



**Ansell**

# CHEMICAL SPLASH GUIDE FOR DENTAL GLOVES

# Ansell has developed this guide to help dental professionals better understand how different gloves protect against common chemicals used in dental environments.

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.

Ansell's dental splash guide is 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.

## 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 pass between the molecules of the glove compound or film. In many cases the material that chemicals have permeated through 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 expressed in terms of EN 16523-1 Breakthrough times (min.). When starting the experiment described on the next page, the Permeation Rate, or speed of permeation, expressed in  $\mu\text{g}/(\text{cm}^2 \cdot \text{min})$  is equal to zero. The Permeation Rate will increase with the time of testing and eventually reach the steady-state permeation: constant rate of permeation that occurs after breakthrough when the chemical contact is continuous and all forces affecting permeation have reached equilibrium. The EN 16523-1 Breakthrough Time is the time at which the Permeation Rate reaches the threshold value of  $1 \mu\text{g}/(\text{cm}^2 \cdot \text{min})$ . While the Breakthrough Time is used as a measure of protection, it is emphasized that the test does not represent conditions likely to be found in service, and the use of test data should be restricted to comparing materials chiefly on a relative basis in broad categories of breakthrough times.

**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 after exposure to a chemical.

If a chemical has a significant impact on the physical properties of a glove material, its permeation resistance is quickly impaired. Please note, however, that permeation and degradation do not always correlate.

Key points to note about chemical permeation:

- 1) Gloves made of different polymers will have different chemical resistance properties. Latex, nitrile and neoprene each have their strengths and weaknesses when exposed to different types of chemicals.
- 2) Chemical resistance depends on:
  - Polymer formulation and manufacturing process
  - Thickness of the glove
  - Composition of the product or concentration of the chemicals
  - Frequency and duration of contact with the chemical(s)
  - Nature of contact – total immersion or splash only
  - Environmental conditions (temperature, humidity, etc.)
- 3) Gloves made of the same polymer and with similar thickness may not always have the same chemical resistance as the formulation and manufacturing process of the two gloves may not be similar.
- 4) The suitability of a glove in protecting against a chemical/ mixture must be determined by testing the specific product against the specific chemical/ mixture in order to accurately determine how well a given glove will protect.

# Methodology

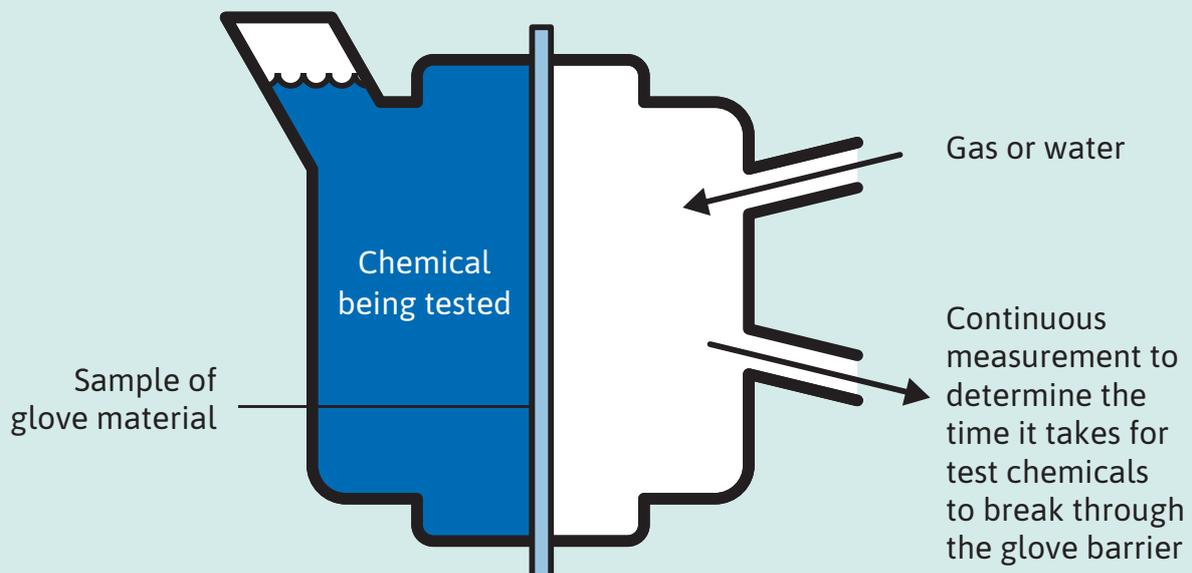
## Permeation Testing



Ansell conducts permeation testing in accordance with both ASTM F739 and EN 16523-1 and can provide test results based on the preference of customers in different regions. Permeation testing is conducted by cutting a specimen from the gloves and clamping it 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.

The EN and ASTM standards allow for variety in analysis and collection media. At Ansell, dry nitrogen is the most common medium and gas chromatography with Flame Ionization Detectors (FID) 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.

## HOW CHEMICAL PERMEATION TESTS WORK



# Splash rating was calculated by taking into account the following factors:

**A** Risk Rating (RR) ranging from 1 (greatest risk) to 4 (least risk), based on EU Hazard Ratings in **“Quick Selection Guide to Chemical Protective Clothing/ Krister Forsberg, Ann Van den Borre, Norman Henry III, James P. Ziegler, Hoboken, NJ: Wiley 7th Edit, 2020”**:

1 Highly toxic and/or highly corrosive (Tx, Cx)

2 Toxic and/or corrosive (T, C)

3 Harmful and/or irritant (X, Xi)

4 No risk

*Risk Ratings for compounds not listed in Forsberg and Mansdorf were estimated from toxicity data in other sources.*

**B** Breakthrough time in minutes, EN ISO 374 permeation test.

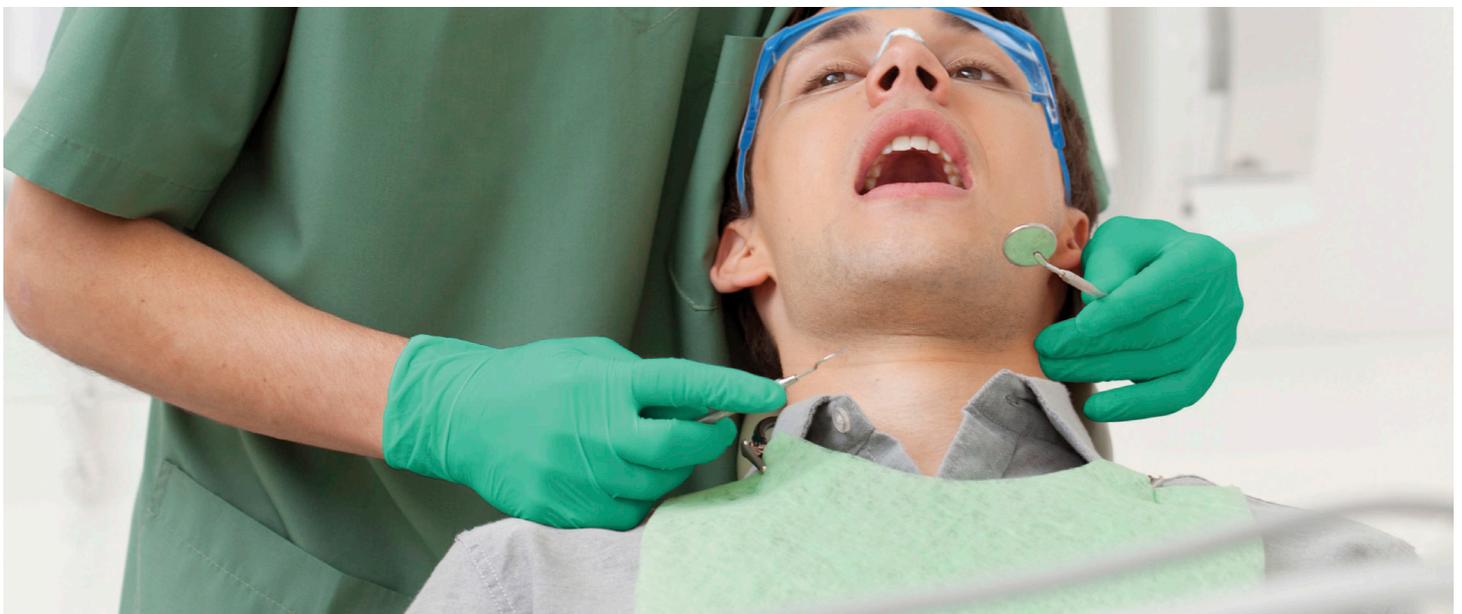
**C** Volatility Rating (VR)

## Rating

1	slightly volatile
2	moderate volatile
3	highly volatile

### Note on the Data and Recommendations

Many of the breakthrough times in the table below have been estimated using data for similar glove/chemical combinations, or are based on EN ISO 374 test data. Recommendations are based on extrapolations from laboratory test results and information regarding the composition of chemicals and may not adequately represent specific conditions of end use. Synergistic effects of mixing chemicals have not been accounted for. For these reasons, and because Ansell has no detailed knowledge of or control over the conditions of end use, any recommendation must be advisory only and Ansell fully disclaims any liability including warranties related to any statement contained herein.



# Splash Guide for Dental Gloves

## Splash Guide

- Recommended Splash Rating : The glove is very well-suited for splash protection against that chemical.
- Caution Splash Rating : The glove can be used under carefully controlled conditions, and as a precautionary measure consider replacing the glove if chemical splash/spills occurs.
- Not Recommended Splash Rating : Avoid exposure of the gloves to that chemical.

	Chemical Name	CAS Number	Conc. (%)			
				MICROFLEX® Soft White Nitrile TQ-601	MICROFLEX® MidKnight™ Touch 93-732	MICROFLEX® XCEED® 93-833.XC-310
1	3-Methacryloxypropyltrimethoxysilane	2530-85-0	100	Recommended	Recommended	Recommended
2	Acetic Acid	64-19-7	100	Not Recommended	Not Recommended	Not Recommended
3	Ammonium Hydroxide	1336-21-6	20	Caution	Caution	Caution
4	Ammonium Hydroxide	1336-21-6	28	Caution	Caution	Caution
5	Ethyl Alcohol	64-17-5	100	Caution	Recommended	Caution
6	Ethylene Glycol	107-21-1	100	Recommended	Recommended	Recommended
7	Formaldehyde	50-00-0	37	Recommended	Recommended	Recommended
8	Glutaraldehyde, Aqueous Solution	111-30-8	25	Recommended	Recommended	Recommended
9	Glycerine	56-81-5	100	Recommended	Recommended	Recommended
10	Glycolic Acid, Aqueous Saturated Solution	79-14-1	70	Recommended	Recommended	Recommended
11	Heptane	142-82-5	100	Recommended	Recommended	Recommended
12	Hydrochloric Acid	7647-01-0	37	Caution	Caution	Caution
13	Hydrogen Peroxide	7722-84-1	30	Caution	Caution	Recommended
14	Isopropanol	67-63-0	10	Caution	Recommended	Recommended
15	Isopropanol	67-63-0	100	Recommended	Recommended	Caution
16	Mercury	7439-97-6	100	Recommended	Recommended	Recommended
17	Methyl Ethyl Ketone	78-93-3	100	Caution	Caution	Caution
18	Methyl Methacrylate	80-62-6	100	Caution	Caution	Caution
19	Naphtha	8030-30-6	100	Recommended	Recommended	Caution
20	n-Hexane	110-54-3	100	Recommended	Caution	Caution
21	Nitric Acid	7697-37-2	70	Not Recommended	Not Recommended	Not Recommended
22	Petrolatum	8009-03-8	100	Recommended	Caution	Caution
23	Phosphoric Acid	7664-38-2	85	Recommended	Recommended	Recommended
24	Propylene Glycol	57-55-6	100	Recommended	Recommended	Recommended
25	Rosin Modified	65997-06-0	100	Recommended	Recommended	Recommended
26	Sodium Bicarbonate, Aqueous Solutions	144-55-8	99	Recommended	Recommended	Recommended
27	Sodium Fluoride, Aqueous Solutions	7681-49-4	4	Recommended	Recommended	Recommended
28	Sodium Hydroxide	1310-73-2	40	Recommended	Recommended	Recommended
29	Sodium Hypochlorite, Aqueous Solution	7681-52-9	8	Recommended	Recommended	Recommended
30	Sulfamic Acid	5329-14-6	20	Recommended	Recommended	Recommended
31	Sulphuric Acid	7664-93-9	50	Recommended	Recommended	Recommended
32	Sulphuric Acid	7664-93-9	96	Not Recommended	Not Recommended	Not Recommended
33	Toluene	108-88-3	100	Caution	Caution	Caution
34	White Mineral Oil (Petroleum), Light	92062-35-6	100	Recommended	Recommended	Recommended
35	12149/ 12150/ 12151/ 12154 3M™ ESPE™ VANISH™ 5% NaF WHITE VARNISH WITH TCP			Caution	Caution	Caution
36	Biflourid 10			Not Recommended	Not Recommended	Not Recommended
37	Calasept			Recommended	Recommended	Recommended
38	Calcur			Recommended	Recommended	Recommended
39	Calcimol LC			Recommended	Recommended	Recommended
40	Calmix			Recommended	Recommended	Recommended
41	Calxyl			Recommended	Recommended	Recommended
42	Canal Plus			Recommended	Caution	Recommended
43	Canal Pro EDTA 17%			Recommended	Recommended	Recommended
44	Caries Finder™ Red			Recommended	Recommended	Recommended
45	Cavicide™			Caution	Recommended	Caution
46	Cavicide™ AF			Recommended	Recommended	Recommended
47	Cavidry (Aka Methyl Ethyl Ketone)	78-93-3	100	Caution	Caution	Caution
48	Clorox® Germicidal Bleach			Recommended	Recommended	Recommended
49	Clorox® Regular-Bleach			Recommended	Recommended	Recommended
50	Composite Wetting Resin			Not Recommended	Not Recommended	Not Recommended

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51	Consepsis, Consepsis V			Yellow	Yellow	Yellow
52	Eugenol	97-53-0	100	Red	Red	Red
53	FL BOND II "BONDING AGENT"			Red	Red	Red
54	Fortify Plus / Modeling Resin			Yellow	Yellow	Yellow
55	Henry Schein Antimicrobial Skin Cleanser			Green	Green	Green
56	High Spot Moisturizing Spray, Clean and Lube and Clean and Lube Wipes			Green	Green	Green
57	Hyde-Out Aldehyde Neutralizer			Green	Green	Green
58	HypoPure			Green	Green	Green
59	IRM LIQUID - Zinc Oxide Eugenol			Yellow	Red	Red
60	IRM Powder Zinc Oxide Eugenol			Green	Green	Green
61	MaxiCide Plus			Green	Green	Green
62	MI Varnish			Yellow	Yellow	Yellow
63	Mikrozid AF wipes			Yellow	Yellow	Red
64	Monobond Etch & Prime			Green	Green	Green
65	NOGENOL (Non-Eugenol Temporary Cement; Base)			Red	Red	Red
66	Opal™ Band™ Cement - Catalyst			Green	Green	Green
67	Optim 1 Wipes			Green	Green	Green
68	Optim Blue			Green	Green	Green
69	Orange Guard			Green	Green	Green
70	Oraseal™ Caulk, Oraseal™ Putty			Green	Green	Green
71	Orotol® plus Disinfection of suction system			Green	Green	Green
72	PermaQuick® Bonding Primer			Yellow	Yellow	Yellow
73	Porcelain Etch			Red	Red	Red
74	Preline Base Paste			Green	Green	Green
75	Premium Dispersed Phase Alloy – Regular Set			Green	Green	Green
76	Provicol			Green	Green	Green
77	Pulp Canal Sealer™ Liquid			Yellow	Yellow	Yellow
78	Purevac Evacuation System Cleaner			Green	Green	Green
79	QUATTROcare plus Spray AMERICA 2141			Green	Green	Green
80	SmearClear™ Mix			Green	Green	Green
81	Sterilex Ultra Disinfectant Cleaner Solution 1			Green	Green	Green
82	Super Sani-Cloth Germicidal Wipe			Green	Green	Yellow
83	Topex® Durashield 5% Sodium Fluoride Varnish			Green	Green	Green
84	Ultra Blend Plus			Green	Green	Green
85	UltraCal™ XS			Green	Green	Green
86	Ultradent™ Citric Acid Solution			Green	Green	Green
87	Ultradent™ EDTA 18% Solution			Green	Green	Green
88	Ultra-Etch			Green	Green	Green
89	Ultra-Etch & Opal Etch			Green	Green	Green
90	Woolite Carpet & Upholstery Cleaner (8352)			Green	Green	Green
91	Woolite Carpet & Upholstery Cleaner, or Fabric & Upholstery Cleaner			Green	Green	Green

**Abbreviation**  
Conc.

### Note on the Data and Recommendations

The Splash Rating was calculated based on chemical permeation breakthrough time, its volatility and health hazard. The breakthrough time is based on EN ISO 374 test data. Recommendations are based on extrapolations from laboratory test results and information regarding the composition of chemicals and may not adequately represent specific conditions of end use. Synergistic effects of mixing chemicals have not been accounted for. For these reasons, and because Ansell has no detailed knowledge of or control over the conditions of end use, any recommendation must be advisory only and Ansell fully disclaims any liability including warranties related to any statement contained herein.

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