Chemical Resistance Guide

Permeation & Degradation Data

8th EDITION

Ansell

Permeation/Degradation Resistance Guide for Ansell Chemical Resistant Gloves

Introduction to the 8th Edition

When reviewing the following recommendations, remember that tests are conducted under laboratory conditions, and that actual workplace conditions usually dictate a *combination* of performance capabilities. A product's resistance to cuts, punctures, and abrasion must also be taken into account as a critical usage factor. A glove with excellent permeation resistance may not be adequate if it tears or punctures easily. Always factor in the physical performance requirements of the job or application when selecting a chemical-resistant glove.

Ansell's ASTM standard permeation and degradation tests are presented on the following pages as an aid in determining the general suitability of various products for use with specific chemicals. Because the conditions of ultimate use are beyond our control, and because we cannot run permeation tests in all possible work environments and across all combinations of chemicals and solutions, these recommendations are advisory only. THE SUITABILITY OF THE PRODUCT FOR A SPECIFIC JOB MUST BE DETERMINED BY TESTING BY THE PURCHASER.

Definition of Key Terms

Permeation is a process by which a chemical can pass through a protective film without going through pinholes, pores, or other visible openings. Individual molecules of the chemical enter the film, and "squirm" through by passing between the molecules of the glove compound or film. In many cases the permeated material may appear unchanged to the human eye.

Chemical permeation can be described in simple terms by comparing it to what happens to the air in a balloon after several hours. Although there are no holes or defects, and the balloon is tightly sealed, the air gradually passes through (permeates) its walls and escapes. This simple example uses gas permeation, but the principle is the same with liquids or chemicals.

Permeation data are presented in two values: **Breakthrough** time and **Rate.** Breakthrough times (min.) are the times observed from the start of the test to first detection of the chemical on the other side of the sample (for test methodology, see the outside back cover of this guide). These times represent how long a glove can be expected to provide effective permeation resistance when totally immersed in the test chemical.

Permeation rates are the highest *flow rates* recorded for the permeating chemicals through the glove samples during a six-hour or eight-hour test. These qualitative ratings are comparisons of permeation rates to each other.

Degradation is a reduction in one or more physical properties of a glove material due to contact with a chemical. Certain glove materials may become hard, stiff, or brittle, or they may grow softer, weaker, and swell to several times their original size. If a chemical has a significant impact on the physical properties of a glove material, its permeation resistance is quickly impaired. For this reason, glove/chemical combinations rated "Poor" are usually not tested for permeation resistance, and combinations rated "Not Recommended" are never tested for permeation resistance. Please note, however, that permeation and degradation do not always correlate.

The overall Degradation **Rating** for each chemical is explained in "How To Read The Charts."

How to Read the Charts

Three categories of data are represented for each Ansell product and corresponding chemical: 1) overall degradation resistance rating; 2) permeation breakthrough time, and 3) permeation rate.

Standards for Color-Coding

A glove-chemical combination receives **GREEN** if either set of the following conditions is met:

- The Degradation Rating is Excellent or Good
- The Permeation Breakthrough Time is 30 minutes or greater
- The Permeation Rate is Excellent, Very Good, or Good

OR

- The Permeation Rating is not specified
- The Permeation Breakthrough Time is 240 minutes or greater
- The Degradation Rating is Excellent, or Good

A glove-chemical combination receives **RED** if either set of the following conditions is met:

- The Degradation Rating is Poor or Not Recommended

OR

- The Degradation Rating is Degrades with Delamination (DD)
- The Permeation Breakthrough Time is less than 20 minutes

All other glove-chemical combinations receive **YELLOW**. In other words, any glove-chemical combination not meeting either set of conditions required for Green, and not having a Red degradation rating of either Poor or Not Recommended, receives a **YELLOW** rating.

Why is a product with a shorter breakthrough time sometimes given a better rating than one with a longer breakthrough time?

One glove has a breakthrough time of just 4 minutes. It is rated "very good," while another with a breakthrough time of 30 minutes is rated only "fair." Why? The reason is simple: in some cases the *rate* is more significant than the *time*.

Imagine connecting two hoses of the same length but different diameters to a faucet using a "Y" connector. When you turn on the water, what happens? Water goes through the smaller hose first because there is less space inside that needs to be filled. But when the water finally gets through the larger hose it really gushes out. In only a few minutes, the larger hose will discharge much more water than the smaller one, even though the smaller one started first.

The situation is similar with gloves. A combination of a short breakthrough time and a low permeation rate may expose a glove wearer to less chemical than a combination of a longer breakthrough time and a much higher breakthrough rate, if the glove is worn long enough.

Key to Permeation Breakthrough

> Greater than (time) < Less than (time)

Key to Degradation Ratings

- E – Excellent; fluid has very little degrading effect.
- G – Good; fluid has minor degrading effect.
- F – Fair; fluid has moderate degrading effect.
- P – Poor; fluid has pronounced degrading effect.
- DD – Degrades the outer layer and delaminates it.
- NR – Not Recommended; fluid has severe degrading effect.

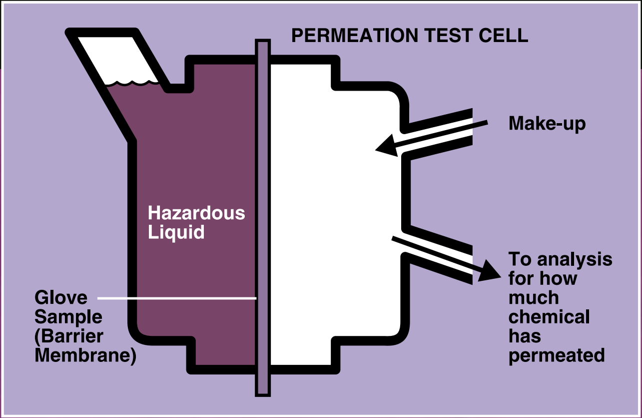
DD is a new degradation rating that applies to Viton/butyl gloves versus certain chemicals. It means "Degrades and Delaminates". If a chemical causes severe swelling of Viton but has little effect on butyl, the adhesion between these two rubber layers can be overcome under the relatively severe continuous liquid contact that is part of an ASTM or CEN standard permeation test. The end result of this stress is Viton "blisters" or even complete layer separation. The damage is likely to be permanent.

In cases such as these the butyl layer is providing most of the protection. But if the end use involves only the possibility of splash or intermittent contact so that the Viton layer never absorbs enough chemical to swell and delaminate, Viton/butyl gloves might still be the best choice. The ultimate decision on when to use plain butyl and when to use Viton/butyl will depend on the overall chemical mix in your facility and on the degree of exposure to each.

Specific Gloves Used for Testing

	Degradation and Permeation
Laminated LCP™ Film	Barrier® 2-100 (2.5 mil/0.06 mm)
Nitrile	Sol-Vex® 37-165 (22 mil/0.56 mm)
Neoprene Unsupported	29-865 (18 mil/0.46 mm)
Polyvinyl Alcohol Supported	PVA™
Polyvinyl Chloride Supported	Snorkel®
Natural Rubber Latex	Canners 343 (20 mil/0.51 mm)
Neoprene/Latex Blend	Chemi-Pro® 224 (27 mil/0.68 mm)
Butyl Unsupported	ChemTek® 38-320 (20 mil/0.51 mm)
Viton/Butyl Unsupported	ChemTek® 38-612 (12 mil/0.30 mm)

Methodology



Permeation Testing

Ansell conducts permeation testing in accordance with ASTM Method F 739 standards. A specimen is cut from the glove and clamped into a test cell as a barrier membrane (see illustration). The "exterior" side of the specimen is exposed to a hazardous chemical. At timed intervals, the unexposed "interior" side of the test cell is checked for the presence of the permeated chemical and the extent to which it may have permeated the glove material.

This standard allows a variety of options in analytical technique and collection media. At Ansell, dry nitrogen is the most common medium and gas chromatography with FID detection is the most common analytical technique. Our Research Department also uses liquids such as distilled water and hexane as collecting media, and techniques such as conductivity, colorimetry, and liquid chromatography for analysis of the collecting liquid.

Degradation Testing

Patches of the test material are cut from the product. These patches are weighed and measured, and then completely immersed in the test chemical for 30 minutes. The percentage of change in size is determined, and the patches are then dried to calculate the percentage of weight change. Observed physical changes are also reported. Ratings are based on the combined data.

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8th EDITION Permeation/Degradation Resistance Guide for Ansell Gloves

The first square in each column for each glove type is color coded to provide an overall rating for both Degradation and Permeation. The letter in each colored square is for Degradation alone.

- GREEN: The glove is very well suited for application with that chemical.
- YELLOW: The glove is suitable for that application under careful control of its use.
- RED: Avoid use of the glove with this chemical.

SPECIAL NOTE: The chemicals in this guide highlighted in BLUE are experimental carcinogens, according to the ninth edition of Sax' *Dangerous Properties of Industrial Materials.* Chemicals highlighted in GRAY are listed as suspected carcinogens, experimental carcinogens at extremely high dosages, and other materials which pose a lesser risk of cancer.

	LAMINATE FILM BARRIER™			NITRILE SOL-VEX®			UNSUPPORTED NEOPRENE 29-SERIES			SUPPORTED POLYVINYL ALCOHOL PVA™			POLYVINYL CHLORIDE (Vinyl) SNORKEL®			NATURAL RUBBER *CANNERS AND HANDLERS™			NEOPRENE/ NATURAL RUBBER BLEND *CHEMI-PRO®			BUTYL UNSUPPORTED CHEMTEK™ BUTYL			VITON/BUTYL UNSUPPORTED CHEMTEK™ VITON/BUTYL		
CHEMICAL	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate	Degradation Rating	Permeation: Breakthrough	Permeation: Rate
1. Acetaldehyde	■	380	E	P	—	—	E	10	F	NR	—	—	NR	—	—	E	13	F	E	10	F	—	—	—	—	—	—
2. Acetic Acid, Glacial, 99.7%	■	150	—	G	158	—	E	390	—	NR	—	—	F	45	G	E	110	—	E	263	—	E	>480	—	DD	>480	—
3. Acetone	▲	>480	E	NR	—	—	G	10	F	P	143	G	NR	<5	—	E	10	F	G	12	G	E	>480	E	DD	93	VG
4. Acetonitrile	▲	>480	E	F	30	F	E	20	VG	■	150	G	NR	—	—	E	4	VG	E	13	VG	E	>480	E	DD	70	E
5. Acrylic Acid	—	—	—	G	120	—	E	395	—	NR	—	—	NR	—	—	E	80	—	E	67	—	—	—	—	—	—	—
6. Acrylonitrile	▲	>480	E	—	—	—	—	—	—	▲	>480	—	—	—	—	E	5	F	—	—	—	E	>480	—	E	>480	—
7. Allyl Alcohol	▲	>480	E	F	140	F	E	140	VG	P	—	—	P	60	G	E	10	VG	E	20	VG	E	>480	—	E	>180	—
8. Ammonia Gas	■	19	E	▲	>480	E	▲	>480	—	—	—	—	—	—	—	—	—	—	■	27	E	—	—	—	—	—	—
9. Ammonium Fluoride, 40%	▲	>480	E	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
10. Ammonium Hydroxide, Conc. (28-30% Ammonia)	E	30	—	E	>360	—	E	250	—	NR	—	—	E	240	—	E	90	—	E	247	—	E	>480	—	E	>480	—
11. n-Amyl Acetate	▲	470	E	E	198	G	NR	—	—	G	>360	E	P	—	—	NR	—	—	P	—	—	E	128	G	F	<10	F
12. Amyl Alcohol	▲	>480	E	E	>480	E	E	348	VG	G	180	G	G	12	E	E	25	VG	E	52	VG	E	>480	E	E	>480	E
13. Aniline	▲	>480	E	NR	—	—	E	145	F	F	>360	E	F	62	G	E	25	VG	E	82	G	E	>480	E	E	>480	E
14. Aqua Regia	—	—	—	F	>360	—	G	>480	—	NR	—	—	G	120	—	NR	—	—	G	193	—	E	>480	—	E	>480	—
15. Benzaldehyde	▲	>480	E	NR	—	—	NR	—	—	G	>360	E	NR	—	—	G	10	VG	G	27	F	E	>480	E	E	100	E
16. Benzene (Benzol)	▲	>480	E	P	—	—	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	E	20	F	E	253	VG
17. Benzotrichloride	▲	>480	E	E	>480	E	NR	—	—	—	—	—	G	—	—	NR	—	—	NR	—	—	—	—	—	—	—	—
18. Benzotrifluoride	▲	>480	E	E	170	G	—	—	—	—	—	—	G	<10	F	P	50	G	P	—	—	—	—	—	—	—	—
19. Bromine Water	—	—	—	E	>480	E	E	>480	E	NR	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
20. 1-Bromopropane (Propyl Bromide)	▲	>480	E	▼	23	F	▼	<10	P	▲	>480	E	▼	<10	F	▼	<10	P	▼	<10	P	▼	10	P	■	182	VG
21. 2-Bromopropionic Acid	▲	>480	—	F	120	—	E	460	—	—	—	—	G	180	—	E	190	—	G	190	—	—	—	—	—	—	—
22. n-Butyl Acetate	▲	>480	E	F	75	F	NR	—	—	G	>360	E	NR	—	—	NR	—	—	P	—	—	E	80	G	DD	<10	F
23. n-Butyl Alcohol	▲	>480	E	E	>360	E	E	270	E	F	75	G	G	180	VG	E	35	VG	E	75	VG	E	>480	E	E	>480	E
24. Butyl Carbitol	—	—	—	E	>323	E	G	188	F	E	>480	E	E	397	VG	E	44	G	E	148	G	—	—	—	—	—	—
25. Butyl Cellosolve	▲	>480	E	E	470	VG	E	180	G	■	120	G	P	60	G	E	45	G	E	48	G	E	>480	—	E	>480	—
26. gamma-Butyrolactone	▲	>480	E	NR	—	—	E	245	G	E	120	VG	NR	—	—	E	60	G	E	104	F	E	>480	E	E	>480	E
27. Carbon Disulfide	▲	>480	E	G	30	F	NR	—	—	E	>360	E	NR	<5	—	NR	—	—	NR	—	—	▼	7	G	■	138	E
28. Carbon Tetrachloride	—	—	—	G	150	G	NR	—	—	E	>360	E	F	25	F	NR	—	—	NR	—	—	F	53	P	—	—	—
29. Cellosolve® (Ethyl Glycol Ether, 2-Ethoxyethanol)	E	>480	E	G	293	G	E	128	G	■	75	G	P	38	G	E	25	VG	E	25	VG	E	>480	E	E	465	E
30. Cellosolve Acetate® (2-Ethoxyethyl Acetate, EGEAA)	▲	>480	E	F	90	G	G	40	F	■	>360	E	NR	—	—	E	10	G	E	23	G	E	>480	E	DD	105	VG

CHEMICAL	BARRIER			SOL-VEX			29-SERIES			PVA			SNORKEL			CANNERS AND HANDLERS*			CHEMI-PRO*			CHEMTEK BUTYL			CHEMTEK VITON/BUTYL		
31. Chlorine Gas	▲	>480	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
32. Chlorobenzene	▲	>480	E	NR	—	—	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	P	9	P	F	>480	E
33. 4-Chlorobenzotrifluoride	—	—	—	E	320	VG	F	50	F	F	—	—	F	—	—	P	—	—	P	—	—	■	75	F	■	48	F
34. 2-Chlorobenzyl Chloride	E	120	E	—	—	—	F	200	E	E	>480	E	F	65	E	F	20	F	—	—	—	E	>480	E	E	>480	E
35. Chloroform	E	20	G	NR	—	—	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	P	5	P	■	212	VG
36. 1-Chloronaphthalene	▲	>480	E	P	—	—	NR	—	—	G	>360	E	NR	—	—	NR	—	—	P	—	—	E	>480	E	E	>480	E
37. 2-Chlorotoluene	▲	>480	E	G	120	G	NR	—	—	—	—	—	—	—	—	NR	—	—	NR	—	—	NR	—	—	—	—	—
38. 4-Chlorotoluene	▲	>480	E	P	—	—	NR	—	—	—	—	—	P	—	—	NR	—	—	NR	—	—	▼	30	F	▲	>480	E
39. "Chromic Acid" Cleaning Solution	—	—	—	F	240	—	NR	—	—	NR	—	—	G	>360	—	NR	—	—	NR	—	—	E	>480	—	E	>480	—
40. Citric Acid, 10%	—	—	—	E	>360	—	E	>480	—	F	50	—	E	>360	E	E	>360	—	E	>480	—	—	—	—	—	—	—
41. Cyclohexane	—	—	—	▲	>360	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	G	30	F	▲	>480	—
42. Cyclohexanol	▲	>480	E	E	>360	E	E	390	VG	G	>360	E	E	360	E	E	103	VG	E	47	G	E	>480	E	▲	>480	E
43. Cyclohexanone	▲	>480	E	F	103	G	P	23	F	E	>480	E	NR	—	—	P	—	—	P	—	—	E	>480	—	▼	150	—
44. 1,5-Cyclooctadiene	▲	>480	E	E	>480	E	NR	—	—	—	—	—	NR	—	—	NR	—	—	NR	—	—	P	—	—	—	—	—
45. Diacetone Alcohol	▲	>480	E	G	240	E	E	208	VG	■	150	G	NR	—	—	E	43	VG	E	60	VG	E	>480	—	DD	—	—
46. Dibutyl Phthalate	—	—	—	G	>360	E	F	132	G	E	>360	E	NR	—	—	E	20	—	G	>480	E	—	—	—	—	—	—
47. 1,2-Dichloroethane (Ethylene Dichloride, EDC)	▲	>480	E	NR	—	—	NR	—	—	E	>360	E	NR	—	—	P	—	—	P	—	—	—	—	—	—	—	—
48. Diethylamine	▲	>480	E	F	51	F	P	—	—	NR	—	—	NR	—	—	NR	—	—	NR	—	—	F	18	—	▼	19	—
49. Diisobutyl Ketone (DIBK)	▲	>480	E	E	263	G	P	—	—	G	>360	E	P	—	—	P	—	—	P	—	—	E	231	G	DD	15	G
50. Dimethyl Sulfoxide (DMSO)	▲	>480	E	E	240	VG	E	398	G	NR	—	—	NR	—	—	E	180	E	E	150	E	E	>480	—	DD	>480	—
51. Dimethylacetamide (DMAC)	▲	>480	E	NR	—	—	NR	—	—	NR	—	—	NR	—	—	E	15	G	E	30	G	E	>480	—	DD	>480	—
52. Dimethylformamide (DMF)	▲	>480	E	NR	—	—	E	45	F	NR	—	—	NR	19	—	E	25	VG	E	40	G	E	>480	E	DD	>480	E
53. Dioctyl Phthalate (DOP, DEHP)	▲	>480	E	G	>360	E	G	>480	E	E	30	F	NR	—	—	P	—	—	E	>360	E	—	—	—	—	—	—
54. Di-n-Octyl Phthalate (DNOP)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	E	>480	—	—	—	—
55. 1,4-Dioxane	▲	>480	E	NR	—	—	NR	—	—	P	—	—	NR	—	—	F	5	F	F	18	F	E	>480	—	—	—	—
56. Electroless Copper Plating Solution	—	—	—	E	>360	—	E	>360	—	NR	—	—	E	>360	—	E	>360	—	—	—	—	—	—	—	—	—	—
57. Electroless Nickel Plating Solution	—	—	—	E	>360	—	E	>360	—	NR	—	—	E	>360	—	E	>360	—	—	—	—	—	—	—	—	—	—
58. Epichlorohydrin	▲	>480	E	NR	—	—	P	—	—	E	300	E	NR	—	—	E	5	F	E	17	VG	E	>480	—	—	—	—
59. Ethidium Bromide, 10%	▲	>480	E	▲	>480	E	—	—	—	NR	—	—	—	—	—	—	—	—	—	—	—	E	>480	—	E	>480	—
60. Ethyl Acetate	▲	>480	E	NR	—	—	F	10	P	F	>360	E	NR	—	—	G	5	F	F	10	F	E	196	G	DD	10	G
61. Ethyl Alcohol, Denatured, 92% Ethanol	▲	>480	E	E	240	VG	E	113	VG	NR	—	—	G	60	VG	E	15	VG	E	37	VG	E	>480	E	E	>480	E
62. Ethylene Glycol	▲	>480	E	E	>360	E	E	>480	E	F	120	VG	E	>360	E	E	>360	E	E	>480	E	—	—	—	—	—	—
63. Ethylene Oxide Gas	■	234	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
64. Ethyl Ether	▲	>480	E	E	95	G	F	<10	F	G	>360	E	NR	—	—	NR	—	—	NR	—	—	—	—	—	—	—	—
65. Ethyl L-Lactate	E	>480	E	E	273	G	E	125	VG	E	125	G	E	15	G	E	15	VG	E	28	VG	E	>480	E	E	>480	E
66. Formaldehyde, 37% in 1/3 Methanol/Water	▲	>480	E	E	>360	E	E	39	VG	P	—	—	E	100	E	E	10	G	E	32	E	E	>480	—	E	>480	—
67. Formic acid, 90%	▲	>480	—	F	240	—	E	>480	—	NR	—	—	E	>360	—	E	150	—	E	>360	—	E	>480	—	—	—	—
68. Furfural	▲	>480	E	NR	—	—	E	40	P	F	>360	E	NR	—	—	E	15	VG	E	43	VG	E	>480	—	G	>480	—
69. Freon TF	—	—	—	E	>360	E	E	240	E	G	>360	E	NR	—	—	NR	—	—	NR	—	—	—	—	—	—	—	—
70. Gasoline, Unleaded (Shell Premium winter blend)	▲	170	E	E	>480	E	NR	—	—	G	>360	E	P	—	—	NR	—	—	NR	—	—	F	20	F	E	>480	E
71. Glutaraldehyde, 25%	—	—	—	E	>360	E	E	>480	E	P	<10	F	E	>360	E	E	210	VG	—	—	—	—	—	—	—	—	—
72. HCFC-141B	▲	>480	E	E	92	F	F	33	F	P	—	—	NR	—	—	NR	—	—	NR	—	—	F	40	F	F	<10	F
73. n-Heptane	▲	>480	E	—	—	—	—	—	—	▲	>480	—	NR	—	—	—	—	—	—	—	—	P	10	F	E	>480	E
74. Hexamethyldisilazine	▲	>480	E	E	>360	—	E	42	—	G	>360	—	P	—	—	F	15	F	F	43	G	■	305	G	■	>480	G
75. n-Hexane	▲	>480	E	E	>480	E	E	48	G	G	>360	E	NR	—	—	NR	—	—	P	—	—	P	5	F	E	>480	E
76. HFE 7100	▲	>480	E	E	>480	E	E	>480	E	P	—	—	E	>480	E	E	120	E	—	—	—	—	—	—	—	—	—
77. HFE 71DE	■	164	E	F	10	F	F	<10	F	F	>480	E	NR	—	—	NR	—	—	—	—	—	—	—	—	—	—	—
78. Hydrazine, 65%	—	—	—	E	>480	—	E	386	—	NR	—	—	E	>360	—	E	150	VG	E	>360	—	E	>480	—	—	—	—
79. Hydrobromic Acid, 48%	▲	>480	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—

80. Hydrochloric Acid, 10%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
81. Hydrochloric Acid, 37% (Concentrated)	▲	>480	—	E	>480	—	E	>480	—	NR	—	—	E	300	—	E	290	—	E	>360	—	—	—	—	—	—	—
82. Hydrofluoric Acid, 48%	▲	>480	—	E	334	—	■	>480	—	NR	—	—	■	155	—	▲	>480	—	—	—	—	E	>480	—	▲	>480	—
83. Hydrofluoric Acid, 95%	▲	>480	E	—	—	—	■	342	VG	—	—	—	—	—	—	—	—	—	—	—	—	▲	>480	E	—	—	—
84. Hydrogen Fluoride Gas	▲	>480	E	■	<15	P	—	—	—	—	—	—	■	2	—	■	15	F	■	<15	F	—	—	—	—	—	—
85. Hydrogen Peroxide, 30%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	G	>360	—	—	—	—	▲	>480	—
86. Hydroquinone, saturated solution	—	—	—	E	>360	E	E	108	E	NR	—	—	E	>360	E	G	>360	E	E	>360	E	—	—	—	—	—	—
87. Hypophosphorus Acid, 50%	—	—	—	E	>480	—	E	>240	—	NR	—	—	E	—	—	E	>480	—	—	—	—	—	—	—	—	—	—
88. Isobutyl Alcohol	▲	>480	E	E	>360	E	E	478	E	P	—	—	F	10	VG	E	15	VG	E	52	E	E	>480	E	E	>480	E
89. Isooctane	▲	>480	E	E	>360	E	E	268	VG	E	>360	E	P	—	—	NR	—	—	P	—	—	■	58	F	▲	>480	E
90. Isopropyl Alcohol	▲	>480	E	E	>360	E	E	110	E	NR	—	—	G	150	E	E	35	VG	E	57	E	—	—	—	—	—	—
91. Kerosene	▲	>480	E	E	>360	E	E	185	G	G	>360	E	F	>360	E	NR	—	—	P	—	—	G	82	—	E	>480	—
92. Lactic Acid, 85%	▲	>480	—	E	>360	—	E	>480	—	F	>360	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
93. Lauric Acid, 36% in Ethanol	—	—	—	E	>360	—	E	>480	—	NR	—	—	F	15	—	E	>360	—	E	>360	—	—	—	—	—	—	—
94. d-Limonene	▲	>480	E	E	>480	E	NR	—	—	G	>480	E	G	125	G	NR	—	—	NR	—	—	F	57	F	F	>480	E
95. Maleic Acid, saturated solution	—	—	—	E	>360	—	E	>480	—	NR	—	—	G	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
96. Mercury	—	—	—	▲	>480	E	—	—	—	—	—	—	▲	>480	E	▲	>480	E	—	—	—	—	—	—	—	—	—
97. Methyl Alcohol (Methanol)	▲	>480	E	E	103	VG	E	73	VG	NR	—	—	G	45	G	E	12	VG	E	22	E	E	>480	—	DD	363	—
98. Methylamine, 40%	▲	>480	E	E	>360	E	E	153	G	NR	—	—	E	135	VG	E	55	VG	E	100	E	E	>480	—	E	>480	—
99. Methyl Amyl Ketone (MAK)	▲	>480	E	F	53	F	F	10	F	E	>360	E	NR	—	—	F	<10	F	F	<10	F	E	155	G	DD	17	F
100. Methyl-t-Butyl Ether (MTBE)	E	>480	E	E	>360	E	P	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—	G	38	F	—	—	—
101. Methyl Cellosolve®	■	470	F	F	208	G	E	10	F	E	30	G	P	55	G	E	20	VG	—	—	—	▲	>480	E	▲	>480	E
102. Methylene Bromide (DBM)	▲	>480	E	NR	—	—	NR	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—	E	70	F	E	>480	E
103. Methylene Chloride (DCM)	E	20	VG	NR	—	—	NR	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—	G	13	P	E	29	G
104. Methylene bis(4-Phenylisocyanate) (MDI)	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	▲	>480	E	▲	>480	E	—	—	—	—	—	—
105. Methyl Ethyl Ketone (MEK)	▲	>480	E	NR	—	—	P	—	—	F	90	VG	NR	—	—	F	5	F	P	<10	F	E	183	G	DD	20	G
106. Methyl Ethyl Ketone (MEK)/Toluene, 1/1	▲	>480	E	—	—	—	—	—	—	—	—	—	—	—	—	F	5	F	—	—	—	F	60	—	—	—	—
107. Methyl Iodide (Iodomethane)	▲	>480	E	NR	—	—	NR	—	—	F	>360	E	NR	—	—	NR	—	—	NR	—	—	F	15	P	G	215	VG
108. Methyl Isobutyl Ketone (MIBK)	▲	>480	E	P	45	F	NR	—	—	F	>360	E	NR	—	—	P	—	—	P	—	—	E	245	G	DD	30	G
109. Methyl Methacrylate (MMA)	▲	>480	E	P	35	P	NR	—	—	G	>360	E	NR	—	—	P	—	—	NR	—	—	E	85	G	DD	10	F
110. N-Methyl-2-Pyrrolidone (NMP)	▲	>480	E	NR	—	—	NR	—	—	NR	—	—	NR	—	—	E	75	VG	F	47	VG	E	>480	—	DD	—	—
111. Mineral Spirits, Rule 66	▲	>480	E	E	>480	E	E	125	G	E	>360	E	F	150	VG	NR	—	—	G	23	G	—	—	—	—	—	—
112. Monoethanolamine	—	—	—	E	>360	E	E	400	E	E	>360	E	E	>480	E	E	50	E	E	57	E	—	—	—	■	>120	—
113. Morpholine	▲	>480	E	NR	—	—	P	—	—	G	90	G	NR	—	—	G	20	G	E	43	G	E	>480	E	DD	235	VG
114. Naphtha, VM&P	▲	>480	E	E	>360	E	G	103	G	E	420	E	F	120	VG	NR	—	—	NR	—	—	—	—	—	—	—	—
115. Nitric Acid, 10%	▲	>480	—	E	>360	—	E	>480	—	NR	—	—	G	>360	—	G	>360	—	E	>360	—	—	—	—	—	—	—
116. Nitric Acid, 70% (Concentrated)	E	>480	—	NR	—	—	▲	>480	—	NR	—	—	F	109	—	NR	—	—	NR	—	—	—	—	—	—	—	—
117. Nitric Acid, Red Fuming	▲	>480	E	NR	—	—	NR	—	—	NR	—	—	P	—	—	P	—	—	NR	—	—	—	—	—	—	—	—
118. Nitrobenzene	▲	>480	E	NR	—	—	NR	—	—	G	>360	E	NR	—	—	F	15	G	F	42	G	E	>480	—	E	>480	—
119. Nitromethane	▲	>480	E	F	30	F	E	60	G	G	>360	E	P	—	—	E	10	G	E	30	E	E	>480	E	E	249	E
120. 1-Nitropropane	■	368	E	NR	—	—	F	30	G	E	>480	G	NR	—	—	E	15	G	E	25	G	E	>480	E	DD	255	E
121. 2-Nitropropane	▲	>480	E	NR	—	—	F	25	F	E	>360	E	NR	—	—	E	5	G	E	30	VG	—	—	—	—	—	—
122. n-Octyl Alcohol	—	—	—	E	>360	E	E	218	E	G	>360	E	F	>360	E	E	30	VG	E	53	G	—	—	—	—	—	—
123. Oleic Acid	—	—	—	E	>360	E	F	13	VG	G	60	E	F	90	VG	F	>360	E	G	120	—	—	—	—	—	—	—
124. Oxalic Acid, saturated solution	—	—	—	E	>360	—	E	>480	—	P	—	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
125. Pad Etch® 1 (Ashland Chemical)	—	—	—	E	>360	—	E	>360	—	F	34	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
126. Palmitic Acid, saturated solution	—	—	—	G	30	—	E	>480	—	P	—	—	G	75	—	G	5	—	E	193	—	—	—	—	—	—	—
127. Pentachlorophenol, 5% in Mineral Spirits	—	—	—	E	>360	E	E	151	F	E	5	F	F	180	E	NR	—	—	—	—	—	—	—	—	—	—	—
128. n-Pentane	E	>480	E	E	>360	E	G	30	G	G	>360	E	NR	—	—	P	—	—	E	13	G	—	—	—	—	—	—

129. Perchloric Acid, 60%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	F	>360	—	E	>360	—	—	—	—	—	—	—
130. Perchloroethylene (PERC)	▲	>480	E	G	361	VG	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	P	<10	F	E	>480	E
131. Phenol, 90%	▲	>480	E	NR	—	—	E	353	G	F	>360	E	G	75	VG	E	90	—	E	180	E	E	>480	—	E	>480	—
132. Phosphoric Acid, 85% (Concentrated)	▲	>480	—	E	>360	—	G	>360	—	NR	—	—	G	>360	—	F	>360	—	G	>360	—	—	—	—	—	—	—
133. Potassium Hydroxide, 50%	—	—	—	E	>360	—	E	>480	—	NR	—	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
134. Propane Gas	—	—	—	▲	>480	E	▲	>480	E	—	—	—	■	7	VG	—	—	—	—	—	—	—	—	—	—	—	—
135. n-Propyl Acetate	—	—	—	F	20	G	P	—	—	G	120	VG	NR	—	—	P	—	—	P	—	—	E	135	G	DD	<10	F
136. n-Propyl Alcohol	E	>480	E	E	>360	E	E	323	E	P	—	—	F	90	VG	E	23	VG	E	30	E	E	>480	—	E	>480	—
137. Propylene Glycol Methyl Ether Acetate (PGMEA)	▲	>480	E	E	200	F	G	37	F	E	>360	E	P	—	—	G	13	F	G	18	F	▲	>480	E	■	334	E
138. Propylene Glycol Monomethyl Ether (PGME)	—	—	—	—	—	—	P	—	—	—	—	—	P	—	—	—	—	—	—	—	—	▲	>480	E	▲	>480	E
139. Propylene Oxide	▲	>480	E	NR	—	—	NR	—	—	G	35	G	NR	—	—	P	—	—	P	—	—	■	43	F	DD	<10	F
140. Pyridine	▲	>480	E	NR	—	—	NR	—	—	G	10	F	NR	—	—	F	10	F	P	10	F	▲	465	E	DD	40	—
141. Rubber Solvent	—	—	—	E	>360	E	E	43	G	E	>360	E	NR	—	—	NR	—	—	NR	—	—	—	—	—	—	—	—
142. Silicon Etch	▲	>480	E	NR	—	—	E	>480	—	NR	—	—	F	150	—	NR	—	—	P	—	—	—	—	—	—	—	—
143. Skydrol® 500B-4	▲	>480	E	NR	—	—	NR	—	—	—	—	—	NR	—	—	NR	—	—	NR	—	—	E	>480	E	DD	>480	E
144. Sodium Hydroxide, 50%	E	>480	—	E	>360	—	E	>480	—	NR	—	—	G	>480	—	E	>360	—	E	>360	—	E	>480	—	E	>480	—
145. Stoddard Solvent	▲	>480	E	E	>360	E	E	139	G	E	>360	E	F	57	G	NR	—	—	G	10	G	—	—	—	—	—	—
146. Styrene	▲	>480	E	NR	—	—	NR	—	—	G	>360	E	NR	—	—	NR	—	—	NR	—	—	G	26	—	E	>480	—
147. Sulfur Dichloride	—	—	—	P	>480	E	NR	—	—	—	—	—	—	—	—	NR	—	—	NR	—	—	—	—	—	—	—	—
148. Sulfuric Acid, 47% (Battery Acid)	—	—	—	E	>360	—	E	>360	—	NR	—	—	G	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
149. Sulfuric Acid, 95-98% (Concentrated)	E	>480	E	NR	—	—	F	24	—	NR	—	—	G	26	—	NR	—	—	NR	—	—	E	>480	—	E	>480	—
150. Sulfuric Acid, 120% (Oleum)	▲	>480	E	—	—	—	F	53	G	NR	—	—	▼	25	G	—	—	—	—	—	—	—	—	—	—	—	—
151. Tannic Acid, 65%	—	—	—	E	>360	—	E	>480	E	P	—	—	E	>360	—	E	>360	—	E	>360	—	—	—	—	—	—	—
152. Tetrahydrofuran (THF)	▲	>480	E	NR	—	—	NR	—	—	P	115	F	NR	—	—	NR	—	—	NR	—	—	F	13	F	DD	10	F
153. Toluene (Toluol)	▲	>480	E	F	34	F	NR	—	—	G	>1440	E	NR	—	—	NR	—	—	NR	—	—	P	20	F	E	313	—
154. Toluene Diisocyanate (TDI)	▲	>480	E	NR	—	—	NR	—	—	G	>360	E	P	—	—	G	7	G	G	65	VG	E	>480	—	E	>480	—
155. Triallylamine	▲	>480	E	▲	>480	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
156. Trichloroethylene (TCE)	▲	>480	E	NR	—	—	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	NR	—	—	DD	204	VG
157. Tricresyl Phosphate (TCP)	—	—	—	E	>360	E	F	253	F	G	>360	E	F	>360	E	E	45	E	E	>360	E	E	>480	—	E	>480	—
158. Triethanolamine (TEA)	—	—	—	E	>360	E	E	170	VG	G	>360	E	E	>360	E	G	>360	E	—	—	—	—	—	—	—	—	—
159. Turpentine	▲	>480	E	E	>480	E	NR	—	—	G	>360	E	P	—	—	NR	—	—	NR	—	—	■	58	—	■	>480	E
160. Vertrel® MCA	▲	>480	E	E	110	G	E	23	G	F	>360	E	G	13	F	G	<10	F	G	<10	F	■	173	VG	DD	20	G
161. Vertrel® SMT	E	10	G	P	—	—	F	<10	F	G	17	G	G	<10	F	F	<10	F	P	<10	P	▼	18	F	DD	<10	F
162. Vertrel® XE	E	105	E	E	>480	E	E	47	G	F	40	VG	G	303	E	E	17	VG	E	43	VG	E	>480	E	DD	398	E
163. Vertrel® XF	E	>480	E	E	>480	E	E	>480	E	F	387	VG	E	>480	E	E	337	VG	E	204	G	E	>480	E	DD	>480	E
164. Vertrel® XM	E	>480	E	E	>480	E	E	105	E	F	10	G	P	55	G	E	23	VG	E	30	VG	—	—	—	—	—	—
165. Vinyl Acetate	▲	>480	E	F	18	F	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	NR	—	—
166. Vinyl Chloride Gas	▲	>480	E	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
167. Xylenes, Mixed (Xylol)	▲	>480	E	G	96	F	NR	—	—	E	>360	E	NR	—	—	NR	—	—	NR	—	—	P	27	F	E	>480	E

▲ A degradation test against this chemical was not run. However, since its breakthrough time is greater than 480 minutes, the Degradation Rating is expected to be **Good** to **Excellent**. ■ A degradation test against this chemical was not run. However, in view of degradation tests performed with similar compounds, the Degradation Rating is expected to be **Good** to **Excellent**. ▼ A degradation test against this chemical was not run. However, in view of data obtained with similar compounds, the Degradation Rating is expected to be **Fair** to **Poor**. ***CAUTION:** This product contains natural rubber latex which may cause allergic reactions in some individuals.

NOTE:

These recommendations are based on laboratory tests, and reflect the best judgement of Ansell in the light of data available at the time of preparation and in accordance with the current revision of ASTM F 739. They are intended to guide and inform qualified professionals engaged in assuring safety in the workplace. Because the conditions of ultimate use are beyond our control, and because we cannot run permeation tests in all possible work environments and across all combinations of chemicals and solutions, these recommendations are advisory only. The suitability of a product for a specific application must be determined by testing by the purchaser.

The data in this guide are subject to revision as additional knowledge and experience are gained. Test data herein reflect laboratory performance of partial gloves and not necessarily the complete unit. Anyone intending to use these recommendations should first verify that the glove selected is suitable for the intended use and meets all appropriate health standards. Upon written request, Ansell will provide a sample of material to aid you in making your own selection under your own individual safety requirements.

NEITHER THIS GUIDE NOR ANY OTHER STATEMENT MADE HEREIN BY OR ON BEHALF OF ANSELL SHOULD BE CONSTRUED AS A WARRANTY OF MERCHANTABILITY OR THAT ANY ANSELL GLOVE IS FIT FOR A PARTICULAR PURPOSE. ANSELL ASSUMES NO RESPONSIBILITY FOR THE SUITABILITY OR ADEQUACY OF AN END-USER'S SELECTION OF A PRODUCT FOR A SPECIFIC APPLICATION.

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