Lakeland®

Disposable and Chemical Protective Clothing

Performance and Selection Guide

Lakeland's MicroMax® NS vs. DuPont's Tyvek®

Although MicroMax® NS is significantly less expensive than Tyvek®, cost should always be secondary to safety.

So how do you make a systematic and defensible choice between the world's two leading Protective Clothing brands? Comparative performance data for a range of exposure types is the only objective way.

Fortunately, comparative performance data are available for each fabric in the user instructions published by each company in accordance with ISO 16602, an international standard endorsed by DuPont.

The ISO 16602 standard is based upon a system of "Types" according to the type and degree of the hazard (as shown below). Standardized test methods for each Type then determine what Performance Class a given fabric meets: the better the performance the higher the Class numeric rating.

ISO 16602

TYPE 6	TYPE 5	TYPE 4	TYPE 3	TYPE 2	TYPE 1
Non-gas tight limited protection against liquid aerosol	Non-gas tight protection against airborne dry particulate chemicals	Non-gas tight protection against liquid chemical splash	Non-gas tight protection against high pressure liquid exposure or splash	Non gas-tight positive pressure suits	Gas-tight protection against chemicals, vapors and toxic particles

Strength /Durability Tests

MicroMax® NS outperforms Tyvek® in five of the nine tests in this category. Tyvek outperforms MicroMax® NS in three, and one is a tie.

Advantage: MicroMax® NS

The following are the comparative test results for Type 6 Liquid Aerosol and Type 5 Dry Particulate:

Physical Property	Test Method	DuPont Tyvek®*	Lakeland MicroMax® NS
Strength / Durability Test		**Performance Class Range 1-6, 6 being the highest performing**	
Abrasion Resistance	EN 530 (method 2)	2	1
Puncture Resistance	EN 863	2	1
Flex Cracking	ISO 7854/B	6	4
Trapezoidal Tear MD	ISO 9073-4	1	3
Trapezoidal Tear XD	ISO 9073-4	1	2
Tensile Strength (max. MD/XD)	ISO 13934-1	1	2
Burst Strength	ISO 2960	Not Disclosed	1
Antistat	EN 1149-5	Pass	Pass
Seam Strength	EN/ISO 13935-2	> 75 N	88.8 N

Resistance to Liquid Penetration Tests

MicroMax® NS outperforms Tyvek® against two of the four common chemicals for which DuPont publishes data under ISO 16602, and two are a tie.

Advantage: MicroMax® NS

Physical Property	Test Method	DuPont Tyvek®*	Lakeland MicroMax® NS
Resistance to Liquid Penetration		**Performance Class Range 1-3**	
Sulfuric Acid (30%) *Penetration/ Repellency*	EN/ISO 6530	3/3	3/3
Sodium Hydroxide (10%) *Penetration/ Repellency*	EN/ISO 6530	3/3	3/3
O-xylene *Penetration/ Repellency*	EN/ISO 6530	1/1	3/2
Butanol-1 *Penetration/ Repellency*	EN/ISO 6530	2/1	3/2

Protection Against Infectious Agents EN14126

In all four tests against blood and other biological contaminates, Lakeland MicroMax® NS is significantly more effective, performing at the highest possible class in each test. Tyvek® does not meet the minimum performance threshold in protection against blood and body fluids, and only meets the minimum classification in the other tests.

Advantage: MicroMax® NS

Physical Property	Test Method	DuPont Tyvek®**	Lakeland MicroMax® NS
		Performance Class Range 1-3 or 1-6	
Protection against Blood and Body Fluids	ISO 16604:2004	< 1	6
Protection against Biologically Contaminated Aerosols	ISO 22611:2003	1	3 (3 is maximum)
Protection against Dry Microbial Penetration	ISO 22612:2005	1	3 (3 is maximum)
Protection against Mechanical Contact with Substances Containing Contaminated Liquids	EN 14126:2003 Annex A	1	6

** Data taken from ***DuPont User Instructions for CAH5***, document L-2984, January 2009/15.

Comfort and Breathability

MicroMax® NS is similar in breathability to Tyvek®, with an MVTR (Moisture Vapor Transfer Rate) that is a little better at 119 vs. 111, and Air Permeability that is a little lower at 0.5 vs 3.3 cfm.

However, considering that a typical cotton T-shirt has a cfm of 180, the difference between 0.5 and 3.3 cfm is almost meaningless in terms of breathability- like wearing 59 T-shirts instead of 60.

The reality is, neither fabric has noticeable breathability.

Physical Property	Tyvek®	MicroMax® NS
Air Permeability (cfm)	~ 3.3	0.5
MVTR*	111.2	119.3

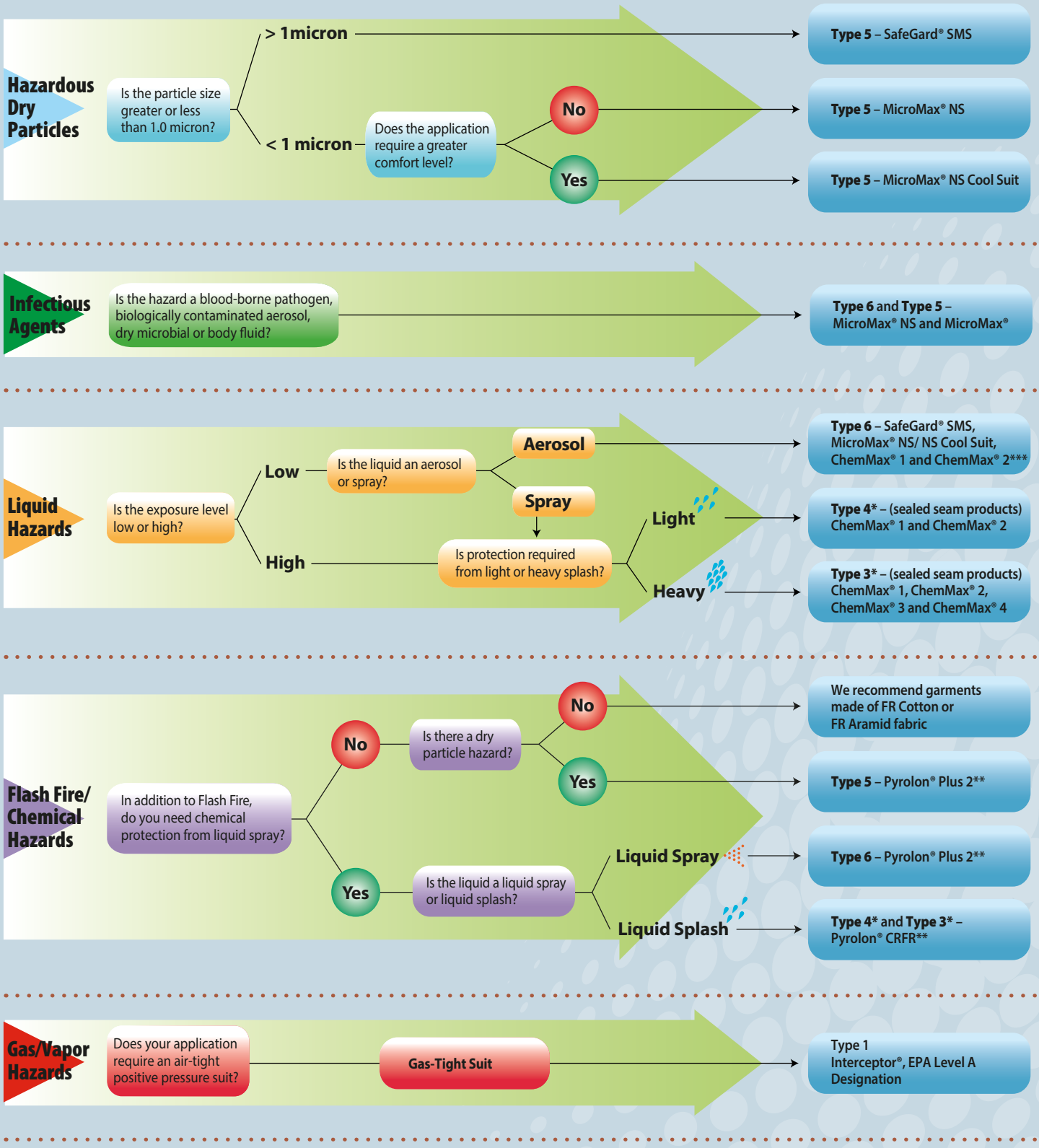
*MTVR = Moisture Vapor Transmission Rate: grams/hour/square meter @ 100˚ Fahrenheit

The breathability difference between MicroMax® NS and Tyvek® comes down to just one T-shirt out of 60!

In Summary...

The data shows that ***MicroMax® NS provides better overall protection than Tyvek®*** and is essentially identical in terms of breathability. It would be the better choice in most situations even if it cost as much as Tyvek®.

Lakeland Solutions Selection Guide



* For details on Type 4 and Type 3 solutions, contact your Lakeland Sales Representative or call Customer Service at 800-645-9291.

** Must be worn over thermally protective clothing, such as fire resistant cottons, aramids or modacrylics.

*** Refer to permeation data on next page for which ChemMax® is indicated for a given hazard.

This is a general guide to selecting garments only, and should not be used as the definitive or only tool in garment selection. It is the responsibility of the user to select garments or products which are appropriate for each intended use and which meet all specified government and industry standards.

Lakeland's ChemMax® Range vs. DuPont's TyChem® Range

Selecting the appropriate chemical suit is a critical and challenging task: the health and well being of a company's employees hangs in the balance. So does productivity and morale… as well as potential liability in the event of an accident.

So how do you make the best and most cost-effective choice for a given work environment?

The accepted industry standard ASTM F1001 list can be helpful for comparing the relative barrier capabilities of various suppliers' products.

Additional considerations are strength and durability, and the types of seam construction, since the seam often presents the path of least resistance into a garment. A sealed seam is always best, but may not necessary in certain light-duty situations.

The chart below summarizes published strength test results, and then performance test data against the ASTM F1001 list for the range of Chemical suit fabrics Lakeland offers, shown next to the comparable suit from DuPont. A red or green cell represents a permeation time for a chemical in excess of 480 minutes, the maximum exposure time that is tested for. Lack of color means less than 480.

One can see that at every level the Lakeland chemical suit performs at least as well or better than the comparable DuPont offering. But in every case, Lakeland suits costs less.

Now that is truly cost-effective!

Comparative Chemical Fabric Performance Data

	Test Method	ChemMax®1	Tychem® 2000	ChemMax®2	Tychem® 4000	ChemMax®3	Tychem® 5000	ChemMax®4 Plus	Tychem® 9000	Interceptor® Plus	Tychem® 1000
Basis Weight	ASTM D3776-90 & D751	2.29 oz/y^2	2.5 oz/y^2	4.3 oz/y^2	3.5 oz/y^2	4.5 oz/y^2	4.4 oz/y^2	7.5 oz/y^2	7.4 oz/y^2	11.0 oz/y^2	11.4 oz/y^2
Thickness	D1777-75	15 mil	10 mil	11 mil	13 mil	16 mil	17.5 mil	19 mil	18 mil	33 mil	25 mil
Ball Burst	ASTM D751	25 lbf	Not Avail.	48 lbf	Not Avail.	55 lbf	68 lbf	83lbf	79 lbf	250 lbf	205 lbf
Grab Tensile MD	ASTM D5034-90	35 lbf	41 lbf	47 lbf	41 lbf	59 lbf	Not Avail.	93 lbf	84 lbf	219 lbf	164 lbf
Grab Tensile XD		27 lbf	47 lbf	34 lbf	50 lbf	42 lbf	Not Avail.	80 lbf	83 lbf	170 lbf	159 lbf
Trapezoidal Tear MD	ASTM D5733	14 lbf	7 lbf	30 lbf	9 lbf	26 lbf	21 lbf	25 lbf	26 lbf	35 lbf	69 lbf
Trapezoidal Tear XD		14 lbf	5 lbf	13 lbf	8 lbf	20 lbf	30 lbf	19 lbf	22 lbf	39 lbf	69 lbf
ASTM F1001 Permeation Time: Red or Green denotes >480 minutes											
Acetone											
Acetonitrile											
Anhydrous Ammonia											
1,3 Butadiene											
Carbon Disulfide											
Chlorine											
Dichloromethane											
Diethylamine											
Dimethyl Formamide											
Ethyl Acetate											
Ethylene Oxide											
n-Hexane											
Hydrogen Chloride											
Methanol											
Methyl Chloride											
Nitrobenzene											
Sodium Hydroxide											
Sulfuric Acid											
Tetrachloroethylene											
Tetrahydrofuran											
Toluene											

(Data as published by Lakeland and DuPont)

PermaSURE®

Lakeland's ChemMax3, ChemMax4 Plus and Interceptor Plus give you get the added bonus of PermaSURE®. PermaSURE® is a free, mobile-friendly online tool that models permeation rates and calculates safe-use times by incorporating environmental, temperature and chemical exposure factors. It is a state-of-the-art technology developed initially by leading Polymer chemists for defense forces to quickly determine which suits are needed for various chemical warfare agents and dual use chemicals. It is based on the known molecular characteristics and behavior of 4000+ chemicals interacting with Lakeland's specific chemical fabrics.

Lakeland®

Protect Your People™

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Please contact Lakeland or your local Lakeland distributor, who will be pleased to help you analyze the hazards of your work environment and select the most appropriate and cost-effective solution.

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