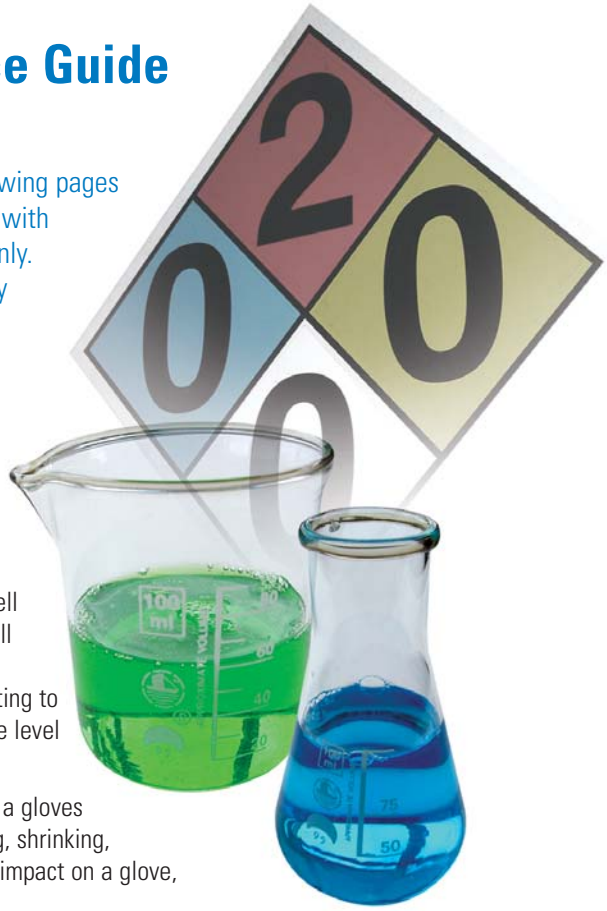
Permeation/Degradation Resistance Guide for Chemical Resistant Gloves

Superior's permeation and degradation tests are displayed on the following pages as a resource guide in determining the suitability of our gloves for use with specific chemicals. Please note these recommendations are advisory only. The suitability of the product for a specific job should be determined by testing, by the customer.



What is Permeation and Degradation?

Permeation is the movement of a chemical through a film, such as a glove. A gloves protective abilities are determined by two factors; its thickness and how its molecules interact with the chemical the glove is being immersed in. Latex gloves for example, are well suited for handling Acetone but will quickly fall apart in Motor Oil. Permeation is measured in 'Breakthrough Time' **(BTT). BTT**(min) is the time it takes from the start of testing to the first detection of a chemical on the inside of the glove. This represents the level of protection a glove can be expected to provide in a given chemical.

Degradation is the deterioration in one or more of the physical properties of a gloves material, due to contact with a chemical. Degradation may appear as swelling, shrinking, stiffening, cracking or discoloration. If a chemical has significant degradation impact on a glove, its protective ability will be quickly reduced.

Understanding The Data

Three categories of data are represented for each product with a corresponding Chemical and Chemical Hazard Code:
1) Degradation Rating 2) Breakthrough Time, 3) Class

DEGRADATION RATING (DR)	
E	Excellent; fluid has little degrading effect.
G	Good; fluid has minor degrading effect.
F	Fair; fluid has moderate degrading effect.
P	Poor; fluid has pronounced degrading effect.
▲	Not Tested
NR	Not Recommended
G/E	A degradation test on this chemical was not run. However, since its break through time is greater than 480 minutes, the Degradation Rating is expected to be GOOD to EXCELLENT.

BREAKTHROUGH TIMES(MINUTES)(BTT)	
Class	
0	1 to 10 minutes
1	11 to 30 minutes
2	31 to 60 minutes
3	61 to 120 minutes
4	121 to 240 minutes
5	241 to 480 minutes
6	More than 480 minutes

As in EN 374, 1994





CHEMICAL	FB-SERIES/J-SERIES			TORPEDO			CHEMINATOR			NORTH SEA SERIES			CHEMSTOP-FLEX	
	DR	BTT	CLASS	DR	BTT	CLASS	DR	BTT	CLASS	DR	BTT	CLASS	BTT	CLASS
Acetone	NR	6	0	NR	11	1	NR	6	0	NR	11	1	11	1
1,2 Dichloro Ethane	NR	4	0	P	11	1	NR	8	0	P	13	1	4	0
1,2 Dichloro Ethane 76% + Phenol 24%	▲	21	1	▲	11	1	▲	14	1	▲	13	1	31	2
1,2-Dichlorethane Reincst	▲	12	1	▲	18	1	▲	8	0	▲	13	1	33	2
1-Butanol	▲	30	1	▲	78	3	▲	80	3	▲	66	3	480	6
2.6-Dimethyl 4-Heptanone	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Acetaldehyde	NR	6	0	P	9	0	P	13	1	P	9	0	18	1
Acetic Acid (Glacial)	F	24	1	G	74	3	G	44	2	G	80	3	252	5
Acetonitrile	▲	12	1	▲	18	1	▲	13	1	▲	16	1	28	1
Acrylamide (50%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Ammonium Fluoride (40%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Ammonium Hydroxide (30%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Amyl Acetate	▲	16	1	▲	27	1	▲	25	1	▲	29	1	54	2
Aniline	G	65	3	G	83	3	G	90	3	E	145	4	165	4
Battery Acid	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Benzaldehyde	▲	18	1	▲	42	2	▲	40	2	▲	38	2	23	1
Benzene	NR	7	0	NR	15	1	NR	9	0	NR	10	0	5	0
Butoxy Propanol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Butoxy Triglycol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Butyl Acetate	▲	12	1	▲	20	1	▲	12	1	▲	26	1	23	1
Butyl Carbitol Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Butyl Cellosolve Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Butyl Dipropasol Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Butyl Ethylene	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Butyl Propasol Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Castor Oil	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Caustic Potash(45%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Caustic Soda (50%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Chlorobenzene	▲	10	0	▲	12	1	▲	14	1	▲	13	1	12	1
Chloroform	▲	4	0	▲	8	0	▲	▲	▲	▲	▲	▲	12	1
Chromic Acid (50%)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Chromium Trioxide	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Citric Acid (30%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Cooking Oil	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Corn Oil	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Cresol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Cresylic Acid	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Cyclohexane	▲	18	1	▲	38	2	▲	34	2	▲	34	2	480	6
Cyclohexanone	▲	63	3	▲	58	2	▲	49	2	▲	57	2	53	2
Cyclohexanol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Detergent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Di-Butyl Phthalate (D.B.P)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Di-isobutyl Ketone	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Di-isocytl Phthalate (D.I.O.P)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Diacetone Alcohol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Dibutyl Phthalate	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Diesel	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Diethanolamine	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Diethylamine	NR	6	0	▲	7	0	▲	8	0	▲	9	0	▲	▲
Diethyl Ether	NR	4	0	NR	6	0	NR	6	0	NR	5	0	13	1
Diethylene Glycol Monobutyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Diethylene Glycol Monohexyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Diethylene Glycol Monomethyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Diethylene Glycol Monopropyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Dimethylacetamide	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	67	3
Dimetyl Formamide (DMF)	NR	14	1	NR	21	1	NR	22	1	NR	27	1	57	2
Dipropasol Glycol Monobutyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Dipropylene Glycol Monobutyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Dipropylene Glycol Monopropyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Epoxidised Soya Bean Oil	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	
Ethanolamine	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6

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CHEMICAL	FB-SERIES/J-SERIES			TORPEDO			CHEMINATOR			NORTH SEA SERIES			CHEMSTOP-FLEX	
	DR	BTT	CLASS	DR	BTT	CLASS	DR	BTT	CLASS	DR	BTT	CLASS	BTT	CLASS
Ethoxytriglycol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Ethyl Acetate	NR	6	0	NR	13	1	NR	7	0	NR	13	1	18	1
Ethyl Butanol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Ethylene Glycol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Ethylene Glycol Monopropyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Formaldehyde (37%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Formic Acid (90%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Genklene	NR	4	0	▲	8	0	NR	6	0	NR	6	0	5	0
Glycerine	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Ground Nut Oil	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Hexylcarbitol Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Hexylcellosolve Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Hydrazine Hydrate (85%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Hydrochloric Acid (10%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Hydrochloric Acid (30%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Hydrochloric Acid (37%)	▲	95	3	▲	▲	▲	▲	210	4	▲	▲	▲	▲	▲
Hydrogen Peroxide	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Hydrogen Peroxide (30%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Hydroquinone	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Iodomethane	▲	5	0	▲	▲	▲	▲	▲	▲	▲	11	1	14	1
Isoamyl Alcohol	F	45	2	G	122	4	G	112	3	F	80	3	480	6
Iso Butyl Alcohol	▲	41	2	▲	91	3	▲	69	3	▲	86	3	480	6
Iso Butyl Methyl Ketone	NR	11	1	NR	22	1	NR	19	1	NR	18	1	32	2
Iso Propyl Alcohol	G	40	2	G	80	3	G	75	3	G	70	3	480	6
Kerosene	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Kerosene (Paraffin)	▲	96	3	NT	119	3	▲	178	4	▲	228	4	▲	▲
Lactic Acid (85%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Malic Acid	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Methoxytriglycol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Methanol	▲	24	1	NT	31	2	▲	▲	▲	▲	▲	▲	480	6
Methyl Acetate	NR	4	0	NR	8	0	NR	9	0	NR	11	1	▲	▲
Methyl Acrylate	NR	3	0	▲	10	0	▲	11	1	▲	11	1	▲	▲
Methyl Alcohol	▲	13	1	▲	20	0	▲	18	1	▲	20	1	67	3
Methyl Ethyl Ketone	NR	4	0	NR	10	1	NR	6	0	NR	10	0	9	0
Methyl Methacrylate	NR	4	0	NR	8	0	NR	9	0	NR	9	0	10	0
Methylcarbitol Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Methylene Chloride	NR	4	0	▲	8	0	NR	6	0	NR	6	0	10	0
Milk	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Milk Products	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Monoethanolamine	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Morpholin	▲	26	1	▲	63	3	▲	56	2	▲	38	2	▲	▲
Muriatic Acid	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
N,N Dimethyl Acetamide	▲	14	1	▲	30	1	▲	29	1	▲	34	2	25	1
n-Hexane	NR	8	0	NR	15	1	P	20	1	P	18	1	320	5
n-Ocatnol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Nitric Acid (10%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Nitric Acid (65%)	▲	70	3	▲	245	5	▲	75	3	▲	124	4	480	6
Nitro Benzene	▲	34	2	▲	55	2	▲	43	2	▲	64	3	36	2
Nitro Methane	▲	15	1	▲	16	1	▲	17	1	▲	19	1	▲	▲
Octane (Petrol or Gasoline)	▲	16	1	▲	27	1	▲	36	2	▲	51	2	63	3
Oil-Based Paints	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Oleic Acid	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Olive Oil	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Ortho Phosphoric Acid (85%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Oxalic Acid	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Paraffin (52% Chlorination)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Phenol (76% IN H20)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	171	4	▲	▲
Pentane	▲	9	0	▲	12	1	▲	19	1	▲	22	1	▲	▲
Petrol	▲	14	1	▲	28	1	▲	24	1	▲	47	2	▲	▲
Perchloric Acid (60%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Phtalic Acid Dibutyl Ester	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Propanol	▲	41	2	▲	82	3	▲	74	3	▲	70	3	▲	▲
Propetamphos (50% IN ROH)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Propoxy Diethylene Glycol	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Propyl Carbitol Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Propyl Cellosolve Solvent	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Propylene Glycol Monobutyl Ether	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Pyridine	NR	10	0	NR	11	0	P	15	1	P	12	1	14	1
Safrotin (50% IN ROH)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Sodium Hydroxide (50%)	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sodium Hypochlorite (6%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Styrene	▲	12	1	▲	22	1	▲	21	1	▲	24	1	18	1

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CHEMICAL	FB-SERIES/J-SERIES			TORPEDO			CHEMINATOR			NORTH SEA SERIES			CHEMSTOP-FLEX	
	DR	BTT	CLASS	DR	BTT	CLASS	DR	BTT	CLASS	DR	BTT	CLASS	BTT	CLASS
Sulphoric Acid (47%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Sulphuric Acid (Con.)	▲	73	3	▲	104	3	▲	119	3	▲	135	4	87	3
Sulphuric Acid 30%	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Tannic Acid (65%)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Tert- Butyl Amine	▲	72	4	▲	164	4	▲	145	4	▲	150	4	▲	▲
Tetrachloroethylene	P	11	1	P	20	1	P	21	1	P	16	1	36	2
Tetrahydrofuran	▲	8	0	▲	9	0	NR	4	0	▲	14	1	5	0
Toluene	NR	7	1	NR	18	1	NR	11	1	NR	12	1	15	1
Toluene Extra Pure	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	21	1
Trichlorothane	P	14	1	P	15	1	P	17	1	P	15	1	▲	▲
Trichloroethelene	NR	5	1	P	17	1	P	12	1	P	18	1	▲	▲
Tricresyl Phosphate (TCP)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Triethanolamine (TEA)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	480	6
Trixylyl Phosphate (T.X.P)	G/E	480	6	G/E	480	6	G/E	480	6	G/E	480	6	▲	▲
Xylene	NR	20	2	NR	33	2	NR	29	1	NR	24	1	31	2

The results herein are obtained under controlled laboratory conditions and are for guidance only. It is the intention to assist the user to make the correct choice of personal protective equipment. Actual conditions of end use are not simulated and it is the responsibility of the user to determine the risk and make the appropriate choice for protection against such risk. The manufacturer, the distributor and the sales agents accept no responsibility for a user's selection against particular risk. The manufacturer, the distributor and the sales agents do not imply any guarantee or responsibility from information provided that a particular product will suit specific end use.

Coating Materials

Coating materials include natural rubber or latex, synthetic rubber, and plastics. Common glove coating materials include:

1. Natural Rubber

2. Synthetic Rubber

- Chloroprene (Neoprene)
- Nitrile rubber

3. Plastics

- Polyurethane
- Polyvinyl alcohol (PVA)
- Polyvinyl chloride

Natural Rubber also known as Latex is found in nature in over 200 plants, but its most common source is the Hevea Brasiliensis tree. Natural rubber dispersed in water is known as latex. Natural rubber has a very high elasticity compared to other glove materials, excellent cut and tear resistance, and outstanding grip and temperature resistance. While it is flexible and durable over a wide range of temperature – 18-149°C (0-300°F), it has poor flame resistance. In general, natural rubber withstands water, alcohols, and some ketones, but has poor chemical resistance against most hydrocarbon and organic solvents. Natural rubber can cause an allergic reaction in some people.

Chloroprene known by its DuPont trade name of Neoprene® chloroprene was the first commercial synthetic rubber. It has good abrasion and cut resistance and resists degradation due to aging, sunlight, ozone, oxidation, and weather. Neoprene® is also flame resistant and demonstrates heat stability up to 93°C (200°F). It provides excellent resistance to a broad range of chemicals including acids, alcohols, fats, caustics, refrigerant, ketones, detergents, and fertilizers. Neoprene® is also combined with natural rubber in some glove coating formulations.

Polyvinyl Alcohol (PVA) is a polymer of vinyl alcohol. PVA offers good resistance to punctures, cuts, snags and abrasion. This material provides resistance to hydrocarbons, chlorinated solvents, esters, and most ketones, but is not resistant to water, water-based solutions (like acids and bases), or light alcohols. PVA is provided as a coated glove by a limited number of manufacturers.

Nitrile Rubber is a co-polymer of acrylonitrile and butadiene. Nitrile rubber offers excellent physical hazards resistance to punctures, cuts, snags, and abrasion. While it is not flame-resistant, it demonstrates functional performance in temperatures ranging from -4-149°C (25-300°F). Nitrile rubber has considerable resistance to oils, fuels, and certain organic solvents. It is commonly used as a coating for dipped gloves and also in the construction of laminated and impregnated cut and sewn gloves.

Polyurethane (PU) is a thermoplastic polymer of urethane. Polyurethane provides good abrasion resistance and tensile strength. Polyurethane offers good resistance to oils, some organic solvents, oxidation and ozone. It has poor resistance to hot water and is not recommended for use above 79°C (175°F). Polyurethane has a very low particulate shed, thus making it a good choice for cleanroom gloves. Polyurethane is also used in some specialty application styles and as a waterproof liner for gloves.

Polyvinyl Chloride (PVC) is a synthetic thermoplastic polymer of vinyl chloride. PVC offers good abrasion resistance but may be susceptible to punctures, cuts, and snags. While it is flexible, it does not provide the tactile sensitivity associated with most rubber products. PVC starts to soften at approximately 82°C (180°F). PVC is effective against water and most aqueous solutions, detergents, and diluted bases and acids. It only has limited chemical resistance to organic solvents. PVC is one of the more common coatings for coated work gloves.