

# PermaShield<sup>®</sup> Chemical Compatibility Charts



**Fab-Tech**  
An Exyte Group Company

## Reliable Service

With nearly three decades of proven service in highly corrosive environments, PermaShield® has demonstrated its reliability for the removal of hazardous exhaust fumes. Engineers can see the strength of PermaShield® to support their manufacturing lines, with no surprises.

PermaShield Fluoropolymer Barrier Coating is the premier chemical and impact resistant coating for applications under 300°F available today. The PermaShield product line has never had a reported failure due to chemical attack of the coating. Many of the chemicals and solvents that are easily contained by PermaShield Fluoropolymer Barrier Coating can cause rapid deterioration of other plastics and all but the most exotic metal alloys.

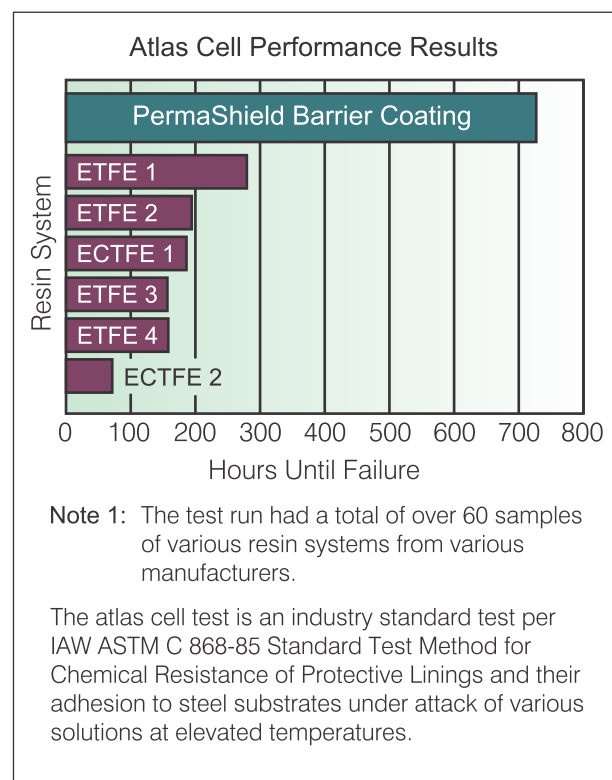
## Research And Testing

Fab-Tech engineers conducted a comprehensive research and testing program of fluoropolymers available on the market to determine the attributes or compatible coatings. Working closely with resin manufacturers, a base formula was selected and then modified to enhance permeation resistance and tested under Fab-Tech's unique coating methodology. Exhaustive tests of virtually all duct coatings available confirmed that this new formula proved to have much better adhesion and permeation resistance than standard ETFE or ECTFE. Test results also showed samples exhibited no observed blisters, peels or delamination.

This coating has better permeation resistance than any other fluoropolymer coating. Independent test results show PermaShield has three times greater permeation resistance than the next best coating found in the marketplace (see Atlas Cell Test graph). The elasticity and bond to the substrate enables smaller diameter duct to be cut to length in the field and a new flange to be turned. This provides the installation contractor with the flexibility needed to address unexpected changes.

Applied using an electrostatic process, PermaShield Fluoropolymer Barrier Coating is integrally bonded to a stainless steel substrate. This process allows the coating to be applied to virtually any fitting, regardless of size or configuration, thus allowing engineers unlimited system design capabilities.

## Field proven so there are no surprises!



## FM Approved

PermaShield® with PermaShield Fluoropolymer Barrier Coating is FM 4922 approved for use as a fume exhaust product without internal fire suppression systems. This covers the maximum approval range of 4" to 60" diameter and a coating thickness up to .012". This product does not burn as certified in ASTM E-84 test with "0" flame spread and a smoke generation index of less than "20". These tests were performed as part of the Factory Mutual approval process for construction materials.

## Desirable Coating Attributes

Along with its high level of chemical resistance, this fluoropolymer coating possesses the following desirable attributes for years of worry free service:

- Excellent cut through and abrasion resistance
- Low cold flow
- High tensile strength - good elongation properties
- Dimensionally stable
- Excellent impact resistance at room temperature
- Continuous use to 300°F in most applications
- Excellent release properties
- Very smooth surface

## Wastewater Applications

PermaShield's unsurpassed performance includes some of the most troublesome chemicals found in wastewater treatment applications. These include the following with maximum use temperatures from Table 1.

CHEMICAL	1 PermaShield™	2 FRP	3 CPVC	4 PP	5 PVC
Hydrogen Sulfide (Dry)	300	210	185	150	140
Hydrogen Sulfide (Wet)	200*	210			140
Sodium Hypochlorite 5%	250	150**	185	120	73

- 1 PermaShield™ coating. From Fab-Tech Inc.
- 2 Vinyl Ester. From Koppers Company, Inc.
- 3 Chlorinated Polyvinyl Chloride. Class 23447-B.
- 4 Polypropylene. Type 1. Polyolefin.
- 5 Polyvinyl Chloride. Class 12454-B.

New wastewater treatment facilities are cleaner and greener than ever before in design and operation. This is due to increasingly stringent regulations as well as increased awareness about the limitations and attributes of many once-prominent building materials. The bottom line is PermaShield is faster, cleaner, safer, and more cost effective than FRP duct when factoring overall installation, maintenance, and total lifetime costs.



Atlas cell test.



FM 4922 test.

## Compatibility Tables

### Table 1 - Max Use Temperatures

Table 1 lists over 500 chemicals whose corrosive characteristics create problems that can often be solved by specifying PermaShield. The maximum use temperature for each chemical service is suggested as a guide only and are not necessarily upper limits of usability but are limits of data available. Little or no chemical attack is indicated at the temperature listed with less than 10% swelling or dimensional change and less than 15% loss of tensile strength at a concentration of 100%, concentrated, or saturated solution. It is recommended that tests be conducted under actual or simulated use conditions whenever possible to determine the suitability of PermaShield Fluoropolymer Barrier Coating or any other material for a specific application. This guide is based on controlled tests of representative chemicals, field applications, experience, and engineering judgement with regard to the suitability of PermaShield Fluoropolymer Barrier Coating in these chemical environments.

### Table 2 - PTFE Sealant Ratings

Table 2 was assembled from known compatibility data for PTFE materials and should be used only as a general guide for determining the suitability of PermaShield Gasket™ sealants for specific uses.

TABLE - Chemical Compatibility Comparison (Maximum Use Temperatures °F)

- 1 PermaShield™ coating. From Fab-Tech, Inc.  
 2 Vinyl Ester. From Koppers Company, Inc.  
 3 Chlorinated Polyvinyl Chloride. Class 23447-B.  
 4 Polypropylene. Type 1. Polyolefin.  
 5 Polyvinyl Chloride. Class 12454-B.

CHEMICAL	PermaShield™ <sup>1</sup>	FRP <sup>2</sup>	CPVC <sup>3</sup>	PP <sup>4</sup>	PVC <sup>5</sup>
<b>A</b>					
Acetaldehyde	100			120	NR
Acetamide	200	NR		73	
Acetic Acid Vapors	212	NR	73	180	140
Acetic Acid (10%)	212*	210		70	70
Acetic Acid (20%)	212*	210		70	70
Acetic Acid (50%)	212*	175		70	70
Acetic Acid (80%)	300	175		70	70
Acetic Acid (90%)	300	100		70	70
Acetic Acid (Glacial)	212*	NR	NR	120	73
Acetic Anhydride	200*	NR		75	NR
Acetone	212		NR	73	NR
Acetone Cyanohydrin	122				
Acetonitrile	300	NR		70	NR
Acetophenone	200	NR		120	NR
Acetyl Chloride	122*				
Acetylene	212*			73	140
Acrylonitrile	212*	NR	NR	120	NR
Acrylic Acid	212				
Adipic Acid	122*	70	185	140	140
Alcohols General	200	100	NR	170	NR
Alcohols, Amyl	300	200	185	170	140
Alcohol, Benzyl	300				
Alcohol, Butyl, Primary	300	120		70	70
Alcohol, Butyl, Secondary	300	120		70	70
Alcohol, Diacetone	122				
Alcohol, Ethyl (Ethanol)	300	100		140	70
Alcohol, Hexyl	70*				
Alcohol, Isopentyl	122				
Alcohol, Isopropyl	300				
Alcohol, Menthyl	300				
Alcohol, Propyl	300				
Allyl Alcohol	212	140		140	73
Allyl Chloride	300	80		80	NR
Alum	300				
Alum, Ammonium	300				
Alum, Chrome	212*				
Alum, Potassium	300				
Aluminum Chloride	300	210	185	180	140
Aluminum Fluoride	300	80**		225	73
Aluminum Hydroxide	300	180	185		140
Aluminum Nitrate	300	160	185	180	140
Aluminum Oxychloride	300				140
Aluminum Sulfate	300	140		225	150
Ammonia, Gas	212*				
Ammonia (Anhydrous)	200				
Ammonia (Aqueous 30%)	200	NR		73	NR
Ammonium Acetate	122*				

CHEMICAL	PermaShield™ <sup>1</sup>	FRP <sup>2</sup>	CPVC <sup>3</sup>	PP <sup>4</sup>	PVC <sup>5</sup>
Ammonium Bifluoride	300		185		140
Ammonium Bisulfide	300				
Ammonium Carbonate	300	150**		180	140
Ammonium Chloride	300	210	185	180	140
Ammonium Dichromate	250*				73
Ammonium Fluoride 10%	300	150**			
Ammonium Fluoride 25%	300	140		212	73
Ammonium Hydroxide (30%)	300	150**	185	180	140
Ammonium Metaphosphate	300				
Ammonium Nitrate	300	180	185	180	140
Ammonium Persulfate	122*	180	73	150	140
Ammonium Phosphate	300	210		225	140
Ammonium Sulfate	300	210	185	180	140
Ammonium Sulfide	300	120			
Amyl Acetate	122	NR		NR	NR
Amyl Chloride	300	120		NR	NR
Aniline	212*		NR	180	NR
Anisole	122				
Anthraquinone	122*				140
Anthraquinone Sulfonic Acid	122*				140
Antimony Trichloride	70*	220		180	140
Aqua Regia	212*		73		NR
Aqua Regia (Fumes)	212	150		70	100
Arsenic Acid	300	80	185	225	140
<b>B</b>					
Barium Carbonate	300	210		225	140
Barium Chloride	300	210		212	140
Barium Hydroxide	300	160		212	140
Barium Nitrate	300			70	70
Barium Sulfate	300	210	185	70	140
Barium Sulfide	300	180		225	140
Beer	300				
Beet Sugar Liquors	300	180		140	150
Benzaldehyde 10%	200			70	73
Benzaldehyde above 10%	122	NR		70	NR
Benzene	200	NR	NR	NR	NR
Benzene Sulfonic Acid	200	210		70	70
Benzene Sulfonic Acid 10%	200			180	40
Benzoic Acid	250*	210		73	140
Benzyl Alcohol	200	NR		150	NR
Benzyl Chloride	100	80		250	70
Benzonitrile	200				
Bismuth Carbonate	300				140
Black Liquor	300		185		140
Bleach 12.5% Active Cl <sub>2</sub>	300		185	120	140
Bleach 5.5% Active Cl <sub>2</sub>	300				
Borax	300	210		180	140
Boric Acid	300	210	185	180	140
Brine Acid	300				
Bromine, Liquid	122	NR			
Bromine, Vapor 25%	122	NR		NR	NR
Bromine, Water	212*			NR	
Bromobenzene	122				NR
Bromotoluene	122			NR	NR
Butadiene	250*		73	NR	140

ANNOTATIONS: \* = No Data Available Above Temperature Listed, \*\* = Synthetic Fiber Surfacing Mat Recommended by Manufacturer  
 NR = Not Recommended by Manufacturer, Blank = No Data Available or Other Relevant Data Prevails

**TABLE - Chemical Compatibility Comparison (Maximum Use Temperatures °F)**

CHEMICAL	PermaShield <sup>1</sup>	FRP <sup>2</sup>	CPVC <sup>3</sup>	PP <sup>4</sup>	PVC <sup>5</sup>
Butane	250*			73	140
Butanol n	250				
Butyl Acetate	100	NR	73	NR	NR
Butyl Alcohol	300	120	73	180	140
Butylaldehyde	122				
Butyl Acrylate	122				
Butyl Amine	122	NR		70	NR
Butyl Cellosolve	70*				
Butyl Lactate	122				
Butylene	300				140
Butyl Phenol	212*				73
Butyl Phthalate	212*	190		180	NR
Butyl Stearate	212*				
Butyric Acid	250*	100		180	73

**C**

Cadmium Cyanide	122*				
Calcium Bisulfide	300	180			
Calcium Bisulfite	300	140		212	150
Calcium Carbonate	300	180**	185	180	140
Calcium Chlorate	300	210			140
Calcium Chloride Saturated	300	210	185	180	140
Calcium Hydroxide Saturated	300	180	185	180	140
Calcium Hypochlorite	300	160**		140	140
Calcium Nitrate	300	300		180	140
Calcium Oxide	300				
Calcium Sulfate	300	210		225	140
Cane Sugar Liquors	212*				
Caprylic Acid	122*	180			
Carbolic Acid (Phenol)	212	NR		140	70
Carbon Dioxide (Dry)	300		185	150	140
Carbon Dioxide (Wet)	300		185	150	140
Carbon Dioxide (Gas)	300	210			
Carbon Disulfide	200*	NR		NR	NR
Carbon Monoxide	300	210	185	225	140
Carbon Tetrachloride (Liquid)	300	100		70	NR
Carbon Tetrachloride (Vapor)	300	175		70	NR
Carbonic Acid	300	210	185		140
Castor Oil	300		185		140
Caustic Potach (10% & 50%)	300	150	185	140	140
Caustic Soda (10% & 50%)	212	210	210	180	100
Cellosolve®	300	210		70	NR
Cellosolv Acetate	212				
Chloracetic Acid 50%	212*				
Chloral Hydrate	121*				140
Chloramine	70*				
Chlorine Dioxide	212*				
Chlorine Gas, Dry	212*	210		NR	73
Chlorine Gas, Wet	212*	210		NR	NR
Chlorine, Liquid	212*	NR			
Chlorine (Dry)	212	210		NR	73
Chlorinated Water Saturated	212	195		150	140
Chlorobenzene	122	NR		73	NR
Chlorobenzyl Chloride	70				
Chloroethanol	200	100		NR	NR
Chloroform	200*	NR	NR	NR	NR
Chlorosulfonic Acid 5%	200	NR		NR	73

CHEMICAL	PermaShield <sup>1</sup>	FRP <sup>2</sup>	CPVC <sup>3</sup>	PP <sup>4</sup>	PVC <sup>5</sup>
Chlorotoluene	122				
Chromic Acid 10%	212*				
Chromic Acid 30%	212*				
Chromic Acid 40%	212*				
Chromic Acid 50%	212*	NR	210	180	NR
Citric Acid	300	140		225	150
Coconut Oil	300				
Coke Oven Gas	212*				
Copper Carbonate	300				
Copper Chloride	300	210	185		140
Copper Cyanide	300	210**	185	225	140
Copper Fluoride	300	210**		225	150
Copper Nitrate	300	210		225	150
Copper Sulfate	300	210	185	120	140
Corn Syrup	300				
Cottonseed Oil	300			225	150
Creosote Hot (wood & coal tar)	212			NR	70
Cresol (crude)	212	140		73	NR
Cresylic Acid 50%	70	NR		NR	140
Croton Aldehyde	70				
Crude Oil	300	210	185	150	150
Cupric Chloride	300	140		140	150
Cupric Fluoride	300				
Cupric Sulfate	300				
Cuprous Chloride	300				
Cyclohexane	212	120	NR	NR	NR
Cyclohexanol	122		NR	120	NR
Cyclohexanone	200	85	NR	NR	NR
Cyclohexylamine	122				

**D**

Detergents General	300	140		200	140
Detergent Solution (Heavy Duty)	300				
Dexron (Trans Fluid)	300				
Dexron II ( Auto Trans Fluid )	300				
Dextrin	300				140
Dextrose	300				
Diacetone Alcohol	122		NR	120	NR
Dibutyl Sebacate	212*				
Dibutyl Phthalate	122	180		120	NR
Dichlorobenzene	122	100		70	NR
Dichloropropane	70				
Dichlorotoluene	70				
Dichlorodifluoro Methane (F-12)	70			80	80
Dichloroethane	70	80		70	NR
Dichloroethylene	100	NR		NR	NR
Dichloropropane	212				
Dichlorotoluene a, a	250				
Diesel Fuels	300	180		200	140
Diethyl Cellosolve	300				
Diethylene Glycol	70	140		225	70
Diethylamine	122	NR		120	NR
Diethylene Glycol					
Butyl Ether Acetate	122				
Meno Butyl Ether	122				
Diethylene Triamine	122				
N, N Diethylethanamine	122				

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TABLE - Chemical Compatibility Comparison (Maximum Use Temperatures °F)

CHEMICAL	1 PermaShield™	2 FRP	3 CPVC	4 PP	5 PVC
Diethyl Ether	200*	NR		NR	73
Diethyl Hydroxy Amine 85%	86				
Diethyl Phthalate	122				
Diglycolic Acid	70*				140
Diisobutyl Ketone	122*				
Diisopropyl Acetate	70				
Diisopropyl Ketone	212				
Dimethyl Acetamide N, N	212				
Dimethylamine	70			120	140
Dimethyl Aniline	200			NR	NR
Dimethyl Formamide	100	NR	NR	120	NR
Dimethyl Hydrazine	70				
Dimethyl Phthalate	212*	150		NR	NR
Dimethyl Sulfoxide	212*	NR		125	NR
Diocetyl Phthalate	200	180	NR	NR	NR
Dioxane 1,4-	122				
Dioxane 2,4	212				
p-Dioxane	200	NR		73	NR
Dipropylene Glycol Methyl Ether	122				
Disodium Phosphate	300				
Divinylbenzene	70				
Dow Therm	200	150		NR	NR

**E**

Epichlorhydrin Dry	200	NR		120	70
Epsom Salt	300				
Ethanol	284				
Ethers	212	180		NR	NR
2 Ethoxy-ethanol 99%	122				
Ethyl Acetate	200	NR		120	NR
Ethyl Acetoacetate	72*				
Ethyl Acrylate	212				
Ethyl Chloride	300	NR		73	NR
Ethyl Ether	200*	NR		73	NR
Ethyl Formate	212				
Ethylene Bromide	300	NR		NR	NR
Ethylene Chlorohydrin	72	200		NR	NR
Ethylene Diamine	72	100		120	NR
Ethylene Dichloride	200	NR	140	NR	NR
Ethylene Glycol	300	140	185	120	140
Ethylene Oxide	212*			NR	NR

**F**

Fatty Acids	300	210	73	120	140
Ferric Chloride	300	210	185	180	140
Ferric Nitrate	300	210	140	180	140
Ferric Sulfate	300	210		180	140
Ferrous Chloride	300	210	185	180	140
Ferrous Nitrate	300	210	140	140	73
Ferrous Sulfate	300	210	185	180	140
Fluorine Gas, Wet	72*		73	NR	73
Fluoroboric Acid	250*	180**	73	73	140
Fluorosilicic Acid	300		73		140
Formaldehyde (Formalin)	200*	150		140	70
Formic Acid	250	100	73	73	73
Freon Dry	200			NR	
Freon Wet	200			70	NR

CHEMICAL	1 PermaShield™	2 FRP	3 CPVC	4 PP	5 PVC
Freon F-11	122*	75	73		140
Freon F-12	122*		73	73	140
Freon F-21	122*				
Freon F-22	122*			73	NR
Freon F-113	122*				
Freon F-114	122*				
Fruit Juices, Pulp	300				
Fuel Oils	300	70		80	150
Fuming Sulfuric Acid	122				
Furan	100				
Furfural (Furfuraldehyde)	212	NR		NR	NR

**G**

Gallic Acid	122*		73	225	140
Gas-Natural	300	210		80	150
Gasoline, Leaded Refined	300	140		NR	140
Gasoline, Unleaded Refined	300	140		NR	140
Gasoline, Sour	300				
Gelatin	212*	120		225	150
Gin	300				
Glucose	300	220		225	150
Glycerine, Glycerol	300	220		225	125
Glycol (Ethylene Glycol)	200	140	185	225	140
Glycolic Acid (Hydroxy Acetic)	122*	100	73	225	140
Glycolis	300				

**H**

Heptane	300	140		NR	140
Hexane	250	100		70	70
Hydrobromic Acid (20%)	300	140		70	NR
Hydrobromic Acid (50%)	300	100		120	
Hydrochloric Acid (up to 37%)	300	180	210	150	140
Hydrochloric Acid (Conc.)	200				
Hydrochloric Acid (Gas)	200	210			
Hydrocyanic Acid	300	150		225	150
Hydrocyanic Acid, 10%	300	180		73	140
Hydrofluoric Acid (35%)	300	100**		125	70
Hydrofluoric Acid (50%)	300	NR	NR	73	73
Hydrofluosilicic Acid	300	180**		225	70
Hydrogen Gas	300	250	73	73	140
Hydrogen Cyanide	300			225	140
Hydrogen Peroxide (50%)	140*	100	185	150	140
Hydrogen Peroxide (90%)	140*	100		70	140
Hydrogen Phosphide	122*				140
Hydrogen Sulfide (Dry)	300	210	185	150	140
Hydrogen Sulfide (Wet)	200*	210			140
Hydroquinone	212*				140
4 Hydroxybenzene Sulfonic Acid	158				
Hypochlorous Acid	300	140	140	73	140

**I**

Iodine (Dry)	212*	150			
Iodine Solution 10%	212*	150		170	70
Isopropyl Ether	122*				
Isooctane	300				
Isopentyl Alcohol	122*				
Isophorone	122				

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CHEMICAL	PermaShield <sup>1</sup>	FRP <sup>2</sup>	CPVC <sup>3</sup>	PP <sup>4</sup>	PVC <sup>5</sup>
Isopropyl Alcohol	230	100		225	70
<b>J</b>					
Jet Fuel-JP4	300	120	73	70	140
Jet Fuel-JP5	300	120	73	70	140
<b>K</b>					
Kerosene	300	150	73	150	140
Keytones	200	NR		70	NR
<b>L</b>					
Lactic Acid	300	210		150	73
Laquers & Laquer Solvents	70			NR	NR
Lard Oil	300		185	73	140
Lauric Acid	212*				140
Lauryl Chloride	212*				
Lead Acetate	300	210	185	180	140
Lead Chloride	300				
Lead Nitrate	300	220		125	140
Lead Sulfate	300				
Lemon Oil	300				
Lime Sulfur	122*			225	150
Linoleic Acid	212*	210		80	140
Linoleic Oil	250*				
Linseed Oil	300	210		225	150
Linseed Oil, Blue	300				
Lithium Bromide	212*	210			
Lithium Hydroxide Saturated	300			70	140
LPG (Propane)	70	44		120	140
Lubricating Oil, ASTM #1	300	200		70	140
Lubricating Oil, ASTM #2	300	200		70	140
Lubricating Oil, ASTM #3	300	200		70	140
Lye					
Calcium Hydroxide 50%	200	180		140	70
Potassium Hydroxide 50%	200	180		140	70
Sodium Hydroxide 50%	200	180		140	70
<b>M</b>					
Magnesium Carbonate	300	180			140
Magnesium Chloride	300	210	185	180	140
Magnesium Hydroxide	300	210	185	180	140
Magnesium Nitrate	300	210	185	180	140
Magnesium Sulfate	300	210	185	180	140
Maleic Acid	250*	200	185	180	140
Malic Acid	250*	140	185	150	140
Mercuric Chloride	250*	210	140	180	140
Mercuric Cyanide	250*	140		225	140
Mercuric Sulfate	250*				
Mercurous Nitrate	250*	140			140
Mercury	300	210	185	150	140
Mesityloxide	122				
Methane	300			70	140
Methane Sulfuric Acid 50%	151				
Methyl Acetate	122			70	NR
Methyl Acrylate	122				
Methyl Alcohol (Methanol)	70	100		180	140
Methylamine	70	NR		70	NR

CHEMICAL	PermaShield <sup>1</sup>	FRP <sup>2</sup>	CPVC <sup>3</sup>	PP <sup>4</sup>	PVC <sup>5</sup>
Methyl Bromide	300			NR	NR
Methyl Cellosolve	300	NR		70	NR
Methyl Chloride	300	NR		NR	NR
Methyl Chloroform	122		NR		
Methyl Ethyl Keytone	122	NR	NR	NR	NR
Methyl Formate	212				
5 Methyl 2 Hexanone	122				
Methyl Isobutyl Keytone	122		NR	NR	NR
Methyl Methacrylate	122				73
Methyl Sulfate	300				
Methyl Sulfuric Acid	122*				
1 Methyl 2 Pyrrolidinone	70				
Methylene Bromide	122				NR
Methylene Chloride	122	NR		70	NR
Methylene Iodine	70				NR
Milk	300	140		212	150
Mineral Oil	300	210	185	120	140
Molasses	300	140		225	150
Monochlorobenzene	100	NR	73		
Monochlorodifluoromethane (F-22)	70			70	NR
Monoethanolamine	150	75		175	NR
Morpholine	200	80		150	
Motor Oil	300	220		140	150
<b>N</b>					
N, N Dimethyldodecylamine	167				
Naphtha	300	200	73	120	140
Naphthalene	300	180			NR
Natural Gas	122				
Nickel Chloride	300	210	185	180	140
Nickel Nitrate	300	210			140
Nickel Sulfate	300	210	185	180	140
Nicotine	122*				140
Nicotinic Acid	212*				140
Nitric Acid 10%	250*				
Nitric Acid 30%	212*				
Nitric Acid 40%	212*				
Nitric Acid 50%	122*	NR	73	NR	100
Nitric Acid 70%	122				
Nitric Acid 90%	122				
Nitrobenzene	122	100		73	NR
Nitrogen Gas					70
Nitrous Acid 10%	212*	150		NR	73
Nitrous Oxide	122*			70	70
Nitromethane	200				
N Methylpyrrolidinone	70				
Nonyl Phenol	122				
<b>O</b>					
2 Octanol	122				
Oils, Crude	200	210		70	150
Oils, Mineral	300	210		140	70
Oils, Vegetable	300	210		140	140
Oleic Acid	250*	210		170	150
Oleum 30%	72			NR	NR
Oleum 30% in Sulfuric Acid	72			NR	NR
Oxalic Acid	122	210		140	70

ANNOTATIONS: \* = No Data Available Above Temperature Listed, \*\* = Synthetic Fiber Surfacing Mat Recommended by Manufacturer  
 NR = Not Recommended by Manufacturer, Blank = No Data Available or Other Relevant Data Prevails

TABLE - Chemical Compatibility Comparison (Maximum Use Temperatures °F)

CHEMICAL	1 PermaShield™	2 FRP	3 CPVC	4 PP	5 PVC
Oxalic Acid 50%	122		185	180	140
Oxygen, Gas	300				
Ozone	212*	220		NR	NR

**P**

Palmitic Acid, 10%	250	210	73	180	140
Paraffin	300	150		70	140
Pentanedione 2, 4	212				200*
Pentyl Acetate	122				
Perchloroethylene	200	100		NR	NR
Perchloric Acid (10%)	200*	150		NR	NR
Perchloric Acid (72%)	200*			200*	
Perchloric Acid (up to 30%)	200	80		80	80
Petroleum Oils, Sour	212*	200		70	150
Petroleum Oils, Refined	212*	200		70	150
Phenol	122		NR	NR	NR
Phenylhydrazine	122*				NR
Phosphoric Acid 10%	300				
Phosphoric Acid 30%	300				
Phosphoric Acid 50%	300				
Phosphoric Acid 85%	300	210	73	180	140
Phosphorous Oxychloride	122				
Phosphorous Pentoxide	212*		73	73	73
Phosphorous Trichloride	212*	NR		NR	NR
Phosphorous Yellow	70*				
Photographic Solutions					
Developers	300	70		150	140
Picric Acid	70*	120		70	NR
Potash	300				
Potassium Alum	300				
Potassium Aluminum Sulfate	300	210		225	150
Potassium Acetate	70			70	150
Potassium Bichromate	250*	210		225	150
Potassium Bisulfate	250*				
Potassium Borate	250*				140
Potassium Bromide	250	210		180	140
Potassium Carbonate Saturated	300	150		225	150
Potassium Chlorate Aqueous	300				
Potassium Chloride	300	210	185	180	140
Potassium Chromate	300	140		225	140
Potassium Chlorate	300	140		180	140
Potassium Cyanide	300	140	185	225	140
Potassium Dichromate	300	210	185	225	140
Potassium Ferricyanide	300	210		225	140
Potassium Ferrocyanide	300	210		140	150
Potassium Hydroxide (50%)	300	150**	185	150	140
Potassium Iodide	250*	200		176	140
Potassium Nitrate	300	210		225	140
Potassium Perchlorate	122*				140
Potassium Permanganate 10%	300	210		150	140
Potassium Permanganate 25%	300	210		150	140
Potassium Persulfate	122*	210		140	
Potassium Sulfate	300	210		225	150
Propane	300	44	73	70	70
Propyl Acetate	122				
Propyl Alcohol (Propanol)	122	100		225	
Pydravl	70				70

CHEMICAL	1 PermaShield™	2 FRP	3 CPVC	4 PP	5 PVC
Pyridine	200	NR		140	NR
Pyrogalllic Acid	122*			70	140
Pyroligneous Acid	100				
Pyroligneous Acid 10%	200	100		70	70

**S**

Salicyclic Acid	250*	160		70	140
Salicylaldehyde	122				NR
Salt Brine 10%	250	210		225	140
Sea Water	250	210		225	140
Silicic Acid	300				
Silicone Oil	300			150	70
Silver Nitrate	300	210		70	70
Silver Sulfate	300				
Soap Solutions	300	140		225	140
Skydrol 500 & 7000	70				70
Sodium Acetate	300	210	185	180	140
Sodium Alum	300				
Sodium Benzoate	300	180	140	170	140
Sodium Bicarbonate	300	210	185	180	140
Sodium Bichromate	212*	210		140	70
Sodium Bisulfate	300	210		180	140
Sodium Bisulfite	300	210	185	180	140
Sodium Borate (Borax)	300	210		140	150
Sodium Bromide	300	210	180	180	140
Sodium Carbonate Saturated	300	150	185	180	140
Sodium Chlorate	300	210		180	70
Sodium Chloride	300	200	210	225	150
Sodium Chlorite Saturated	250*				
Sodium Chromate 10%	100	210		140	
Sodium Cyanide	300	210**	185	180	140
Sodium Dichromate	212*	210		140	70
Sodium Fluoride	300	180	140	185	140
Sodium Hydrosulfide 50%	300				
Sodium Hydroxide 15%	300	150**			
Sodium Hydroxide 30%	250				
Sodium Hydroxide 50%					
Caustic Soda	250	180**	210	180	100
Sodium Hypochlorite 5%	250	150**	185	120	73
Sodium Iodide	300				
Sodium Metaphosphate	300			70	150
Sodium Nitrate	300	210		225	150
Sodium Nitrite	300	210	185	180	140
Sodium Perchlorate	250*		170		140
Sodium Peroxide	300	80		212	120
Sodium Phosphate, Alkaline	300	210		225	70
Sodium Phosphate, Acid	300	210		180	70
Sodium Phosphate, Neutral	300	210		225	70
Sodium Silicate	300	210**		180	150
Sodium Sulfate	300	210	185	150	140
Sodium Sulfide	300	210	185	150	140
Sodium Sulfite	300	210	185	150	140
Sodium Tetraborate (Borax)	300	210		140	150
Sodium Thiosulfate (Hypo)	300	70		150	150
Sour Crude Oil	300	210			140
Stannic Chloride	300	180	185	225	150
Starch	300				

ANNOTATIONS: \* = No Data Available Above Temperature Listed, \*\* = Synthetic Fiber Surfacing Mat Recommended by Manufacturer  
NR = Not Recommended by Manufacturer, Blank = No Data Available or Other Relevant Data Prevails



**TABLE - Chemical Compatibility Comparison (Maximum Use Temperatures °F)**

CHEMICAL	PermaShield <sup>1</sup>	FRP <sup>2</sup>	CPVC <sup>3</sup>	PP <sup>4</sup>	PVC <sup>5</sup>
Stearic Acid	300	210	185	73	140
Stearoyl Chloride	250				
Stoddard's Solvent	300	220		70	125
Succinic Acid	212*				
Sulfate Liquors	212*				
Sulfite Liquor	212*				
Sulfolane	200				
Sulfur	300	250		225	140
Sulfur Chloride	70*	NR		NR	70
Sulfur (Molten)	250			NR	NR
Sulfur Dioxide Gas Wet & Dry	300	210	NR	73	73
Sulfuric Acid 10%	300				
Sulfuric Acid 50%	300	180	210	150	140
Sulfuric Acid 90%	300	NR	210	73	140
Sulfuric Acid 93%	300				
Sulfuric Acid 96%	300				
Sulfuric Acid 98%	300				
Sulfuric Acid (Conc.)	300	NR		NR	NR
Sulfuric Acid (Fuming-Oleum)	300				
Sulfurous Acid	212*	120		225	150

**T**

Tall Oil	300	150		175	140
Tannic Acid	300	210	185	180	140
Tanning Liquors	250*			225	150
Tar	300			70	70
Tartaric Acid	250*	210		150	140
Tetrachloroethylene	200	120		70	70
Tetraethyl Lead	300			150	140
Tetrahydrofuran	100		NR	NR	NR
Tetramethyl Ammonium Hydroxide	212				
Thionyl Chloride	122*	NR		120	70
Thread Cutting Oils	300				
Toluene (Tolvol)	200	140	NR	NR	NR
Toluenesulfonic Acid (sol. sat.)	158				
Tomato Juice	212*	210	185	180	70
Transformer Oil	212*	210		150	70
Tricresyl Phosphate	212*	140		150	70
Tributyl Phosphate	122				NR
Trichloroacetic Acid	122			150	140
Trichlorobenzene	122				
Trichloroethylene	100		NR	NR	NR
Trichloroethylene 1, 1, 1	70	140		125	70
Trichloroethylene and Nitric Acid	122				
Trichloroethylene in Methanol	122				
Trichlorotrifluoroethane (F-113)	70			70	73
Triethanolamine	75	120		170	140
Triethylamine	122				

CHEMICAL	PermaShield <sup>1</sup>	FRP <sup>2</sup>	CPVC <sup>3</sup>	PP <sup>4</sup>	PVC <sup>5</sup>
Triethylene Tetramine	122				
Triethyl Phosphate	212*				
Triphenyl Phosphite	100				
Trisodium Phosphate	300	210	185	225	150
Turpentine	300	100	73	NR	125

**U**

Urea	212*	140	185	225	70
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**V**

Vaseline	300				
Vinegar	212*	210		225	150
Vinyl Acetate	122	NR		NR	NR

**W**

▲ Water	100	210	210	180	140
▲ Water, Acid Mine	100	210		225	150
▲ Water, Brackish	100				
▲ Water, Deionized	100	210		225	150
▲ Water, Demineralized	100	210		225	150
▲ Water, Distilled or Fresh	100	210		225	150
▲ Water, Salt	100	210		225	150
▲ Water, Sea	100	210		225	150
▲ Water, Sewage	100				
Whiskey	300	80		225	150
White Liquor	212*	180		140	150
Wines	212*	180		225	150

**X**

Xylene (Xylol Xylole)	200	70	NR	NR	NR
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**Z**

Zinc Chloride	300	210	185	225	140
Zinc Nitrate	300	210		225	140
Zinc Sulfate	300	210	185	225	140

**Plating Solutions**

Brass	212*	180	185	180	140
Cadmium	212*	220	185	180	140
Chrome	212*	140	210	180	140
Copper	212*	120	210	180	120
Gold	212*	180	185	180	125
Lead	212*	160		225	140
Nickel	212*	180		225	140
Rhodium	212*				
Silver	212*	180		225	150
Tin	212*	210		225	150
Zinc	212*	180		225	150

▲ The PermaShield maximum use temperature for all varieties of water listed in this guide is currently set at 100°F. Good system layout practices and adequate drainage would minimize the occurrence of prolonged fluid exposure to the coating.

ANNOTATIONS: \* = No Data Available Above Temperature Listed, \*\* = Synthetic Fiber Surfacing Mat Recommended by Manufacturer  
 NR = Not Recommended by Manufacturer, Blank = No Data Available or Other Relevant Data Prevails

TABLE - Chemical Compatibility of 100% PTFE PermaShield Gasket™ Sealents

CHEMICAL	PTFE RATING	CHEMICAL	PTFE RATING	CHEMICAL	PTFE RATING
Abietic Acid	1	Carbon Dioxide, Dry	1	Furfural	1
Acetic Acid, Crude	1	Wet	1	Glycerine, Glycerol	1
Pure	1	Carbon Disulfide	1	Glycol	1
Vapors	1	Carbon Monoxide	1	Grain Alcohol	1
Acetic Anhydride	1	Carbon Tetrachloride	1	Green Sulfate Liquor	1
Acetone	1	Carbonic Acid	1	Heptane	1
Acetophenone	1	Cetane (Hexadecane)	1	Hexachloroethane	1
Acetylene	1	Chlorine, Dry	1	Hexane	1
Acrylic Anhydride	1	Wet	1	Hydrazine	1
Allyl Acetate	1	Chlorine Dioxide	1	Hydrobromic Acid	1
Allyl Methacrylate	1	Chlorine Trifluoride	1	Hydrochloric Acid	1
Aluminum Chloride	1	Chlorazotic Acid (Aqua Regia)	1	Hydrofluoric Acid, less than 65%	1
Aluminum Fluoride	1	Chloronitrous Acid (Aqua Regia)	1	150°F and Below	1
Aluminum Hydroxide (Solid)	1	Chlorinated Solvents, Dry	1	Above 150°F	1
Aluminum Nitrate	1	Wet	1	65% To Anhydrous	1
Aluminum Sulfate	1	Chloroacetic Acid	1	Hydrofluoric Acid, Anhydrous	1
Alums	1	Chloroethylene	1	Hydrofluorosilicic Acid	1
Ammonia, Liquid	1	Chloroform	1	Hydrofluosilicic Acid	1
Ammonia, Gas, 150°F & Below	1	Chlorosulfonic Acid	1	Hydrogen Gas, +150°F To -350°F	1
Above 150°F	1	Chromic Acid	1	Above 150°F	1
Ammonium Chloride	1	Chromic Anhydride	1	Hydrogen Fluoride	1
Ammonium Hydroxide	1	Chromium Trioxide	1	Hydrogen Peroxide 10-90%	1
Ammonium Nitrate	1	Citric Acid	1	Hydrogen Sulfide	1
Ammonium Phosphate	1	Copper Chloride	1	Dry, 150°F and Below	1
Monobasic	1	Copper Sulfate	1	Dry, Above 150°F	1
Dibasic	1	Cresols, Cresylic Acid	1	Wet, 150°F and Below	1
Tribasic	1	Cyclohexane	1	Wet, Above 150°F	1
Ammonium Sulfate	1	Cyclohexanone	1	Iodine Pentafluoride	1
Amyl Acetate	1	Dibutyl Phthalate	1	Isobutane	1
Aniline, Aniline Oil	1	Dibutyl Sebacate	1	Isopropyl Alcohol	1
Aniline Dyes	1	Diethyl Carbonate	1	Jet Fuels	1
Aqua Regia	1	Dimethyl Ether	1	Kerosene	1
Barium Chloride	1	Dimethyl Hydrazine, Unsymmetrical	1	Lactic Acid, 150°F and Below	1
Barium Hydroxide	1	Dimethyl Formamide	1	Above 150°F	1
Barium Sulfide	1	Dioxide	1	Lime Saltpeter (Calcium Nitrates)	1
Benzaldehyde	1	Dow Therm A	1	Lubricating Oils, Sour	1
Benzene, Benzol	1	Dow Therm E	1	Refined	1
Benzonitrile	1	Ethane	1	Lye	1
Benzoyl Chloride	1	Ethers	1	Magnesium Chloride	1
Benzyl Alcohol	1	Ethyl Acetate	1	Magnesium Hydroxide	1
Black Sulfate Liquor	1	Ethyl Alcohol	1	Magnesium Sulfate	1
Bleach (Sodium Hypochlorite)	1	Ethyl Cellulose	1	Mercuric Chloride	1
Borax	1	Ethyl Chloride	1	Mercury	1
Boric Acid	1	Ethyl Ether	1	Methane	1
Brine	1	Ethyl Hexoate	1	Methanol, Methyl Alcohol	1
Bromine	1	Ethylene	1	Methylacrylic Acid	1
Bromine Trifluoride	N	Ethylene Bromide	1	Methyl Chloride	1
Butadiene	1	Ethylene Glycol	1	Methyl Ethyl Keytone	1
Butane	1	Ethylene Oxide	1	Methyl Methacrylate	1
Butyl Acetate	1	Ferric Chloride	1	Mineral Oils	1
Butyl Alcohol, Butanol	1	Ferric Phosphate	1	Molten Alkali Metals	N
N-Butyl Amine	1	Ferric Sulfate	1	Muriatic Acid	1
Butyl Methacrylate	1	Fluorine, Gas	N	Naphthalene	1
Calcium Bisulphate	1	Liquid	1	Naphthas	1
Calcium Chloride	1	Fluorine Dioxide	1	Naphthols	1
Calcium Hypochlorite	1	Formaldehyde	1	Natural Gas	1
Capolactam	1	Formic Acid	1	Nickel Chloride	1
Carbolic Acid, Phenol	1	Freon	1	Nickel Sulfate	1

1 = Recommended (little or no effect) O = Insufficient Data N = Not Recommended

CHEMICAL	PTFE RATING	CHEMICAL	PTFE RATING	CHEMICAL	PTFE RATING
Nitric Acid, Crude	1	Picric Acid, Molten	O	Sodium Silicate	1
Less Than 30%	1	Water Solution	1	Sodium Sulfate	1
Above 30%	1	Pinene	1	Sodium Sulfide	1
Red Fuming	1	Piperidene	1	Sodium Thiosulfate, "Hypo"	1
Nitrobenzene	1	Polyacrylonitrile	1	Sodium Superoxide	1
2-Nitro-Butanol	1	Potash, Potassium Carbonate	1	Stannic Chloride	1
Nitrocalcite (Calcium Nitrate)	1	Potassium Acetate	1	Steam	1
Nitrogen Tetroxide	1	Potassium Bichromate	1	Stearic Acid	1
Nitromethane	1	Potassium Chromate, Red	1	Styrene	1
2-Nitro-2-Methal-Propanol	1	Potassium Cyanide	1	Sulfur Chloride	1
Nitromuriatic Acid (Aqua Regia)	1	Potassium Dichromate	1	Sulfur Trioxide, Dry	1
Nitrohydrochloric Acid	1	Potassium Hydroxide	1	Sulfuric Acid	
(Aqua Regia)	1	Potassium Permanganate	1	10%, 150°F and Below	1
Norge Nitter (Calcium Nitrate)	1	Potassium Sulfate	1	10%, Above 150°F	1
Norwegian Saltpeter	1	Producer Gas	1	10-75%, 150°F & Below	1
(Calcium Nitrate)	1	Propane	1	75-95%, 150°F & Below	1
N-Octadecyl Alcohol	1	Propylene	1	75-95%, Above 150°F	1
Oleic Acid	1	Propyl Nitrate	1	Fuming	1
Oleum	1	Prussic Acid, Hydrocyanic Acid	1	Sulfurous Acid	1
Oxalic Acid	1	Pyridine	1	Tannic Acid	1
Oxygen, Gas, 150°F and Below	1	Saltpeter, Potassium Nitrate	1	Tartaric Acid	1
Gas, Above 150°F	1	Silver Nitrate	1	Tetrabromoethane	1
Liquid, Down to -350°F	O	Soda Ash, Sodium Carbonate	1	Toluene	1
Liquid, Below -350°F	O	Sodium Bicarbonate, Baking Soda	1	Trichloroacetic Acid	1
Ozone	1	Sodium Bisulfate	1	Trichloroethylene	1
Palmitic Acid	1	Sodium Chloride	1	Tricresyl Phosphate	1
Pentachlorophenol	1	Sodium Cyanide	1	Triethanolamine	1
Perchloric Acid	1	Sodium Dioxide	1	Turpentine	1
Perchloroethylene	1	Sodium Hydroxide	1	Varnish	1
Petroleum Oils, Crude	1	Sodium Hypochlorite	1	Vinegar	1
Refined	1	Sodium Metaphosphate	1	Vinyl Chloride	1
Phenol	1	Sodium Metaborate Peroxhydrate	1	Vinyl Methacrylate	1
Phosphoric Acid, Crude	1	Sodium Nitrate	1	Water, Mild Acid, With Oxidizing Salt	1
Pure, Less Than 45%	1	Sodium Perborate	1	No Oxidizing Salts	1
Above 45%, 150°F and Below	1	Sodium Peroxide	1	Whiskey And Wines	1
Above 45%, Above 150°F	1	Sodium Phosphate, Monobasic	1	Wood Alcohol	1
Phosphorus Pentachloride	1	Dibasic	1	Ylenes	1
Phthalic Acid	1	Tribasic	1	Zinc Chloride	1

1 = Recommended (little or no effect)    O = Insufficient Data    N = Not Recommended

This chemical compatibility guide was assembled from known compatibility data for PTFE materials and should be used only as a general guide for determining the suitability of PermaShield Gasket™ sealants for specific applications. An independent study of the compatibility with your specific fluids is advised for confirmation of chemical compatibility. When immersion tests are performed with PermaShield Gasket™ sealants, the test sample must be first precompressed at 250psi minimum. Immersion test samples are available for your use, free of charge from our Colchester, Vermont facility.

## About Fab-Tech

The success of any company is dependent on its workforce. This has certainly been the case with Fab-Tech. From dedicated office personnel to skilled and motivated craftsmen, the work environment is one of exceptional teamwork. This business approach has earned Fab-Tech the distinction as one of the most responsive and innovative companies in the metal fabrication industry. Fab-Tech takes great pride in its workforce and boasts the finest forming, fabricating, welding and coating facilities in North America, totaling over 78,000 square feet.

## Customer Service

Fab-Tech is fully dedicated to complete customer service. Since each exhaust fitting is essentially manufactured to order, communication is critical. We work very closely with contractors, engineers and end-users to assure the finished product is consistent with prints, shop drawings and cut sheets. In addition, our professional engineering staff is also available to evaluate and design your custom fabrication as well as provide installation supervision and training upon request. Constantly aware of valuable lead time and the need for minimal delays, Fab-Tech is capable of round-the-clock manufacturing and expedited turn around. Fab-Tech continues to strive for new and better ways to serve our customers, from initial order to final installation.

## Fab-Tech

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## PermaShield<sup>®</sup>

Manufactured in the USA and under license in the following locations:

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