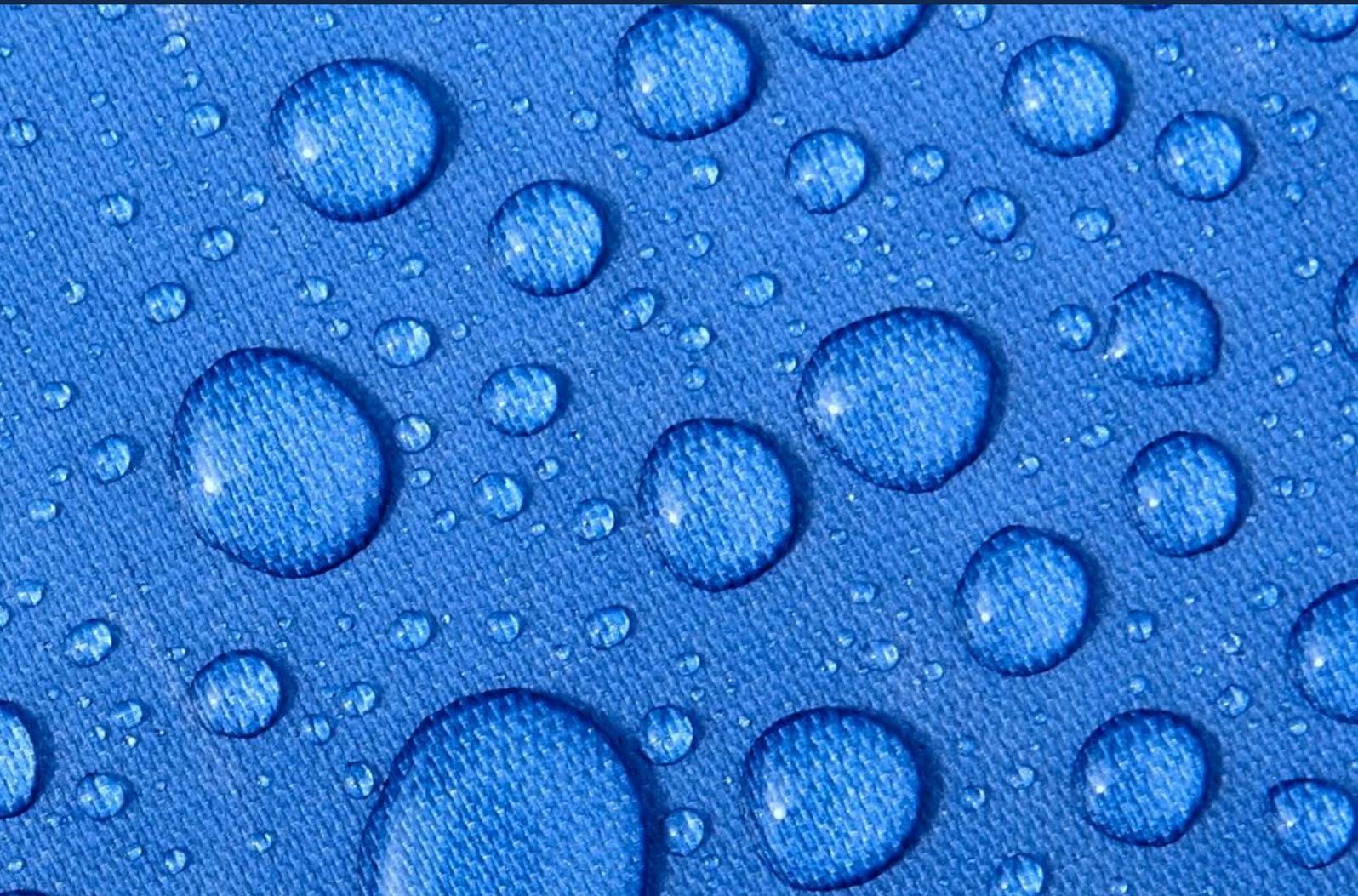




RESPIREX™

Living + Breathing Personal Protection



Respirex Materials Guide

Chemical Permeation & Mechanical Properties



Material Testing

Respirex thoroughly test all of the materials that we use in our garments and we have our own independent UKAS accredited laboratory for chemical permeation testing and for testing the physical properties of materials.

This allows us to regularly re-test our fabrics and seams to ensure quality. We can also advise customers on fabric selection for their particular chemical hazard and even conduct specific chemical testing if required.

The laboratory has a broad range of commercial customers outside Respirex and is able to offer confidential testing services for chemical permeation, abrasion resistance, flex cracking resistance, puncture resistance, tensile strength, seam tensile strength and trapezoidal tear resistance.

What is Permeation?

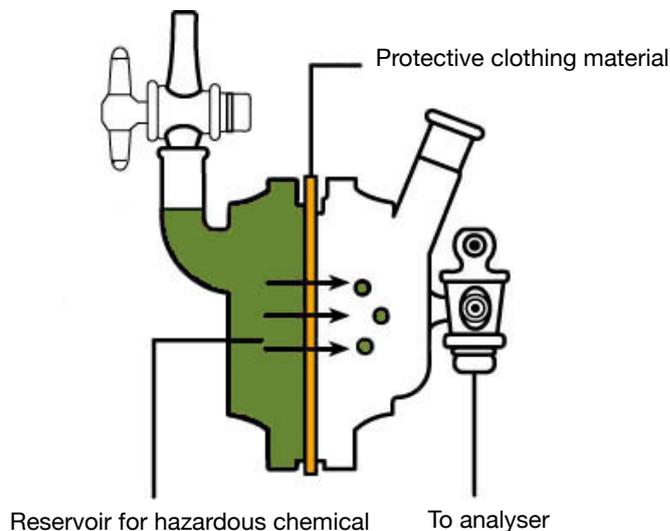
Permeation is a process by which a chemical passes through a polymer by means of molecular diffusion. This occurs without there being any physical holes in the fabric.

How is permeation measured?

Permeation is measured by exposing the outer surface of a sample of fabric to the chemical against which it is being tested. The exposure is total and constant, and emulates total immersion conditions. The inner surface of the fabric is monitored analytically to determine the amount of chemical (if any) passing through the fabric.

What is the “breakthrough time”

The breakthrough time is the elapsed time between first exposure of the fabric to chemical and the rate of permeation reaching a target value. The target permeation rate for tests carried out according to BS EN ISO 6529 or BS EN 374-3 is one microgram of chemical passing through each square centimetre of fabric every minute. When measured according to a standard method, the breakthrough time is a value by which the performance of different fabrics can be compared.



Key to Permeation Tables

Breakthrough Times:

 Breakthrough times over 480 minutes	 Breakthrough times 31 to 60 minutes
 Breakthrough times 241 to 480 minutes	 Breakthrough times less than 30 minutes
 Breakthrough times 61 to 240 minutes	 Not tested

Chemicals in bold text are the 15 standard test chemicals defined in EN943-2:2002

Disclaimer:
Every effort is taken to ensure the information in the Material Permeation Guide is up-to-date, but materials manufacturers are constantly refining production techniques and material specifications, which may effect test results. The Permeation Guide is intended for materials selection guidance only, if you are unsure about a materials suitability for your particular application, please contact Respirex.

Chemical	CAS Number	Laminate Viton® (A00158 - Orange)	Viton® / Butyl / Viton® (A00003 - Orange)	Viton® / Butyl / Polyester (A00002)	Tychem® TK. (A00159 - Lime)	Chemprotex™ 400 (A00159 - Yellow)	Chemprotex™ 300 (A00132 - Blue)	Butyl (A00027 - Olive)	Neoprene (A00017 - Yellow, A00019 - Orange)	PVC C2 (A00037 - Yellow, A00038 - Green)	Heavy Duty PVC (A00087 - Grey)	Hazmax™ Boot
hydrofluoric acid 73%	7664-39-3											
hydrogen chloride gas	7647-01-0											
hydrogen fluoride gas	7664-39-3											
hydrogen fluoride liquid	7664-39-3											
hydrogen peroxide, 27.5%	7722-84-1											
lactic acid, 40%	50-21-5											
methacrylic acid	79-41-4											
methane sulphonyl chloride	124-63-0											
methanol	67-56-1											
methyl acrylate	96-33-3											
methyl methacrylate	80-62-6											
methyl vinyl ketone	78-94-4											
nitric acid, 10%	7697-37-2											
nitric acid, 60% - 70%	7697-37-2											
nitric acid, fuming	7697-37-2											
nitrobenzene	98-95-3											
oleum, 30%	8014-95-7											
oxalic acid, saturated	144-62-7											
petrol - unleaded	8006-61-9											
phenol, solid	108-95-2											
phenol, 85%	108-95-2											
phenol, liquid - 41 degC	108-95-2											
phosgene	75-44-5											
phosphoric acid, 20%	7664-38-2											
phosphoric acid, 85%	7664-38-2											
phosphorus trichloride	7719-12-2											
potassium hydroxide, 40%	1310-58-3											
propan-2-ol	67-63-0											
propylene oxide	75-56-9											
pyridine	110-86-1											
sodium hydroxide, 40%	1310-73-2											
sodium hypochlorite, 13%	7681-52-9											
styrene	100-42-5											
sulphur dioxide	7446-09-5											
sulphuric acid 10% - 50%	7664-93-9											
sulphuric acid 96%	7664-93-9											
tetrachloroethylene	127-18-4											
tetrahydrofuran	109-99-9											
thionyl chloride	7719-09-7											
toluene	108-88-3											
toluene-2,4-diisocyanate	584-84-9											
toluidine, o-	95-53-4											
trichlorobenzene, 1,2,4-	120-82-1											
trichloroethylene	79-01-6											
triethylamine	121-44-8											
trifluoroacetic acid	76-05-1											
vinyl acetate	108-05-4											
xylene	1330-20-7											

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Mechanical Properties of Materials

		Viton® /Butyl /Viton®	Laminate Viton®	Viton® /Butyl /Poly.	Tychem® TK	Chemprotex™ 400	Chemprotex™ 300	Butyl	Neoprene	PVC C2	Heavy Duty PVC	300µm PVC	150µm PVC
Abrasion Resistance	EN 530 Method 2												
Flex Cracking Resistance	EN ISO 7854 Method B												
Tear Resistance	EN ISO 9073-4												
Tensile Strength	EN ISO 13934-1												
Puncture Resistance	EN 863												
Resistance to Ignition	EN 13274-4 Method 3												
Seam Permeation Resistance	EN ISO 6529												
Seam Strength	EN ISO 13935-2												

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	Abrasion	Flex Cracking	Tear	Strength	Puncture	Permeation	Ignition*	Seam Strength	Seam Permeation
Class 6 (Best)	> 2,000	> 100,000	> 150 N	> 1,000 N	> 250 N	> 480 min	Pass	> 500 N	> 480 min
Class 5	> 1,500	> 40,000	> 100 N	> 500 N	> 150 N	> 240 min	-	> 300 N	> 240 min
Class 4	> 1,000	> 15,000	> 60 N	> 250 N	> 100 N	> 120 min	-	> 125 N	> 120 min
Class 3	> 500	> 5,000	> 40 N	> 100 N	> 50 N	> 60 min	-	> 75 N	> 60 min
Class 2	> 100	> 2,500	> 20 N	> 60 N	> 10 N	> 30 min	-	> 50 N	> 30 min
Class 1	> 10	> 1,000	> 10 N	> 30 N	> 5 N	> 10 min	Fail	>30 N	> 10 min

* Resistance to Ignition is given purely as pass or fail (not as a class)

White boxes indicate no test results available at time of publication.

About the Laboratory

The Respirix Testing Laboratory is an independent test facility accredited by the United Kingdom Accreditation Service (UKAS) and has provided the majority of the results for this permeation guide. It offers a range of chemical permeation and physical testing services to European, International and American standards:

- BS EN 374-3:2003
- BS EN 14325:2004
- BS EN ISO 6529:2001
- ASTM F739-07

Accredited testing is carried out at 23°C plus or minus 1°C, depending on the standard chosen.

The laboratory can provide technical advice on the permeation performance of Respirix products, and which fabrics may be most suitable for different applications. Further testing against chemicals or fabric combinations not listed in this guide can be also commissioned. The laboratory offers:

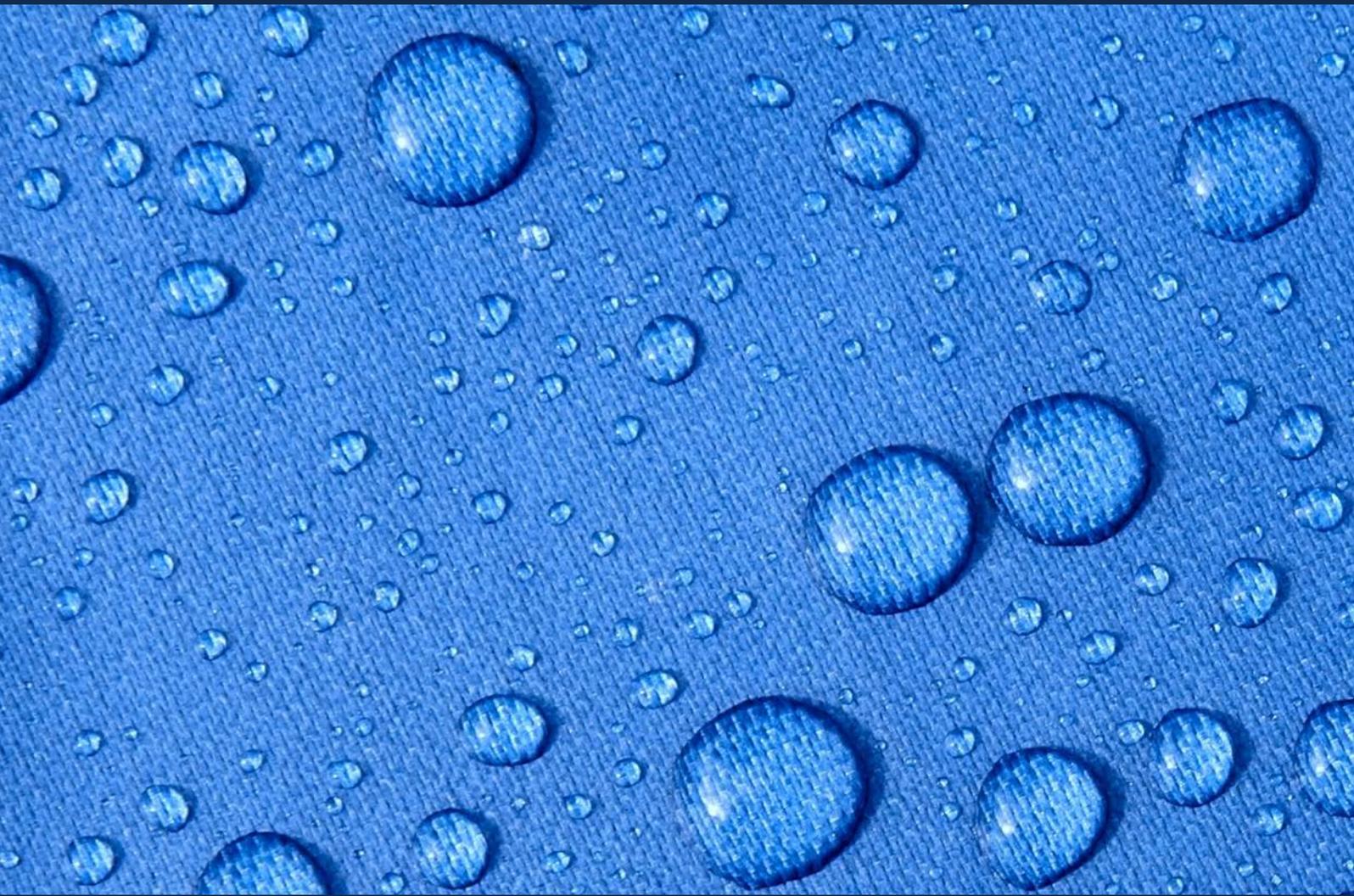
- Confidentiality
- Independent Service
- Fast Turnaround

The laboratory can be contacted on by telephone on +44 (0)1737 857931 or by e-mail at laboratory@respirex.co.uk.



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RMPG/R3