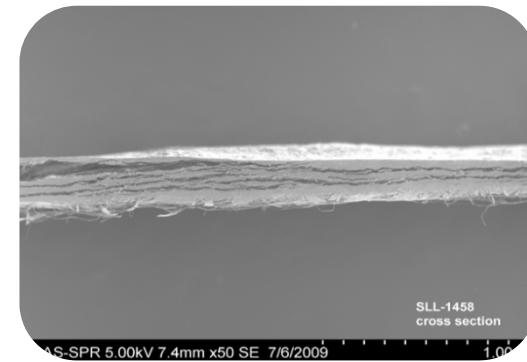
1.8 oz/yd²

Thickness: 10 mils

Barrier: Film



DuPont™ Tyvek®



- 1.2 oz/yd²
- Thickness: 5.9 mils
- **Barrier : 100% Tyvek®**



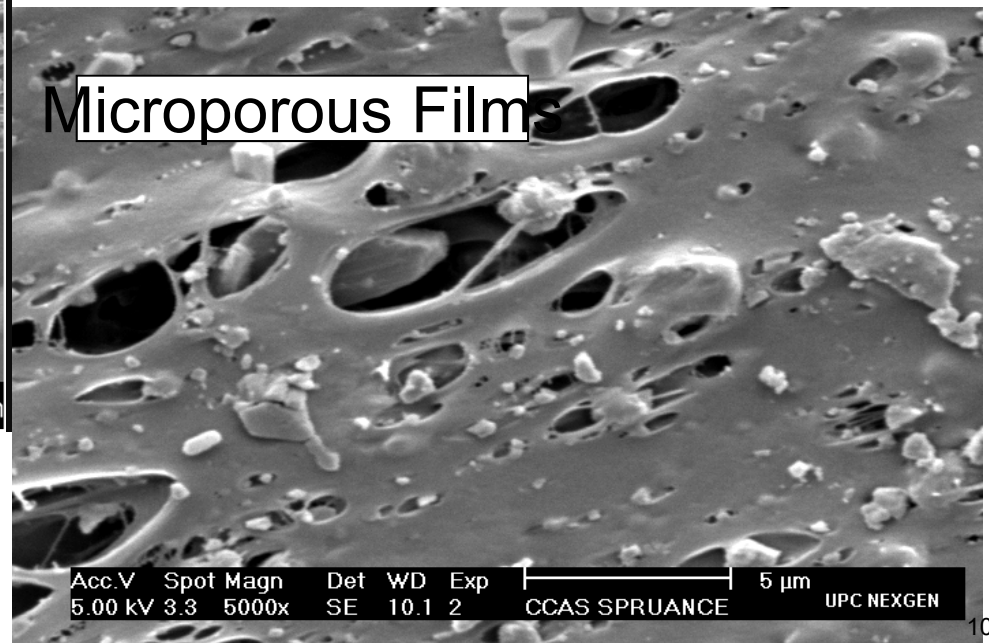
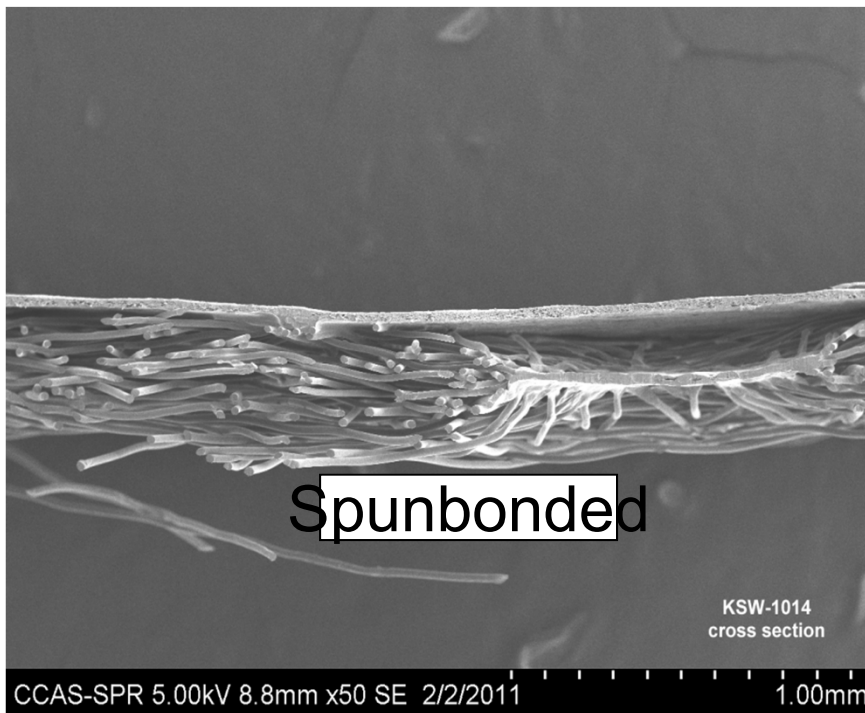
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Microporous fabrics rely on a delicate film for protection

The film layer is the sole source of protection for microporous film garments. The film layer can be easily abraded or worn away. Barrier protection is lost once the film layer is damaged.



Strip of tape easily pulls apart the film layer



Industrial Hazards Requiring General Protection

Hazardous

- Dry Particulates
- Aerosols



Asbestos
Abatement



Lead
Abatement



Fiberglass
Handling

Non-Hazardous

- Dry Particulates
- General Dirt & Grime
- Aerosols
- Liquid Splash



Paint
Spray



Dirty Job
Clean-Up



Food
Handling

Product Portfolio

- **ProShield® garments:** Affordable and practical, basic to mid-level barrier protection, based on SMS or microporous film (MPF). Engineered for applications that need low levels of protection against **non-hazardous liquids and particulates** as well as thermal hazards (FR).
- **Tyvek® garments :** Providing the best balance of protection, durability and comfort, Tyvek® garments offer built-in protection that keeps your workers **protected against hazardous particulates and light liquid chemical splashes.**
- **Tychem® garments:** Robust yet lightweight protection, composed of multiple barrier layers, that **provide a mid to high level of chemical barrier against a broad range of chemical, biological and thermal (FR) hazards.**





Secondary flame-resistance protection

Fabric Technology

- Lightweight, disposable overgarment designed to help protect and preserve primary flame-resistance garments
- Non-woven wood-pulp/polyester blend that is treated to provide fire retardancy and liquid repellency characteristics
- Flame retardant treated; fabric tested to ASTM D6413 with less than 2 seconds of afterflame and less than 6 inches of char length damage, and does not melt and drip
- Fabric will not ignite and continue to burn after flame source is removed

Applications

- A cost-efficient disposable cover to protect and preserve reusable FR garments
- Welding, Steel Mills, Coal Mines, Maintenance Work, Refineries, Laboratories, Utilities, etc.



TYVEK® Garments (a fabric patented and ONLY by DuPont)

For Hazardous particulate & light chemical splash protection



What you know as “just” Tyvek®. Breathable inherent barrier, excellent abrasion resistance. *Ideal for asbestos removal, lead & mold abatement, spray painting and protection from radioactive particulates.*



Formerly our Tyvek® Dual. Tyvek® on the front with the entire back of the garment in SMS for more breathability, allowing the wearer to feel cooler. Ideal for application where Tyvek® protection is needed only in the front of the garment





All the benefits of regular Tyvek® plus:

- CE Cat III Type 5/6 certification
- More fitting hood design and thumb loop on the sleeve
- Hi Vis w/ reflective taping

Option
5/11/2018



- All the benefits of Tyvek® 500 plus:
- CE Cat III Type 4 certification
 - Fully Taped seams
 - Self adhesive chin flap
 - ISO 16603 certified to protect against bloodborne pathogens
 - Individually packaged

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- CE Cat III Type 3 certification
- EN 14126 certified for protection against biological hazards
- Some chemical holdout to replace Chem suits



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Tyvek® for Painting Applications: Protect the Worker

- In paint applications, workers need protection from dry particulate, aerosol and light liquid splash.
- Coveralls made with Tyvek® fabric may be suitable for use to protect workers in paint applications because :
 - **Structure of fabric offers a high degree of protection against airborne particles and non-hazardous light liquid splash**
 - **Fabric is highly resistant to abrasion,**



Performance Attribute \ Fabric Technology	Particle Protection (New)	Particle Protection (After abrasion)	Liquid Barrier (New)	Liquid Barrier (After abrasion)	Comfort	Durability
Tyvek®	■ ■ ■ ■	■ ■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■	■ ■ ■ ■ ■
Microporous film	■ ■ ■ ■ ■	■ ■	■ ■ ■ ■ ■	■	■	■ ■

Top 5 Considerations for protective garments. DuPont™ Tyvek® Over other white Garments

1. Superior barrier after abrasion (100% Barrier Retained)
2. Better garment durability
3. Unmatched versatility (meets multiple protection needs)
4. Improved breathability
5. Documented performance of Tyvek®, made by DuPont

BP Oil Spill



Fukushima Nuclear
Disaster



Avian Flu



Ebola



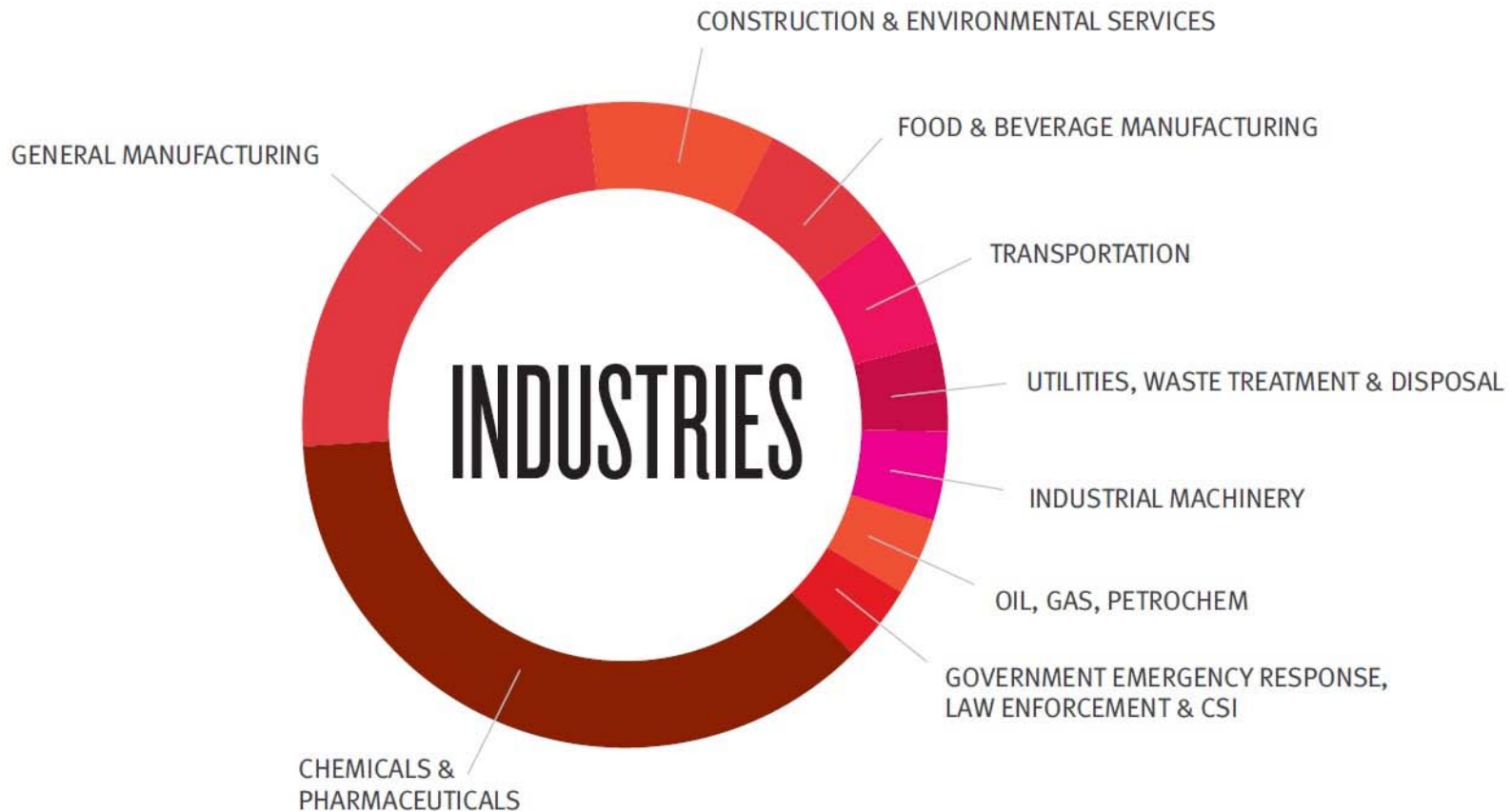
ALL SUITS LOOK THE SAME, BUT ONLY ONE SUIT MAKES THE DIFFERENCE – DUPONT™ TYVEK®

- An ideal balance of protection, durability and comfort
- Breathable inherent barrier protection
- Excellent abrasion resistance
- Comfort fit design allows for greater range of motion



Top Disposable Protective Clothing Verticals

These industries consume nearly 70% of protective garment sales annually, making them excellent sales opportunities.



DUPONT™ TYVEK® AND GENERAL PROTECTION PRODUCTS

Garment	Typical general industrial hazards/Description/Examples																								
	Non-hazardous								Hazardous																
	Particles			Aero-sol	Light liquid splash*				Particles										Aero-sol	Light liquid splash*			Flame** resistance		
	General dirt & grime	Animal waste	Sanding & grinding waste	Spray paint	Oil & grease	Lubri-cants	Fertilizer	Sewage	Fertilizer	Pesti-cides	Asbestos	Lead	Chro-mium	Beryllium	Mold	Fiber-glass	Carbon	Radio-active particles	Isocyanate containing	Sulfuric acid (18%)	Sulfuric acid (30%)	Sodium hydroxide (40%)	Sodium hydroxide (50%)		
Tyvek® 400	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●					
Tyvek® 500	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		●			
Tyvek® 600	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●		
Tyvek® 800 J	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	●	
ProShield® 50	○	○	○	●	●	●	●	●																	
ProShield® 10	○	○	○	○	○	○	○	○																	
Tempo®	○	○	○	○	○	○																		●	

● Generally preferred

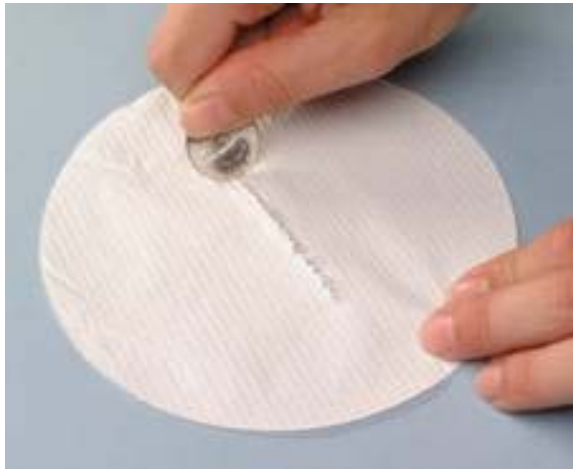
○ Acceptable for use

Abrasion Demonstration

DuPont™ Tyvek®



Microporous Film



KleenGuard®



	TYVEK®	Microporous Film	SMS
Damage	Minor to None	Significant tear	Significant holes
Barrier	Uncompromised	Compromised	Significantly Compromised

Barrier Durability Demo



4 Passes with each sample
on rough substrate

**DuPont™
Tyvek®**



100% Barrier Retention

**Microporous
Film**



Complete Barrier Loss - holes!



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Key Fabric Selection Criteria

Protection

Will potentially hazardous materials penetrate through the garment?

- Does it comply with OSHA requirements?

Durability

Will it maintain its protection throughout the task?

- Will a change out(s) be required during the task?

Comfort

- Will the garment contribute to heat stress?
- Will wearing the garment lower worker productivity?



Summary- Tychem® 2000 SFR

Description

- Chemical and secondary flame protection in a lightweight garment
- Effective barrier against a range of inorganic acids and bases as well as industrial cleaning chemicals and particles
- Provide secondary flame resistance when worn over primary FR garments
- Garment design for dual CR/FR hazard

Target Applications

- Refineries
- Petrochemical plants
- Laboratories
- Hazardous maintenance operations

Commercially Available June 2017



Tychem® 2000 SFR Unique Features



Benefits

- Provides Primary CR barrier similar to Tychem® 2000 garments
 - Against inorganic acids and bases
- Offers Secondary FR performance in flame/fire exposures

Garment Design Features

- Respirator fit hood
 - Lined with ProShield® 6 SFR
- Chinflap with double-sided adhesive tape
- Single flap closure over zipper with double-sided adhesive tape (for extra protection)
- Seams sewn then over taped with clear chemical protective tape
- Nylon zipper with large metal pull
- Tunneled elastic at hood, wrist, & ankle
- Elastic in the waist

Where will Tychem® 2000 SFR Fit in DuPont CR/FR Portfolio?



DuPont™ ProShield® 6 SFR

- Secondary FR garment - protects primary FR garment from dirt/contaminants
- Must be worn over primary FR garment
- Should not be worn alone where FR protection is needed

NEW DuPont™ Tychem® 2000 SFR

- Protects against many inorganic acids and bases (liquids) and particles
- Secondary FR garment – Must be worn over primary FR garment
- Should not be worn alone where FR protection is needed

DuPont™ Tychem® 6000 FR

- Primary FR, broad spectrum CR (particles and liquids), and arc flash rated garment
- Garment offers outstanding protection, coveralls certified to NFPA 2112 (fire) and NFPA 1992 (chemical); Arc Flash rating 15 cal/cm²

DuPont™ Tychem® 10000 FR

- Encapsulated Level A chemical suit certified to NFPA 1991 with flash fire escape option and liquefied gas option
- High chemical barrier (including chemical warfare agents) – particle, liquid, and gas

Comparison of Permeation Test Results

(Tychem® 2000 SFR vs. Pyrolon® CRFR)

Comparison of Permeation Test (ASTM F739) Results				
#	Sourced Fabric	Tychem® 2000 SFR	Pyrolon® CRFR	Tychem® 2000
	Chemical Name (Concentration)	Normalized Breakthrough Time (minutes) at 0.1 µg/cm ² /min (US BT)		
1	Dimethylacetamide, N, N- (8% in water)	>480	Not reported	>480
2	Chromic Acid (61%)	>480	Not reported	>480
3	Hydrogen Peroxide (70%)	>480	Not reported	>480
4	Lithium Hydroxide (20%)	>480	Not reported	>480
5	Potassium Hydroxide (45%)	>480	Not reported	>480
6	Sulfuric Acid (>95%)	>480	Not reported	>480
7	Sodium Hydroxide (50%)	>480	Not reported	>480
Note: Pyrolon® CRFR info from their website.				

Tychem® 2000 SFR samples show permeation results comparable to Tychem® 2000 and superior to Pyrolon® CRFR.

Comparison of Penetration Test Results

(Tychem® 2000 SFR vs. Pyrolon® CRFR)

Comparison of Penetration Test (ASTM F903) Results			
#	Sourced Fabric	Tychem® 2000 SFR	Pyrolon® CRFR
	Chemical Name (Concentration)	Time to Penetrate (minutes)	
1	Acetone (>95%)	>60	>60
2	Acetonitrile (>95%)	>60	>60
3	Benzene (>95%)	>60	>60
4	Carbon Disulfide (>95%)	>60	>60
5	Crude Oil (>95%)	>60	>60
6	Dichloromethane (>95%)	>60	Not reported
7	Diesel Fuel (>95%)	>60	>60
8	Ethyl Acetate (>95%)	>60	>60
9	n-Hexane (>95%)	>60	>60
10	1,1,2,2 – Tetrachlorethylene (>95%)	>60	>60
11	Toluene (>95%)	>60	>60
<p>Note: Pyrolon® CRFR info from their website. ASTM F903 Method C - 0 psi for 5 min, 2 psi for 1 min and 0 psi for 54 mins</p>			

Tychem® 2000 SFR fabric passes ASTM F903 penetration Method C test for these 11 chemicals.

Key Takeaways

- Permeation testing is most meaningful test when it comes to chemical protection

Do not compromise your chemical protection to get secondary FR protection

Tychem® 2000 SFR balances chemical protection with secondary flame resistance for the suitable hazards

Full line of Chemical protective clothing options dependent on the chemical, biological, and thermal hazard present



Tychem® 10000 FR Tychem® 10000

Tychem® RESPONDER® CSM

Tychem® 9000

Tychem® 6000 FR

Tychem® 6000

Tychem® 5000

Tychem® 4000

Tychem® 2000 SFR

Tychem® 2000



Tools: DuPont™ SafeSPEC™



The DuPont™ SafeSPEC™ suite of product selector tools helps you easily select your protective apparel by matching your hazard with appropriate garment choices.

Desktop DuPont™ SafeSPEC™: www.safespec.dupont.com

- Literature, eCatalog and PDF catalog
- Videos, product-specific information, FAQs
- CE products: www.safespeccleanroom.dupont.com

SafeSPEC™ Mobile App:

- Hazard scenarios, product portfolio all available on mobile
- Make informed decisions on your chemical protective apparel from anywhere
- Tablet version available now

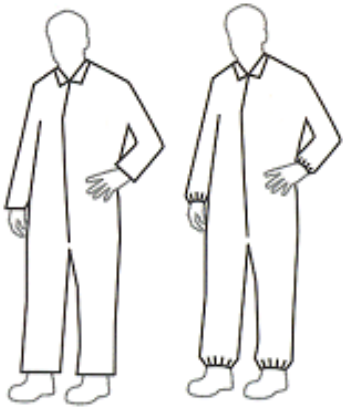


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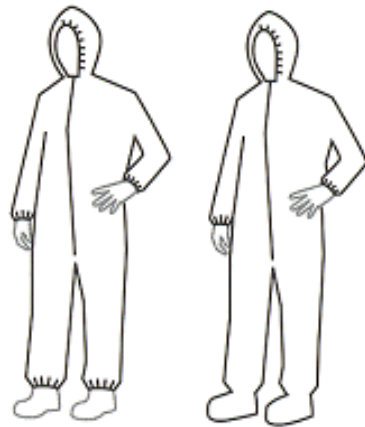
DuPont™ Tyvek® Garments

Seam/Style Information

Standard Coveralls



Hooded Coveralls



Lab Coats



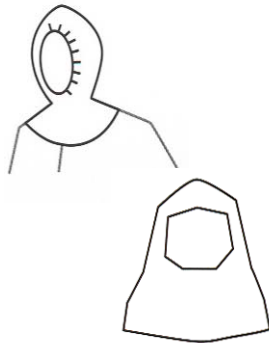
Frocks



Shoe & Boot Covers



Hoods & Sleeve Covers



Tyvek® garments available in serged only.

Sleeve Covers





Thank You

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