



## Description

**Chemprotex™ X**, is a high performance, multi-layer, nonwoven, chemical barrier fabric that is also light in weight. It incorporates a 7-layer chemical barrier film, with a protective polyethylene top layer on the outside, with a spun bonded non-woven inner core and with an additional 7-layer chemical barrier film, with an outer polyethylene layer on the inside. This combination provides excellent chemical protection with our most durable limited life fabric.



## Material Performance Summary



Abrasion



Flex



Cold Flex



Tear



Tensile



Puncture



Bursting



Flame

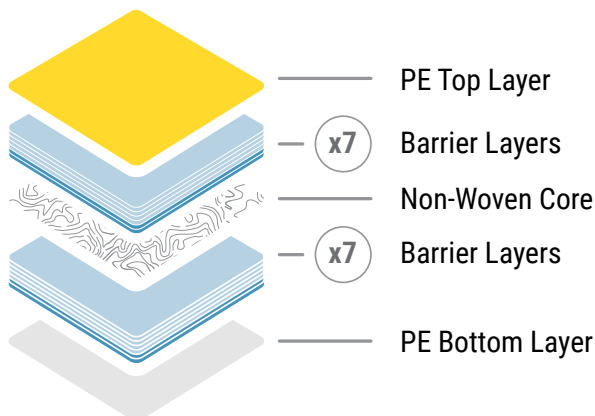


Ignition



&gt;480mins

## Construction



## Permasure®

PermaSURE® is a toxicity modelling smartphone app for Respirex™ chemical protective suits made from Chemprotex™ fabrics. PermaSURE® calculates your safe working time based on the chemical you are working with, the suit you are using and the suit and chemical temperature.

Garments manufactured from Chemprotex™ X are compatible with the PermaSURE app. for full details visit: [www.respirex.com/permasure](http://www.respirex.com/permasure)

# Material Performance

Property	Test Method	Property value of Chemprotex™ X	Performance Class of Chemprotex™ X	Minimum Class Required For EN943-2:2019
Abrasion resistance	EN 12974-2 (inc. pressure drop)	> 2,000 cycles	6 (of 6)	4
Flex cracking resistance	EN ISO 7854 Method B (inc. pressure drop)	> 1,250 cycles	2 (of 6)	1
Flex cracking resistance at low temperatures (-30°C)	EN ISO 7854 Method B at -30°C (inc. pressure drop)	> 200 cycles	2 (of 6)	2
Trapezoidal tear resistance	EN ISO 9073-4	>150 N	6 (of 6)	3
Puncture resistance	EN 863	> 50 N	3* (of 6)	2
Bursting Resistance			4 (of 6)	-
Tensile strength	EN ISO 13934-1:1999	> 250 N	4 (of 6)	4
Resistance to flame	EN 13274-4 Method 3 modified (inc. pressure drop)	No part ignited or continued to burn on removal from the flame	2 (of 3)	1 (of 3)
Resistance to ignition			Pass	Pass
Seam strength	EN ISO 13935-2	> 500N	6	5
Permeation of Propane at -50°C		> 480 mins	6 (of 6)	-
Temperature range		-40°C to +70°C	-	-
Ignition temperature		> 360°C	-	-
Melting Point		110°C**	-	-

Material tested in accordance with Table 1 of EN943-2:2019 - Minimum performance requirements of chemical protective clothing materials for regular robustness suits.

\* The suit may not be suitable for use where there is a high risk of puncture - see Respirex GTB Reusable suit.

\*\* The material becomes soft at temperatures above 90°C and has less than 2% shrinkage at 100°C. No visible shrinkage at 70°C

# Chemical Permeation

Chemical Name	State	CAS Number	Actual (min.)	BT <sub>0.1</sub> (min.)	BT <sub>1.0</sub> (min.)	EN Class	SSPR $\mu\text{g}/(\text{min}\cdot\text{cm}^2)$	MDPR $\mu\text{g}/(\text{min}\cdot\text{cm}^2)$	Observation
acetaldehyde	L	75-07-0	>480	>480	>480	6	<0.05	0.05	No degradation
acetic acid (30%)	L	64-19-7	>480	>480	>480	6	<0.001	0.001	No degradation
acetic acid (glacial)	L	64-19-7	>480	>480	>480	6	<0.001	0.001	No degradation
acetic anhydride	L	108-24-7	>480	>480	>480	6	<0.001	0.001	No degradation
<b>acetone</b>	<b>L</b>	<b>67-64-1</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.02</b>	<b>0.02</b>	<b>No degradation</b>
<b>acetonitrile</b>	<b>L</b>	<b>75-05-8</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.05</b>	<b>0.05</b>	<b>No degradation</b>
acetophenone	L	98-86-2	>480	>480	>480	6	<0.05	0.05	No degradation
acrylamide (50%)	L	79-06-1	>480	>480	>480	6	<0.10	0.10	No degradation
acrylic acid	L	79-10-7	>480	>480	>480	6	<0.005	0.005	Discolouration
acrylonitrile	L	107-13-1	>480	>480	>480	6	<0.05	0.05	No degradation
allyl alcohol	L	107-18-6	>480	>480	>480	6	<0.05	0.05	No degradation
<b>ammonia</b>	<b>G</b>	<b>7664-41-7</b>	<b>32</b>	<b>49</b>	<b>&gt;480</b>	<b>6</b>	<b>0.17</b>	<b>0.005</b>	<b>No degradation</b>
ammonium hydroxide (35% NH <sub>3</sub> in water)	L	1336-21-6	>480	>480	>480	6	<0.001	0.001	No degradation
amyl acetate-n	L	628-63-7	>480	>480	>480	6	<0.02	0.02	No degradation
aniline	L	62-53-3	>480	>480	>480	6	<0.05	0.05	No degradation
aviation fuel	L	-	>480	>480	>480	6	<0.05	0.05	No degradation
benzene	L	71-43-2	140	157	>402	5	1.1 (max)	0.02	No degradation
benzonitrile	L	100-47-0	>480	>480	>480	6	<0.05	0.05	No degradation
benzoyl chloride	L	98-88-4	>480	>480	>480	6	<0.05	0.05	No degradation
benzyl alcohol	L	100-51-6	>480	>480	>480	6	<0.05	0.05	No degradation
benzyl chloride	L	100-44-7	>480	>480	>480	6	<0.05	0.05	No degradation
bromine	L	7726-95-6	108	nt	114	3	nm	0.06	Discolouration
butadiene 1,3	G	106-99-0	>480	>480	>480	6	<0.02	0.02	No degradation
butane	G	106-97-8	>480	>480	>480	6	<0.05	0.05	No degradation
butanol n-	L	71-36-3	>480	>480	>480	6	<0.05	0.05	No degradation
Butyl aldehyde	L	123-72-8	>480	>480	>480	6	<0.05	0.05	No degradation
Butyl ether n-	L	142-96-1	>480	>480	>480	6	<0.05	0.05	No degradation
<b>carbon disulphide</b>	<b>L</b>	<b>75-15-0</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.05</b>	<b>0.05</b>	<b>No degradation</b>
<b>chlorine</b>	<b>G</b>	<b>7782-50-5</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>No degradation</b>
chloroacetic acid (68%)	L	79-11-8	>480	>480	>480	6	<0.001	0.001	No degradation
chlorobenzene	L	108-90-7	66	114	389	5	1.1 (max)	0.05	No degradation
chloroethanol 2-	L	107-07-3	>480	>480	>480	6	<0.02	0.02	No degradation
chloroform	L	67-66-3	>480	>480	>480	6	< 0.005	0.005	No degradation
cresol m-	L	108-39-4	>480	>480	>480	6	<0.05	0.05	No degradation
cyclohexane	L	110-82-7	>480	>480	>480	6	<0.05	0.05	No degradation
cyclohexanone	L	108-94-1	7	13	>480	6	0.23	0.05	No degradation
dichlorodimethylsilane	L	75-78-5	>480	>480	>480	6	<0.001	0.001	Slight blistering
<b>dichloromethane</b>	<b>L</b>	<b>75-09-2</b>	<b>66</b>	<b>114</b>	<b>&gt;480</b>	<b>6</b>	<b>0.28</b>	<b>0.05</b>	<b>No degradation</b>
diesel fuel	L	-	>480	>480	>480	6	<0.10	0.10	No degradation
<b>diethylamine</b>	<b>L</b>	<b>109-89-7</b>	<b>107</b>	<b>&gt;288</b>	<b>&gt;480</b>	<b>6</b>	<b>0.12</b>	<b>0.05</b>	<b>No degradation</b>
di(2-ethylhexyl)phthalate	L	117-81-7	nt	nt	>480	6	nm	1.0	No degradation
dimethylacetamide N,N	L	127-19-5	223	>480	>480	6	0.08	0.05	No degradation
dimethylformamide N,N	L	68-12-2	>480	>480	>480	6	<0.01	0.01	No degradation
dimethyl sulphate	L	77-78-1	>480	>480	>480	6	<0.02	0.02	No degradation
dimethyl sulphide	L	75-18-3	>480	>480	>480	6	< 0.005	0.005	No degradation
dimethyl sulphoxide	L	67-68-5	>480	>480	>480	6	<0.02	0.02	No degradation
dioxane 1,4-	L	123-91-1	26	>480	>480	6	0.05	0.01	No degradation
epichlorohydrin	L	106-89-8	>480	>480	>480	6	<0.05	0.05	No degradation
ethanol	L	64-17-5	>480	>480	>480	6	<0.02	0.02	No degradation
ethanolamine	L	141-43-5	>480	>480	>480	6	<0.001	0.001	No degradation
<b>ethyl acetate</b>	<b>L</b>	<b>141-78-6</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.01</b>	<b>0.01</b>	<b>No degradation</b>
ethyl cellosolve acetate	L	111-15-9	>480	>480	>480	6	<0.01	0.01	No degradation
ethylene diamine	L	107-15-3	>480	>480	>480	6	<0.001	0.001	No degradation
ethylene dibromide	L	106-93-4	>480	>480	>480	6	<0.05	0.05	No degradation
ethylene glycol	L	107-21-1	>480	>480	>480	6	<0.05	0.05	No degradation

Chemical Name	State	CAS Number	Actual (min.)	BT <sub>0.1</sub> (min.)	BT <sub>1.0</sub> (min.)	EN Class	SSPR µg/(min.cm <sup>2</sup> )	MDPR µg/(min.cm <sup>2</sup> )	Observation
ethylene oxide	G	75-21-8	>480	>480	>480	6	<0.05	0.05	No degradation
formaldehyde (37%)	L	50-00-0	>480	>480	>480	6	<0.001	0.001	No degradation
formic acid (96%)	L	64-18-6	>480	>480	>480	6	<0.001	0.001	Discolouration
furaldehyde 2-	L	98-01-1	7	16	>480	6	0.50	0.02	No degradation
glutaraldehyde (5%)	L	111-30-8	>480	>480	>480	6	<0.10	0.10	No degradation
<b>heptane</b>	<b>L</b>	<b>142-82-5</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.02</b>	<b>0.02</b>	<b>No degradation</b>
hexane	L	110-54-3	>480	>480	>480	6	<0.05	0.05	No degradation
hydrazine monohydrate	L	7803-57-8	>480	>480	>480	6	<0.001	0.001	No degradation
hydrochloric acid (37%)	L	7647-01-0	>480	>480	>480	6	<0.001	0.001	No degradation
hydrofluoric acid (48%)	L	7664-39-3	>480	>480	>480	6	<0.02	0.02	No degradation
hydrofluoric acid (73%)	L	7664-39-3	30	267	>480	6	0.18	0.01	No degradation
<b>hydrogen chloride</b>	<b>G</b>	<b>7647-01-0</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>No degradation</b>
hydrogen fluoride (anhydrous gas)	G	7664-39-3	132	244	304	5	nm	0.01	Degraded and discoloured
hydrogen fluoride (anhydrous liquid)	L	7664-39-3	52	125	228	4	1.5	0.01	Degraded and discoloured
hydrogen peroxide (30%)	L	7722-84-1	>480	>480	>480	6	<0.001	0.001	No degradation
kerosene	L	8008-20-8	>480	>480	>480	6	<0.05	0.05	No degradation
mercuric chloride (sat. solution)	L	7487-94-7	>480	>480	>480	6	<0.001	0.001	No degradation
methacrylic acid	L	79-41-4	>480	>480	>480	6	<0.001	0.001	No degradation
<b>methanol</b>	<b>L</b>	<b>67-56-1</b>	<b>46</b>	<b>57</b>	<b>&gt;480</b>	<b>6</b>	<b>0.54</b>	<b>0.02</b>	<b>No degradation</b>
methyl acrylate	L	96-33-3	118	231	>480	6	0.15	0.02	No degradation
methyl-t-Butyl-ether	L	1634-04-4	145	248	>480	6	0.16	0.05	No degradation
methyl chloride	G	74-87-3	>480	>480	>480	6	<0.05	0.05	No degradation
methyl ethyl ketone	L	78-93-3	>480	>480	>480	6	<0.05	0.05	No degradation
methyl mercaptan	G	74-93-1	>480	>480	>480	6	<0.001	0.001	No degradation
methyl methacrylate	L	80-62-6	58	97	>480	6	0.42	0.02	No degradation
methyl vinyl ketone	L	78-94-4	>480	>480	>480	6	<0.05	0.05	No degradation
Methyl -2-pyrrolidone n-	L	872-50-4	6	12	>480	6	0.74	0.05	No degradation
methylene bromide	L	74-95-3	28	39	>480	6	0.45	0.05	No degradation
nicotine	L	54-11-5	nt	nt	>480	6	nm	0.10	No degradation
nitric acid (70%)	L	7697-37-2	>480	>480	>480	6	<0.001	0.001	No degradation
nitric acid (>90% fuming)	L	7697-37-2	>480	>480	>480	6	<0.01	0.01	Discolouration
nitrobenzene	L	98-95-3	>480	>480	>480	6	<0.05	0.05	No degradation
nitromethane (96%)	L	75-52-5	>480	>480	>480	6	<0.05	0.05	No degradation
oleum (15% free SO <sub>3</sub> )	L	8014-95-7	>480	>480	>480	6	<0.001	0.001	No degradation
perchloric acid	L	7601-90-3	>480	>480	>480	6	<0.001	0.001	No degradation
petrol, leaded	L	-	>480	>480	>480	6	<0.10	0.10	No degradation
petrol, unleaded	L	8006-61-9	>480	>480	>480	6	<0.05	0.05	No degradation
phenol (85%)	L	108-95-2	>480	>480	>480	6	<0.05	0.05	No degradation
phosphoric acid (85%)	L	7664-38-2	>480	>480	>480	6	<0.001	0.001	No degradation
phosphorus oxytrichloride	L	10025-87-3	373	437	440	5	5.7 (max)	0.001	No degradation
potassium chromate (sat. solution)	L	7789-00-6	>480	>480	>480	6	<0.05	0.05	No degradation
propan-2-ol	L	67-63-0	>480	>480	>480	6	<0.05	0.05	No degradation
propylene oxide 1,2-	L	75-56-9	75	91	>480	6	0.55 (max)	0.05	No degradation
pyridine	L	110-86-1	19	22	>480	6	0.50 (max)	0.05	No degradation
'Roundup' weedkiller	L	-	>480	>480	>480	6	<0.001	0.001	No degradation
sodium cyanide (45%)	L	143-33-9	>480	>480	>480	6	<0.001	0.001	No degradation
<b>sodium hydroxide (40%)</b>	<b>L</b>	<b>1310-73-2</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>No degradation</b>
sodium hypochlorite (12% chlorine)	L	7681-52-9	>480	>480	>480	6	<0.001	0.001	No degradation
styrene	L	100-42-5	157	208	>480	6	0.51 (max)	0.05	No degradation
sulphur dioxide	G	7446-09-5	>480	>480	>480	6	<0.001	0.001	No degradation
<b>sulphuric acid (50%)</b>	<b>L</b>	<b>7664-93-9</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>&lt;0.001</b>	<b>0.001</b>	<b>No degradation</b>
sulphuric acid (95-98%)	L	7664-93-9	>480	>480	>480	6	<0.001	0.001	No degradation
tetrachloroethylene	L	127-18-4	>480	>480	>480	6	<0.05	0.05	No degradation
<b>tetrahydrofuran</b>	<b>L</b>	<b>109-99-9</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>-</b>	<b>0.05</b>	<b>No degradation</b>
<b>toluene</b>	<b>L</b>	<b>108-88-3</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>&gt;480</b>	<b>6</b>	<b>-</b>	<b>0.02</b>	<b>No degradation</b>

Chemical Name	State	CAS Number	Actual (min.)	BT <sub>0.1</sub> (min.)	BT <sub>1.0</sub> (min.)	EN Class	SSPR $\mu\text{g}/(\text{min}\cdot\text{cm}^2)$	MDPR $\mu\text{g}/(\text{min}\cdot\text{cm}^2)$	Observation
toluene 2,4-diisocyanate	L	584-84-9	>480	>480	>480	6	<0.10	0.10	No degradation
toluidine o-	L	95-53-4	>480	>480	>480	6	<0.05	0.05	No degradation
trichloroacetic acid (80%)	L	650-51-1	>480	>480	>480	6	<0.001	0.001	No degradation
trichlorobenzene 1,2,4-	L	120-82-1	>480	>480	>480	6	<0.05	0.05	No degradation
trichloroethylene	L	79-01-6	>480	>480	>480	6	< 0.005	0.005	No degradation
trifluoroacetic acid	L	76-05-1	>480	>480	>480	6	<0.001	0.001	No degradation
triethylamine	L	121-44-8	161	279	>480	6	0.2 (max)	0.05	No degradation
vinyl acetate	L	108-05-4	>480	>480	>480	6	<0.05	0.05	No degradation
xylene (iso-mix)	L	1330-20-7	377	399	>480	6	0.35 (max)	0.05	No degradation

Breakthrough times are measured in accordance with ISO 6529:2013 Method A or EN374-3:2003

### Key:

<b>BT<sub>0.1</sub></b>	Normalised breakthrough detection time at a permeation rate of 0.1 $\mu\text{g}/(\text{cm}^2\cdot\text{min})$	<	Less than
<b>BT<sub>1.0</sub></b>	Normalised breakthrough detection time at a permeation rate of 1.0 $\mu\text{g}/(\text{cm}^2\cdot\text{min})$	>	Greater than
<b>imm</b>	Immediate	<b>CAS number</b>	Chemical Abstract Service Number. The number is unique for each chemical.
<b>nm</b>	Not measured	<b>SSPR</b>	Steady State Permeation Rate
<b>nt</b>	Not tested	<b>MDPR</b>	Minimum Detectable Permeation Rate
<b>-</b>	Not Applicable	<b>MAX</b>	Maximum Permeation Rate (SSPR not reached)
<b>L</b>	Liquid	<b>MDPR</b>	Minimum Detectable Permeation Rate
<b>G</b>	Gas	<b>MAX</b>	Maximum Permeation Rate (SSPR not reached)

## Chemical Warfare Agent Protection

The Chemprotex™ X material has been tested for resistance to permeation by chemical warfare agents in accordance with FINABEL O.7.C methods at the respected TNO laboratories. Both the material and seams were found to offer an extremely high level of protection against the following agents:

- Mustard agent (HD)
- Sarin (GB)
- Soman (GD)
- VX

### Material

Agent	Breakthrough time (hours)	Temperature (°C)
HD	> 48	37
GB	> 48	37
GD	> 48	37
VX	> 48	37

### Seams

Agent	Breakthrough time (hours)	Temperature (°C)
HD	> 48	37
GB	> 48	37
GD	> 48	37
VX	> 48	37

## Resistance to penetration by Infective Agents

The material has passed the requirements of EN14126:2003 for protective clothing against infective agents. It is therefore suitable to provide protection against blood, blood-borne pathogens, body fluids, biologically contaminated aerosols and both wet and dry microbial penetration.

Tested According To	Requirement	Level of Performance	EN14126:2003 Class
ISO 22610:2006	Resistance to wet microbial penetration	> 75 min	6
ISO 16603:2004	Resistance to penetration by blood and body fluids using synthetic blood	Pass	N/A
ISO 16604:2004	Resistance to penetration by blood-borne pathogens using bacteriophage Phi-X174	20 kPa	6
ISO/DIS 22611:2003	Resistance to penetration by biologically contaminated aerosols	> 5 (Log R)	3
ISO 22612:2005	Resistance to dry microbial penetration	<1 (Log <sub>(10)</sub> CFU)	3

## End of Life Disposal

Incineration is acceptable as no halogens are present or used in the manufacture. The calorific value is the same as oil; however uncontrolled combustion can lead to noxious fumes and un-burnt hydrocarbons. All components are thermoplastic and can be recycled as mixed polyolefin where facilities exist. The film has been designed not to biodegrade due to its intended application, so the film will not destabilise or cause toxic leach if used in landfill.

The product is comprised mainly from ethylene gas which is a by-product of oil production and refining which was once flared. No formal carbon footprint has been made on this product, however provided the product is not incinerated overall carbon dioxide release to the atmosphere during production and disposal will be low.



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