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DIFFERENCE®

# CORES SAFE CHEMICAL PERMEATION TESTING GUIDE

**ANSI, ASTM F739-12**

Average Breakthrough Times

Permeation Rates

Performance Levels

Ratings

# Chemical Permeation Testing

Chemical permeation is the process by which chemicals migrate through protective glove material at the molecular level. It is important to note that chemical permeation can occur without any physical or observable changes to glove the material. To be better informed about selecting gloves when working with chemicals, it is important to understand how chemical permeation is tested and measured.

## TESTING OVERVIEW

Chemical permeation tests are completed in laboratory conditions where a sample of glove material is placed in a 2-sided chamber. One side of the chamber is filled with the test chemical, the other side with collection medium where measurements are taken to determine the level of chemical permeation over a period of time (480 minutes) and at a fixed temperature (~21°C/69°F).

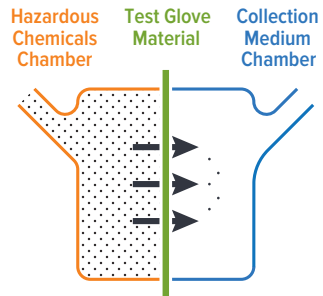


Illustration of chemical testing chamber

**Disclaimer:** Chemical permeation tests are conducted in controlled laboratory conditions and not in field conditions. Testing cannot replicate specific wear and tear environments under actual application conditions. The information included is provided as a guide only. Using the correct gloves, for specific applications can only be determined by testing in those applications by the purchaser.

## TESTING RESULTS KEY

Chemical Permeation (ANSI)	
Model Number	
Previous Name	
Item Number	
Palm Thickness	
Compliance Requirement	
Test Method	
Chemical	CAS Number
<b>ACIDS</b>	
Acetic Acid (Glacial)	64-19-7
Hydrochloric Acid (37%)	7647-01-0
Nitric Acid (70%)	7697-37-2
Sulfuric Acid (96%)	7664-93-9
Phosphoric acid (85%)	7664-38-2

CoreSafe®			
F280			
0.71 mm / 28 mil			
BTT lowest (min)	Rating	Degradation %	Recommendation
7	0	22.9	Not Recommended
>480	6	10.1	Recommended
>480	6	14.2	Recommended
>480	6	16.9	Recommended
>480	6	-10.4	Recommended
>480	6	-8.4	Recommended
>480	6	-9.4	Recommended
>480	6	-2.1	Recommended
271	5	22.1	Recommended
>480	6	14.2	Recommended
>480	6	18.4	Recommended
40	2	25.4	Not Recommended
<5	0	-10.2	Not Recommended

**Breakthrough Times (BTT):** The *elapsed time* between initial contact of the test chemical with the outside surface of the glove and the time at which permeation rate reaches 1µg/cm<sup>2</sup>/min (ASTM F739-12). A higher number is better or longer.

**Rating:** The ANSI/ISEA 105-2016 numerical classification for chemical permeation.

**Degradation %:** The percentage change in the puncture resistance of the glove material after a continuous contact with the external surface with the challenge chemical compared to the puncture resistance of the glove material before exposure (ANSI/ISEA 105-2016). A lower number is better.

**Recommendation:** The destructive change in one or more properties of a material. These are rated on a *color-coded scale* (see table below).

### Rating is based on Breakthrough Time (BTT)

Average BTT (min)	Rating
7	0
>480	6
>480	6
>480	6
≥ 240	5
≥ 480	6
67	3
256	5

### Recommendation Criteria

Color Coding Criteria			
BTT (min)	Degradation %	Physical Changes	Recommendation
>30	0-60%	No	Recommended
>10	61-90%	No	Fair
<10	>90%	Yes	Not Recommended

# CORESAFE®

**R** Recommended **F** Fair **NR** Not Recommended

Chemical Permeation (ANSI)		CoreSafe® U13B				CoreSafe® F13Y				CoreSafe® U17N				CoreSafe® F280				CoreSafe® F28YB			
Model Number		0.33 mm / 13 mil				0.33 mm / 13 mil				0.43 mm / 17 mil				0.71 mm / 28 mil				0.71 mm / 28 mil			
Palm Thickness		BS EN 16523-1:2015+A1:2018				BS EN 16523-1:2015+A1:2018				BS EN 16523-1:2015+A1:2018				BS EN 16523-1:2015+A1:2018				BS EN 16523-1:2015+A1:2018			
Test Method		Average BTT (min)	Rating	Degradation %	Recommendation	BTT lowest (min)	Rating	Degradation %	Recommendation	BTT lowest (min)	Rating	Degradation %	Recommendation	BTT lowest (min)	Rating	Degradation %	Recommendation	BTT lowest (min)	Rating	Degradation %	Recommendation
Chemical	CAS Number																				
<b>ORGANIC ACIDS</b>																					
Acetic Acid - Glacial	64-19-7	<5	0	25.0	NR	<5	0	27.7	NR	<5	0	2.8	NR	7	0	22.9	NR	72	2	22.7	NR
Acetic Acid, 10%	64-19-7	>480	6	10.0	R	>480	6	15.0	R	>480	6	2.3	R	>480	6	10.1	R	>480	6	0.7	R
Acetic Acid, 20%	64-19-7	>480	6	15.0	R	>480	6	15.0	R	>480	6	2.0	R	>480	6	14.2	R	>480	6	1.8	R
Acetic Acid, 25%	64-19-7	>480	6	12.0	R	>480	6	20.0	R	>480	6	1.8	R	>480	6	16.9	R	>480	6	2.6	R
<b>INORGANIC ACID</b>																					
Hydrochloric Acid, 10%	7647-01-0	>480	6	-9.3	R	>480	6	-4.7	R	>480	6	-12.2	R	>480	6	-10.4	R	>480	6	-15.5	R
Hydrochloric Acid, 37%	7697-37-2	>480	6	-7.7	R	>480	6	-3.9	R	>480	6	-10.1	R	>480	6	-8.4	R	>480	6	-9.0	R
Nitric Acid, 10%	7697-37-2	>480	6	-6.8	R	>480	6	-3.4	R	>480	6	-8.9	R	>480	6	-9.4	R	>480	6	14.9	R
Nitric Acid, 40%	7697-37-2	>480	6	-7.0	R	>480	6	-3.5	R	>480	6	-9.2	R	>480	6	-2.1	R	>480	6	2.4	R
Nitric Acid, 65%	7664-38-2	75	3	50.5	NR	75	3	56.3	NR	170	4	19.8	NR	271	5	22.1	NR	NT		21.9	NR
Sulphuric Acid, 40%	7664-93-9	>480	6	24.7	R	>480	6	24.7	R	>480	6	22.1	R	>480	6	14.2	R	>480	6	5.4	R
Sulphuric Acid, 50%	7664-93-9	>480	6	32.0	R	>480	6	40.0	R	>480	6	24.5	R	>480	6	18.4	R	>480	6	8.8	R
Sulphuric Acid, 96%	8007-56-5	25	1	60.3	F	25	1	62.5	F	42	2	39.6	F	40	2	25.4	F	94	3	26.4	F
<b>ALKALIS</b>																					
Ammonium Hydroxide, 25%	1336-21-6	<5	0	-51.8	F	<5	0	-51.8	F	<5	0	-64.3	NR	<5	0	-10.2	NR	3	0	-12.3	NR
Potassium Hydroxide, 50%	1310-58-3	>480	6	25.0	R	>480	6	30.0	R	>480	6	-1.2	R	>480	6	-2.1	R	>480	6	-12.0	NR
Sodium Hydroxide, 20%	1310-73-2	>480	6	34.5	R	>480	6	36.5	R	>480	6	-1.5	R	>480	6	-2.2	R	>480	6	-13.3	NR
Sodium Hydroxide, 40%	1310-73-2	>480	6	15.0	R	>480	6	25.0	R	>480	6	-1.2	R	>480	6	-1.6	R	>480	6	10.1	R
Sodium Hydroxide, 50%	1310-73-2	>480	6	35.0	R	>480	6	35.0	R	>480	6	-0.9	R	>480	6	-1.5	R	>480	3	26.4	R
<b>ALCOHOLS</b>																					
Butanol	71-36-3	NT		NT		NT		NT		NT		24.2	NR	>480	6	12.6	R	>480	6	3.6	R
Ethanol, 96%	64-17-5	NT		NT		NT		NT		NT		12.3	NR	>480	6	16.2	R	>480	6	24.9	R
Iso Propyl Alcohol (Propan-2-ol)	67-63-0	NT		NT		NT		NT		NT		48.6	NR	>480	6	26.8	R	>480	6	40.5	R
Methanol	67-56-1	<5	0	20.1	NR	<5	0	22.3	NR	7	0	10.4	NR	14	1	12.5	F	16	1	4.9	F
<b>KETONES</b>																					
Acetone	67-64-1	<5	0	90.0	NR	<5	0	90.0	NR	<5	0	89.8	NR	<5	0	75.8	NR	<5	0	82.9	NR
Cyclohexanone	108-94-1	<5	0	98.7	NR	<5	0	98.7	NR	<5	0	98.7	NR	<5	0	74.2	NR	NT		64.2	NR
Methyl ethyl ketone	78-93-3	<5	0	90.0	NR	<5	0	90.0	NR	<5	0	89.9	NR	<5	0	84.7	NR	<5	0	86.6	NR
<b>ALDEHYDES</b>																					
Formaldehyde, 37%	50-00-0	>480	6	-13.4	R	>480	6	-13.4	R	>480	6	-1.2	R	>480	6	-2.1	R	>480	6	-1.6	R
<b>ESTERS</b>																					
Ethyl Acetate	141-78-6	<5	0	98.7	NR	<5	0	98.7	NR	<5	0	98.7	NR	<5	0	89.7	NR	<5	0	88.8	NR
<b>ALIPHATIC SOLVENTS</b>																					
Cyclohexane	110-82-7	<5	0	89.0	NR	<5	0	89.0	NR	<5	0	87.4	NR	NT		65.5	NR	<5	0	79.1	NR
n - Hexane	110-54-3	<5	0	90.0	NR	<5	0	90.0	NR	<5	0	88.9	NR	NT		68.7	NR	<5	0	78.4	NR
n - Heptane	142-82-5	<5	0	95.0	NR	<5	0	95.0	NR	<5	0	92.1	NR	<5	0	62.5	NR	<5	0	73.1	NR
<b>AROMATIC SOLVENTS</b>																					
Toluene	108-88-3	<5	0	90.0	NR	<5	0	90.0	NR	<5	0	89.7	NR	<5	0	94.5	NR	<5	0	93.6	NR
Xylene	1330-20-7	<5	0	95.0	NR	<5	0	95.0	NR	<5	0	92.5	NR	<5	0	92.6	NR	<5	0	91.2	NR
<b>AMINES</b>																					
Diethyl Amine	109-89-7	<5	0	90.0	NR	<5	0	90.0	NR	<5	0	89.9	NR	<5	0	84.5	NR	<5	0	81.9	NR
<b>CHLORINATED SOLVENTS</b>																					
Dichloromethane	75-09-2	<5	0	98.0	NR	<5	0	98.0	NR	<5	0	97.4	NR	<5	0	93.6	NR	<5	0	80.4	NR
<b>PEROXIDES</b>																					
Hydrogen Peroxide, 30%	7722-84-1	300	5	18.0	R	30	1	19.8	F	>240	4	NT	NR	>480	6	37.3	R	>480	6	37.3	R



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