

Chemical resistance of common metals used in valves.

The information in these tables is offered as a general guide only to the chemical resistance of commonly used materials in the construction of METAL valves.

These tables are *not* to be used as an absolute recommendation as there are too many factors that can influence the corrosion resistance, such as temperature, temperature fluctuations, concentrations and solutions, velocity and abrasion. J+J therefore accept no responsibility for any problems arising from use of these tables.

We recommend that if any doubt exists as to the resistance of a material to a specific chemical, that tests be carried out to verify the compatibility.

What the ratings mean:

Ratings are based on media at ambient/ room temperature unless otherwise stated.

A = EXCELLENT RESISTANCE

B = GOOD OR ACCEPTABLE RESISTANCE

C = POOR RESISTANCE

D = DO NOT USE, NO RESISTANCE

Chemical compatibility



Doc: ChemComp/01

Jun 2007

Chemicals

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Acetaldehyde	B	C	C	C	A		A	A	A	D	A	B	C		A
Acetamine	B	B	B	B	B					A					A
Acetate Solvents	A	B	A	B	A			A	A	D	D		D		A
Acetic Acid, Aerated	B	F	D	D	A			A	A	C	D		C	A	A
Acetic Acid, Air Free	B	B	D	D	A	A	A	A	A	C	D		D	A	A
Acetic Acid, crude	C	C	C	C	A	A	A	B	A	D	D		D	A	A
Acetic Acid Glacial					A	A	A		A	D	D	B	C	A	A
Acetic Acid, pure	C	C	D	D	A	A	A	D	A	D	D		D	A	A
Acetic Acid 10%	C	C	C	C	A	A	A	B	A	D	B	B	D	A	A
Acetic Acid 80%	C	C	C	C	A	A	A	B	A	D	D	C	D	A	A
Acetic Acid Vapors	B	D			D	D	B	C	A	D				A	A
Acetic Anhydride	B	D	D	D	B	B	B	B	A	D	C	C	D	A	A
Acetone	A	A	A	A	A	A	A	A	A	D	A	A	D	A	A
Other Ketones	A	A	A	A	A	A	A	A	A	D	A	D	D	A	A
Acetyl Chloride	D	A		C	C			B	A	D	D	D	D		A
Acetylene	A	B	A	A	A	A	A	A	A	B	A	A	A		A
Acid Fumes	B	D	D	D	B		B			C	D				A
Acrylonitrile	B	A	A	C	A		B	A	A	D	D	D	C		A
Air	A	A	A	A	A		A	A	A	A	A	A	A		A
Alcohol, Amyl	B	B	B	C	A		B	B	B	C	A	A	B	A	A
Alcohol, Butyl	B	B	B	C	A		A	A	A	B	A	C	A	A	A
Alcohol, Diacetone	A	A	A	A	A		A	B	A	D	A	B	D	A	A
Alcohol, Ethyl	B	B	B	B	B		A	B	A	A	A	A	A	A	A
Alcohol, Fatty	B	B	B	B	A		A		A	B	A			A	A
Alcohol, Isopropyl	B	B	B	B	B		A	B	B	C	A	A	A	A	A
Alcohol, Methyl	B	B	B	B	A		A	A	A	B	A	A	C	A	A
Alcohol, Propyl	A	A	B	B	A		A	A	A	B	A	A	A	A	A
Alumina	A	A						A	A	A	A	A			A
Aluminum Acetate	C	D		D	A	B	B	C	B	D	D	A	D		A
Aluminum Chloride Dry	B	B	C	D	C		D	B	B	B	A	A	A	A	A
Aluminum Chloride Solution	C				D	C	B	B	B	B	D		A	A	A
Aluminum Fluoride	C		D	D	C			B	A	A	C	A	A		A
Aluminum Hydroxide	A	A	D	D	A	B	B	B	A	A	C	A	A		A
Aluminum Nitrate	D	D		D	C		B	C	B	B	D	B	D		A
Aluminum Oxalate	B						A	B							A
Aluminum (Aluminum Potassium Sulfate)	D	D		D	B	C	B	C	A	B	D		B	A	A
Alum (Aluminum Sulfate)	C	C	D	D	B	A	B	C	A	A	D	A	A	A	A
Amines	B	B	B	C	A	A	A	B	B	D	C	C	D		A
Ammonia Alum	C				A		A	A	A	B	C	C		A	A
Ammonia, Anhydrous Liquid	A	D	A	B	A	A	A	B	A	B	D	B	D	A	A
Ammonia, Aqueous	B	C	C	C	A		A	A	A	D	A	B	C		A
Ammonia, Gas, hot	B	B	B	B	B					A	A				A
Ammonia Liquor	A	B	A	B	A			A	A	D	D		D		A
Ammonia Solutions	B	F	D	D	A			A	A	C	D		C	A	A
Ammonium Acetate	B	B	D	D	A	A	A	A	A	C	D		D	A	A
Ammonium Bicarbonate	B	B	C	B	B		B	B		B	A	A	A		A
Ammonium Bromide 5%	D				B		B	B			A				A
Ammonium Carbonate	B	B	B	B	B		B	B		C	D	A	B		A
Ammonium Chloride	D	D	D	D	C	C	B	B	B	B	C	A	A		A
Ammonium Hydroxide 28%	C	D	C	C	B	A	A	F	B	B	D	B	A	A	A

Ratings: A=Excellent B=Good C=Poor ¹¹⁶D=Do not use Blank =No Information

Chemical compatibility



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Chemicals

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Ammonium Hydroxide Concentrated	C	D	C	C	A	A	A	C	B	C	D	A	A	A	A
Ammonium Monosulfate	D				B			B	B		D				A
Ammonium Nitrate	B	D	D	D	A	A	B	D	B	A	D	A	A		A
Ammonium Oxalate 5%	A				A		A	B			A				A
Ammonium Persulfate	C	C			A		A	D		D	D	B	B		A
Ammonium Phosphate	C	D	D	D	B		B	C	A	C	C	A	A		A
Ammonium Phosphate Di-basic	B	C	D	D	B		B	C	A	A	A		A		A
Ammonium Phosphate Tri-basic	C	C	D	D	B		B	C	A	A	A		A		A
Ammonium Sulfate	C	C	C	D	B	B	B	B	A	B	B	A	B	A	A
Ammonium Sulfide	C	D	D	D	B		B	B	A	A	A	A	D		A
Ammonium Sulfite	C	C	C	C	A		B	D		B	A	B	A		A
Amyl Acetate	B	B	C	C	B	A	A	B	A	D	A	B	D		A
Amyl Chloride	D	B		B	A		A	B	B	D	A	D	D		A
Aniline	C	D	C	C	B		A	B	B	D	D	C	C	A	A
Aniline Dyes	C	C	C	C	A		A	A		C	A	C	B		A
Apple Juice	B	C	D	D	B		A	A		A	A	B	A		A
Aqua Regia (Strong Acid)	D	D	D	D	B		B			D	D	D	D	D	A
Aromatic Solvents	A	A	C	B	A		A	B		D	A	D			A
Arsenic Acid	D	D	D	D	B		B	D	B	A	D	B	A	A	A
Asphalt Emulsion	C	A	B	B	A		A	A	A	D	A	D	A		A
Asphalt Liquid	C	A	B	B	A		A	A	A	C	A	D	A		A
Barium Carbonate	C	B	B	B	B		B	B	A	B	A	A	A		A
Barium Chloride	D	B	C	C	B	B	C	B		A	A	A	A		A
Barium Cyanide	D	C		C	B		B	D		B	A	B	B		A
Barium Hydrate	D	D			A		A	B			A				A
Barium Hydroxide	D	C	C	B	B	A	A	B		A	A	B	A		A
Barium Nitrate	B				A		A			A	A				A
Barium Sulfate	D	C	C	C	A		A	B		A	A	B	A		A
Barium Sulfide	D	D	C	D	B		B	C		A	A	A	A		A
Beer	A	B	D	D	A	A	A	A		B	A	B	A		A
Beet Sugar Liquors	A	A	B	B	A		A	A		A	A	B	A		A
Benzaldehyde	A	A	A	C	A		A	B	B	D	A	A	D		A
Benzene (Benzol)	B	B	B	B	B	B	A	A	B	D	C	D	B	A	A
Benzoic Acid	B	B	D	D	B	A	B	B	A	C	A	D	B		A
Beryllium Sulfate	B	B		B	B		A	B		B	A	B	B		A
Bleaching Powder Wet		B			C		B	A	D	D	B	B	B		A
Blood (meat juices)	B	B		D	A	A	A		B	B	A	B	B		A
Borax (Sodium Borate)	C	D	C	C	A			A	B	A	A	A	A		A
Bordeaux Mixture					A		A			A	A	A			A
Borax Liquors	C	A	C	C	B		A	B		A	A	A	A		A
Boric Acid	B	C	D	D	B		B	B	A	B	A	B	A	A	A
Brake Fluid	B	B		B	B	A	B	B		D	B	B	D		A
Brines, Saturated	C	B	D	C	B		B	B	A	A	A	A	A		A
Bromine, Dry	C	B	D	D	D		B	A	A	D	D	D	B	B	A
Bunker Oils (Fuel)	A	B	B	B	A		A	A		B	A		A		A
Butadiene	B	C	B	B	A		A	C	B	C	A	C	B		D
Butane	A	A	B	B	A		A	B	A	B	A	D	A		A
Butter					A		A			B	A				A
Buttermilk	A	D	D	D	A		A	D		A	A	B	A		A
Butyl Acetate	B	B		B	B		A	B	B	D	B	D	D		A

Ratings: A=Excellent B=Good C=Poor 117 D=Do not use Blank =No Information

Chemical compatibility



Doc: ChemComp/01

Jun 2007

Chemicals

Chemicals	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Butylene	A	A	A	A	A		A	A		D	A	D	D		A
Butyric Acid	B	C	D	D	B		B	B	A	C	A	C	C		A
Calcium Bisulfite	C	C	D	D	B		B	D	B	A	D	D	A		A
Calcium Carbonate	C	C	D	D	B		B	B	B	A	A	B	A		A
Calcium Chlorate	B	D		C	B		B	B		B	D	B	B	B	A
Calcium Chloride	C	B	C	C	B	B	B	B	A	A	A	B	A		A
Calcium Hydroxide	D	C	C	C	B		B	A	A	A	A	A	A		A
Calcium Nitrate	B				B		B			B	C	B			A
Calcium Phosphate	D	C		C	B		B			B	B	B	B		A
Calcium Silicate	D	C		C	B		B			B	A	B	B		A
Calcium Sulfate	B	C	C	C	B	B	B	B	B	A	A	B	A		A
Caliche Liquor			B		A		A			B	A				A
Camphor	C	C		C	B		C	C		B	A	B	B		A
Cane Sugar Liquors	A	B		B	A		A	B		B	A	B	B		A
Carbonated Beverages	B	B	D	B	B	B	B	C		B	A	B	B	A	A
Carbonated Water	A	B	B	A	A	B	A	B		A	A	A	A	A	A
Carbon Bisulfide	A	C	B	B	B		B	B		D	A	D	A		A
Carbon Dioxide, Dry	A	A	A	B	A	A	A	A		C	A	B	B	A	A
Carbonic Acid	A	D	D	D	B	B	A	B		B	A	B	A	A	A
Carbon Monoxide	A	A		B	A	A	A	A	A	B	A	B	B		A
Carbon Tetrachloride, dry	B	C	B	C	A	A	A	A	A	D	A	D	B	A	A
Carbon Tetrachloride, wet		D	D	D	B		B	B	B	D	B	D	B	A	A
Casein	C	C		C	B		B	C		B	A	B	B		A
Caster Oil	A	A	B	B	A		A	A	A	A	A	B	A		A
Caustic Potash					A		A	B		B	D				A
Caustic Soda	D		B	B	A		A	A		C	D	B	B		A
Cellulose Acetate	B	B		B	B		B	B	B	D	C	B	D		A
China Wood Oil (Tung)	A	C	C	C	A		A	A	A	A	A	D	A		A
Chlorinated Solvents	D	C	C	C	A		A	B		D	A	D	C		A
Chlorinated Water	C				C	D	A	D	D	B	D		A	B	A
Chlorine Gas, Dry	B	C	B	B	B	C	A	A	A	C	D	D	B	A	A
Chlorobenzene, dry	B	B	B	B	A		A	B	B	D	B	D	A		A
Chloroform, dry	D	B	B	C	A	B	A	A	B	D	A	D	B		A
Chlorophyll, dry	B	B		B	B		A	B		B		B	B		A
Chlorosulfonic Acid, dry	B	C	B	B	B		B	B	A	D	D	D	D		A
Chrome Alum	C	C	B	C	A		A	B		B	B	B	B		A
Chronic Acid<50%	C	D	D	D	C	C	B	C	B	D	D	C	C		A
Chronic Acid>50%	D	D	D	C	C	D	B	D	B	D	D	C	C		A
Chromium Sulfate	B	C		D	B		C	B		B	C	B	B		A
Cider	B				A		B	A			A				A
Citric Acid	B	C	D	D	B	C	A	B	A	B	A	B	A	A	A
Citrus Juices	C	B	D	D	B		A	A		A	A		A		A
Coca Cola Syrup					A		A			B	A		B		A
Coconut Oil	B	B	C	C	B		A	B		A	A	A	A		A
Coffee	A	A		D	A		A	B		A	A	A	A		B
Coffee Extracts, hot	A	B	C	C	A		A	A		A					A
Coke Oven Gas	A	C	B	B	A		A	B		C	D	D	B		A
Cooking Oil	B	B	B	B	A		A	A		A	A	D	A		A
Copper Acetate	D	D	D	D	A		A	C	B	C	D	B	D		A
Copper Carbonate	D				A		A			A					A

Ratings: A=Excellent B=Good C=Poor 118 D=Do not use Blank =No Information

Chemical compatibility



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Chemicals

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPBR	Viton	Flexible Graphite	Teflon-Reinforced
Copper Cyanide	D	D		D	A		A	C		A	A	B	B		A
Copper Nitrate	D	D	D	D	B		B	D		A	A	B	A		A
Copper Sulfate	D	D	D	D	B	B	B	C	A	A	A	A	A	A	A
Corn Oil	B	B	C	C	B		B	B		A	A	C	A		A
Cottonseed Oil	B	B	C	C	B		B	B		A	A	C	B		A
Cresol					B		B			D	D	D	D		A
Creosote Oil	B	B	B	B	B	B	A	B	B	C	D	D	A		A
Cresylic Acid	C	C	C	D	B		B	B		D	D	D	B		A
Crude Oil, sour	B	C	B	C	A		A	B		A	A	D	A		A
Crude Oil, sweet	A	B	B	B	A		A	A		A	A		A		A
Cupric Nitrate	D				A		A	D			D				A
Cutting Oils, Water Emulsions	A	A	B	B	A		A			A	A		A		A
Cyanide Plating Solution	D	D		D	B		B	D		B	D	B	B		A
Cyclohexane	A	A	A	A	A		A	B	B	C	A	D	A		A
Cyclohexanone	B	B			A		A	B	B	D	A				A
Detergents, Synthetic	B	B		B	B		A	B		B	A	B	A		A
Dextrin	B	B		B	B		B	B		B	A	B	B		A
Dichloroethane				C	C		B	B		D	D	D			A
Dichloroethyl Ether	B	B		B	B		B	B		D	D	D	D		A
Diesel Oil Fuels	A	A		A	A		A	A		A	A	D	A		A
Diethylamine	B	B	A	B	A		A	B		B	A	C	D		A
Diethyl Benzene					B		B			D	C	D			A
Diethylene Glycol	B	B	A	A	A		A	B		A	A	A	B		A
Diethyl Sulfate	B	B		B	B		B	B		C	A	C	B		A
Dimethyl Formamide	B	B		B	A		A	B		B	A	D	D		A
Dimethyl Phthalate										B	C		D		A
Dioxane	B	B		B	B		B	B		D	C	C	D	A	A
Dipentane (Pinene)	A	A		A	A		A			B	A	D	B		A
Disodium phosphate	B			B	B		B	C		B	A		B		A
Dowtherm	A	A	B	B	A		A	A		D	A	D	A	A	A
Drilling Mud	B	B	B	B	A		A	A		B	A	A	A		A
Dry Cleaning Fluids	A	C	B	B	A		A	A		B	D	A	B		A
Drying Oil	C	C	C	B	B		B	B		B	A	A			A
Enamel		A									B	A			A
Epsom Salts (MgSo4)	A	B	C	C	B		B	B		B	A	A	A		A
Ethane	A	B	C	C	B		B	B		A	A	D	A		A
Ethers	A	B	A	B	A	B	A	B		D	C	C	C		A
Ethyl Acetate	A	C	B	C	B	A	B	B	B	D	C	C	D		A
Ethyl Acrylate	C	B	C	C	A		A	B		A	D	B	C	D	A
Ethyl Benzene							A		A	C	A	D			A
Ethyl Bromide	B	A		B	B		C	B		B	A	B	B		A
Ethyl Chloride, dry	B	B	B	B	A	A	A	B	B	C	A	C	B		B
Ethyl Chloride, wet	D	C	C	D	B		B	B	B	C	A	B	B		A
Ethylene Chloride	C				A		A	B	B	D	A		D		A
Ethylene Dichloride					B		A	B		D	C	D	D	A	A
Ethylene Glycol	A	B	B	B	B	A	A	B	A	A	A	A	A		A
Ethylene Oxide	C	C	B	B	B		B	B	A	D	A	D	D		A
Ethyl Ether		B		C	A		A	A	B	D	A	D	D		A
Ethyl Silicate	B	B		B	B		B	B		B	A	B	B		A
Ethyl Sulfate	A				B		B			B	A	C	A		A

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Fatty Acids	B	C	D	D	A		A	B	A	B	A	D	A	A	A
Ferric Hydroxide					A		A	A		B	A	A			A
Ferric Nitrate	D	D	D	D	C	B	A	D	B	A	A	A	A		A
Ferric Sulfate	D	D	D	D	B	B	A	D		A	A	A	A		A
Ferrous Ammonium Citrate	B				B		B			A	A				A
Ferrous Chloride	D	B	D	D	D		D	D	D	A	A	A	A	A	A
Ferrous Sulfate	C	B	D	D	B		B	B	B	A	A	A	A	A	A
Ferrous Sulfate, Saturated	C	C	C	C	A		A	B	B	C	A	B	B	A	A
Fertilizer Solutions	B	C	B	B	B		B	B		B	A	D	A		A
Fish Oils	C	B	B	B	A		A	A		A	A	D	A		A
Flue Gases	C	B		B	A		A	B		C	C	D	C		A
Fluoboric Acid	B				B		A			A	D				A
Fluorosilicic Acid	D	B	D	D	B		B	A	B	C	C	C	C		A
Formaldehyde, cold	A	A	A	B	A	A	A	A	B	B	A	B	D		A
Formaldehyde, hot	B	B	D	D	C		B	B	B	B	A				A
Formic Acid, cold	D	B	D	D	B	B	A	B	A	D	D		B	A	A
Formic Acid, hot	D	B	D	D	B	D	B	B	B	D	D		A	A	A
Freon Gas, dry	B	B	B	B	A	A	A	A	B	C	A	C	C	A	A
Freon 11, MF,112, BF	B	B	C	A	A		A	B	B	C	A	C	D	A	A
Freon 12, 12, 32, 114, 115	A	A	B	A	A		A	B	B	B	A	A	D	A	
Freon 21, 31	B	B		C	A		A	B	B	D	A	D	D	A	
Freon 22	A	A		B			A		B	D	A	D	D	A	
Freon 113, TF	B	B		C	A		A	B	B	B	A	C	C	A	
Freon, wet	D	D		D	C	B	B	B	B	B	A	B	D	A	A
Fruit Juices	B	B	D	D	A		A	B		A	A	A	A		A
Fuel Oil	A	B	B	B	A		A	B		A	A	D	A		A
Fumaric Acid										B	A				A
Furfural	A	A	A	B	A	B	A	B	B	D	A	C	D		A
Gallic Acid 5%	A	C	D	D	B		B	B	B	B	A	C	A		A
Gas, Manufactured	B	B	B	B	B		B	A		A	A		A		A
Gas, Natural	B	B	B	B	A		B	A		A	A	D	A		A
Gas, Odorizers	A	A	B	B	B		A	B		B	A		A		A
Gasoline, Aviation	A	A	A	B	A		A	A	A	C	A		A	A	A
Gasoline, Leaded	A	A	A	A	A		A	B	A	C	A		A	A	A
Gasoline, Motor	A	A	A	B		A	A	A	A	C	A	D	A	A	A
Gasoline, Refined	A	B	B	B	A		A	B	A	C	A	D	A	A	A
Gasoline, sour	A	B	B	B	A		A	C	A	C	A	D	A	A	A
Gasoline, Unleaded	A	A	A	B	A		A	A	A	C	A		A	A	A
Gelatine	A	A	D	D	A		A	B		A	A	A	A		A
Glucose	A	A	B	B	A		A	A	A	A	A	A	A		A
Glue	A	B	A	B	B		A	B	A	A	A	B	A		A
Glycerine (Glycerol)	A	B	C	B	A	A	A	A	A	C	A	A	B	A	
Glycol Amine	C	D		B	B	A			D	A	C	D	D	A	
Glycol	A	B	C	B	B		A	B		B	C	A	A		A
Graphite	B	B		C	B		A	B		B	A	B	B		A
Grease	B	C	A	A	A		A	B		A	A	D	A		A
Helium Gas	B	B		B	A		A	B	A	B	A	B	B		A
Heptane	A	A	B	B	A		A	B	A	A	A	D	A		A
Hexane	A	B	B	B	A		A	B	A	A	A	D	A		A
Hexanol, Tertiary	A	A	A	A	A		A	A	A	A	A	D	B		A

Ratings: A=Excellent B=Good C=Poor 120 D=Do not use Blank =No Information

Chemical compatibility



Doc: ChemComp/01

Jun 2007

Chemicals

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Hydraulic Oilm Petroleum Base	A	B	A	B	A		A	A		A	A	D	A		A
Hydrazine	C	D		D	B		B	D		C	D	D	D		A
Hydrocyanic Acid	A	D	D	C	A		A	C	B	B	D	B	B	A	A
Hydrofluosilicic Acid	D	A	D	D	C		C	B		B	A	B	A	A	A
Hydrogen Gas, cold	A	B	B	B	A		A	A		B	A	B	A		A
Hydrogen Gas, hot	C		B		B		A		A	B	A	B			A
Hydrogen Peroxide, Concentrated	A	D	D	D	B		B	D	D	D	D	B	B		A
Hydrogen Peroxide, Dilute	A	C	D	D	B		B	D	D	A	D	B	A		A
Hydrogen Sulfide, Dry	A	C	B	B	A	B	B	B	B	C	C	A	A	A	A
Hydrogen Sulfide, Wet	B	D	C	D	B		B	C	D	C	C	B	A	A	A
Hypo (Sodium Thiosulfate)	B	C	D	D	B		B	B		C	A	A	A		A
Illuminating Gas	A	A	A	A	A		A	A		A	A	D	A		A
Ink-Newsprint	C	C	D	D	A		A	B		A	A	B	A		A
Iodoform	C	C	B	C	A		A	C		A	A		A		A
Iso-Butane					B		B			B	A	D			A
Iso-Octane	A	A	A	B	A		B		A	A	A	D	A		A
Isopropyl Acetate					B				D	D	A	D		A	A
Isopropyl Ether	B	A	A	B	A		B	A	C	C	A	D	D	A	A
JP-4 Fuel	A	A	A	B	A		A	A	A	A	A		A		A
JP-5 Fuel	A	A	A	A	A		B	A	B	B	A		A		A
JP-6 Fuel	A	A	A	A	A		A	A	A	A	A		A		A
Kerosene	A	A	B	B	A		A	A	A	A	A	D	A	A	A
Ketchup	D	D	D	D	A		A	B		A	A		A		A
Ketones	A	A	A	A	A		A	A		D	A	D	D		A
Laquer (and Solvent)	A	A	C	C	A		A	A		D	A	D	D		A
Lactic Acid Concentrated cold	C	D	D	D	A	D	A	D	A	B	D	B	A	A	A
Lactic Acid Concentrated hot	C	D	D	D	B	D	A	D	B	C	D	B	B	A	A
Lactic Acid Dilute cold	A	D	D	D	A	B	A	C	A	B	D	B	A	A	A
Lactic Acid Dilute hot	B	D	D	D	A	D	A	D	B	C	D		D	A	A
Lactose	B	B		C	B		B	B		B	A	B	B		A
Lard	A	B		A	A		A			B	A	C			A
Lard Oil	B	B	C	C	B		A	B		A	A	B	A		A
Lead Acetate	D	C	D	D	B		B	B		A	A	B	B		A
Lead Sulfate	D	C		D	B		B	B		B	A	B	B		A
Lecithin	C	C		C	B		B	B		D	A	D	B		A
Linoleic Acid	A	B	B	B	A		A	B		B	A	D	B		A
Linseed Oil	A	B	A	A	A		A	B		A	A	D	A		A
Lithium Chloride	D	B		B	B		A	B		B	A	B	B		A
LPG	A	A	B	B	B		B	B		A	A	D	A		A
Lubricating Oil Petroleum Base	A	B	A	A	A		A	B		A	A	D	A		A
Ludox	D	D		B	B		B	B		B	B	B	B		A
Magnesium Bisulfate	B	B	B	B	A		A	B		B	A	B	B		A
Magnesium Bisulfate	C	D		D	B		B	B		B	A	B	B		A
Magnesium Carbonate	B	A		B	A		A	B		B	A	B	B		A
Magnesium Chloride	C	B	C	D	B	C	B	B	A	A	A	A	A		A
Magnesium Hydroxide	D	B	B	B	A	A	A	B	B	A	A	A	A		A
Magnesium Hydroxide Hot	D	D	B	B	A	A	A	A	B	B	A		A		A
Magnesium Nitrate	B				A		A	B		B	A		B		A
Magnesium Sulfate	B	B	B	B	A	A	A	B	A	A	A	A	A		A
Maleic Acid	B	B	B	C	B		B	B	A	B	A	D	A		A

Ratings: A=Excellent B=Good C=Poor D=Do not use Blank =No Information

Chemical compatibility



Doc: ChemComp/01

Jun 2007

Chemicals

Chemicals	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Maleic Anhydride	B	B		B	B		B	B	B	D	C	D	B		A
Malic Acid	B	B	D	D	B		B	B		A	A		A		A
Malt Beverages					A		B	A		A	A	B	A		A
Manganese Carbonate	B				B		A			B	A				A
Manganese Sulfate	B	B		D	A		A	B		B	A	B	B	A	A
Mayonnaise	D	D	D	D	A		A	B		A	A		A		A
Meat Juices	B	D			A		A			B	A				A
Melamine Resins				D	C		C			B	A				A
Methanol	B	B		B	A		A	B		B	C	D	B		A
Mercuric Chloride	D	D	D	D	B		B	D	B	A	A	A	A		A
Mercuric Cyanide	D	D	D	D	A		A	C	B	A	A	A	A		A
Mercurous Nitrate	D	D			A		A	D		A	A		B		A
Mercury	D	D	A	A	A		A	B	B	A	A	A	A		A
Methane	A	A	B	B	A		A	B	A	A	A		A		A
Methyl Acetate	A	A	B	B	A		A	B	A	D	B	B	D		A
Methyl Acetone	A	A	A	A	A		A	A		D	B	A	D		A
Methylamine	A	D	B	B	A		A	C	B	D	A	B	D		A
Methyl Bromide 100%	C	C		D	B		A	B		B	A	D	B		A
Methyl Cellosolve	A	A	B	B	A		A	B	B	C	A	B	D		A
Metyl Cellulose					A		A		B	D	A				A
Methyl Chloride	D	B	B	B	A		A	B		D	A	D	B		A
Methyl Ethyl Ketone	A	A	A	A	A		A	A	B	D	A	B	D	A	A
Methylene Chloride	C	A	B	B	A		A	B	B	D	A	D	C		A
Methyl Formate	C	A	C	C	B		A	B	B	D	A	B	D		A
Methyl Isobutyle ketone					A		A			D	A			A	A
Milk & Milk Products	A	B	D	D	A		A	B		A	A	A	A		A
Mineral Oils	A	B	B	B	A		A	A		A	A	D	A		A
Mineral Spirits	A	B	B	B	B		B	B		A	A		A		A
Mixed Acids (cold)	D	D	C	C	B		B	C		D	D	D	B		A
Molasses, crude	B	A	A	A	A		A	A		A	A		A		A
Molasses, Edible	A	A	C	C	A		A	A		A	A		A		A
Molybdic Acid					A		A			A	A				A
Monochloro Benzene Dry					B		B	B		D	C			A	A
Morphine	B	B		B	A		A	B		D	A	B	D		A
Mustard	B	A	B	B	A		A	A		A	A		A		A
Naptha	A	B	B	B	B		B	B	A	B	A	D	A		A
Napthalene	B	B	B	B	B		B	B	B	D	A	D	A		A
Natural Gas, Sour	B	B	B	B	A		A	D	A	A	A	D	A		A
Nickel Ammonium Sulfate	D	D	D	D	A		A	C		A	C	B	D		A
Nickel Chloride	D	D	D	D	B		A	B	A	A	D	B	A	A	A
Nickel Nitrate	C	D	D	D	B		A	B		A	C	A	A		A
Nickel Sulfate	D	D	D	D	B		A	B	B	A	C	B	A	A	A
Nicotinic Acid	A	A	B	C	A		A	A		D	C	D	B		A
Nitric Acid 10%	D	D	D	D	A	A	A	D		C	D		A	A	A
Nitric Acid 30%	D	D	D	D	A	D	A	D		C	D	B	A	B	A
Nitric Acid 80%	B	D	D	D	C	D	B	D		D	D	B	B	B	A
Nitric Acid 100%	B	D	D	D	A	D	A	D		D	D	D	B	B	A
Nitric Acid Anhydrous	B	D	D	C	A	D	A	D		D	D	D	A	B	A
Nitrobenzene	C	D	B	B	A		A	B	B	D	B	C	C		A
Nitrogen	A	A	A	A	A		A	A		A	A	B	A		A

Ratings: A=Excellent B=Good C=Poor 122 D=Do not use Blank =No Information

Chemical compatibility



Doc: ChemComp/01

Jun 2007

Chemicals

Chemicals	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy 20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Nitrus Acid 10%	D	D	D	D	B		B	D		C	B		A		A
Nitrous Gases	B	D	B	C	A		A	D			B				A
Nitrous Oxide	C	B	B	C	B		B	D	B	B	A		A		A
Oils & Fats	B				A		A			A	A	D			A
Oils, Animal	A	A	A	A	A		A	B	A	B	A	B	B		A
Oils, Petroleum	A	B	A	A	A		A	A	A	A	A	A	D		A
Oils, Petroleum Sour	A	C	B	C	A		A	A	A	A	B	A	D		A
Oils, Water Mixture	A	A	B	B	A		A		A	A	A	A			A
Olaic Acid	B				B		B	A	A		D	C			A
Oleic Acid	B	B	C	C	B		A	B	B	B	B	C	D	A	A
Oleum	B	C	B	D	B		B	C	B	D	D	D	C		A
Oleum Spirits	D	D		D	B		B	D		C	D	D	A		A
Olive Oil	B	C	B	B	A		A	A		A	A	B	A		A
Oxalic Acid	C	B	D	D	B		IB	B		C	C	B	A	A	A
Oxygen	A	A	B	B	A		NA	A	A	B	D	A	A		A
Ozone, Dry	A	A	A	A	A		A	A	A	D	C	A	B		A
Ozone, Wet	B	B	C	C	A		A	A	A	D	C	B	B		A
Paints & Solvents	A	A	A	A	A		A	A		D	A	D	B		A
Palmitic Acid	B	B	C	C	B		B	B		B	A	B	A		A
Palm Oil	A	B	C	C	B		A	A		B	A	D	A		A
Paper Pulp	D	B		B	A		A	B		B	A	B	B		
Paraffin	A	A	B	B	A		A	A	A	A	A	D	A		A
Paraformaldehyde	B	B	B	B	B		B	B		B	A	D			A
Paraldehyde					B		B			B	A	D		A	A
Pentane	A	A	B	B	A		A	B		A	A	D	A		A
Perchlorethylene, Dry	B	C	B	B	A		A	B	B	D	B	D	A		A
Petrolatum (Vaseline Petroleum Jelly)	B	B	C	C	B		A	A		A	A		A		A
Phenol	A	B	D	D	A		BA	A		D	C	D	B		A
Phosphate Ester 10%	D	D	A	A	A		A	A	A	D	A	A			A
Phosphate Acid 10%	D	D	D	D	D		IB	D		B	D	B	A	A	A
Phosphoric Acid 50% Cold	D	D	D	D	B		IB	C		B	D	B	A	A	A
Phosphoric Acid 50% Hot	D	D	D	D	D		IB	C		B	D	B	A	A	A
Phosphoric Acid 85% Cold	D	D	B	B	A		CB	A		C	D		B	A	A
Phosphoric Acid 85% Hot	D	D	C	C	B		IB			C	D			A	A
Phosphoric Anhydride	A				A		A			D	B		B	A	A
Phosphorous Trichloride	D		B	C	A		A			D	D	B	B	A	A
Phthalic Acid	B	B	C	C	B		B	A	B	C	B		A		A
Phthalic Anhydride	B	B	C	C	B		B	A	A	C	A		A		A
Picric Acid	C	C	D	D	B		CB	D	B	C	C	D	B		A
Pineapple Juice	A	C	C	C	A		A	A		A	A		A		A
Pine Oil	B	B	B	B	A		A	B		A	A	D	A		A
Pitch (Bitumen)					A		A			C	A	D			A
Polysulfide	D	D		B	B		A	B		B	D	B	B		A
Polyvinyl Acetate	B	B		B	B		B	B			A	B			A
Polyvinyl Chloride	B	B		B	B		B	B			A	B			A
Potassium Bicarbonate	A				A		A	B		B	A				A
Potassium Bichromate	A				A		A	A		B	B		B		A
Potassium Bisulfate	B				A		A	B		B	A	B	A		A
Potassium Bisulfate	C	C	D	D	B		B	D		A	A	B	A		A
Potassium Bromide	C	C	D	D	A		CB	B		A	A		A		A

Ratings: A=Excellent B=Good C=Poor 123 D=Do not use Blank =No Information

Chemical compatibility



Doc: ChemComp/01

Jun 2007

Chemicals

Chemicals	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Potassium Carbonate	D	B	B	B	B	A	B	B		A	A	B	A		A
Potassium Chlorate	C	B	B	B	B	B	B	C		A	A	B	A		A
Potassium Chloride	D	C	C	B	B	B	A	B	B	A	A	A	A		A
Potassium Chromate	B	B	B	B	B		B	B		B	A	B	B		A
Potassium Cyanide	D	D	B	B	B		B	B	B	A	A	A	A		A
Potassium Dichromate	A	D	C	C	B		A	B		A	A	B	A		A
Potassium Ferricyanide	B	D	C	C	A	B	B	B		A	A	B	A		A
Potassium Ferrocyanide	B	B	C	C	B		B	A		A	A		A		A
Potassium Hydroxide Dilute Cold	D	D	A	A	B	B	B	A		A	D		D		A*
Potassium Hydroxide to 70%, Cold	D	D	B	B	B	C	B	A		B	D	B	D		A*
Potassium Hydroxide Dilute Hot	D	D	B	B	B	C	B	A		B	D	A			A*
Potassium Hydroxide to 70%, Hot	D	D	A	B	B	D	B	A		C	D				A*
Potassium Iodide	D	D	C	C	B	B	B	C		A	A	B	A		A
Potassium Nitrate	A	B	B	B	B	B	B	B	B	A	A	B	A		A
Potassium Oxalate	C				A		A				A				A
Potassium Permanganate	B	B	B	B	B	B	B	B	B	A	A	B	A		A
Potassium Phosphate	D	C		C	B		B	B	B	A	A	A	A		A
Potassium Phosphate Di-basic	B	B	A	A	A		A	B	B	A	A	B	A		A
Potassium Phosphate Tri-basic	D		A	A	B		B	B		B		B			A
Potassium Sulfate	A	B	B	C	A	A	A	B		A	A	A	A		A
Potassium Sulfide	B	B	B	B	A		A	C	A	A	A	B	B		
Potassium Sulfite	B	B	B	B	A		A	C	B	B	A	A	B		A
Producer Gas	B	B	B	B	B	A	B	A		A	A	D	A		A
Propane Gas	A	A	B	B	B	A	A	B	A	A	A	D	A		A
Propyl Bromide	B	B		B	B		A	B		B	A	B	B		A
Propylene Glycol	A	B	B	B	B		B	B		A	C	B	A		A
Pyridine	B			B	B		A			D	D		D		A
Pyrogallic Acid	B	B	B	B	B	B	A	B		A	A		A		A
Quench Oil	A	B	B	B	A		A			A	A		A		A
Quinine, sulfate, dry					A	B	A	B			A				A
Resins & Rosins	A	A	C	C	A	B	A	A		C	A		A		A
Resorcinol					B		B								A
Road Tar	A	A	A	A	A		A	A		B	A	D	A		A
Roof Pitch	A	A	A	A	A		A	A		B	A		A		A
Rosin Emulsion	A	B	C	C	A		A	A		D	A		B		A
R P-1 Fuel	A	A	A	A	A		A	A		B	A		A		A
Rubber Latex Emulsions	A	A	B	B	A		A			A	C		A		A
Rubber solvents	A	A	A	A	A		A	A		D	C		D		A
Salad Oil	B	B	C	C	B		A	B		A	A	B	A		A
Salicylic Acid	C	C	D	D	A		B	B		A	A	B	A		A
Salt (NaCl)	B	B	C	C	B		A	A		A	A		A		A
Salt Brine	B	B		D	B		B	B		A	A	B	B		A
Sauerkraut Brine					B		B				C				A
Sea Water	C	C	D	D	B		B	A		A	A	A	A		A
Sewage	C	C	C	D	B	A	B	B		A	B	B	B		A
Shellac	A	A	A	B	A		A	A		A	A				A
Silicone Fluids	B	B		B	B		B			B	A		B		A
Silver Bromide	D				A	C	A	B			D				A
Silver Cyanide	D	D		D	A		A	B		B	D		B		A
Silver Nitrate	D	D	D	D	A		A	D		C	A	A	A		A

Ratings: A=Excellent B=Good C=Poor 124D=Do not use Blank =No Information

* Not with reinforced or polyfill

Chemical compatibility



Doc: ChemComp/01

Jun 2007

Chemicals

Chemicals	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Silver Plating sol.	B				A		A				D				A
Soap Solutions (Stearates)	C	A	A	B	A		A	A		A	A	A	A		A
Sodium Acetate	B	B	C	C	B		B	B	B	B	A	B	A		A
Sodium Aluminate	D	B	C	C	A		B	B	B	A	A	B	A		A
Sodium Benzoate	B				B		B	B	B		B				A
Sodium Bicarbonate	B	B	C	C	B		A	B		A	B	A	A		A
Sodium Bichromate	A				B		B			D	A				A
Sodium Bisulfate 10%	D	B	D	D	A		A	B		A	D	B	A		A
Sodium Bisulfite 10%	D	B	D	D	A		B	B	B	A	D	B	A		A
Sodium Borate	B	B	C	C	B		B	B		A	A	B	A		A
Sodium Bromide 10%	B	B	C	D	B		B	B		A	A	B	A		A
Sodium Carbonate (Soda Ash)	D	B	B	B	A		A	B	B	A	A	B	A		A
Sodium Chlorate	C	B	C	C	B		B	C		B	A	A	A	B	A
Sodium Chloride	B	B	C	C	B		A	A	B	A	A	B	A	A	A
Sodium Chromate	D	C	B	B	A		B	B		A	A	B	A		A
Sodium Citrate	D				B		B				A				A
Sodium cyanide	D	D	B	B	A	B	A	B		A	A	B	A		A
Sodium Ferricyanide	A				A		A	B			A				A
Sodium Fluoride	C	C	D	D	B	B	A	B		A	A	B	A		A
Sodium Hydroxide 20% Cold	D	A	A	A	A	A	B	A		A	D	B	B	A	A*
Sodium Hydroxide 20% Hot	D	A	B	B	A	C	A	A		B	D	B	C	A	A*
Sodium Hydroxide 50% Cold	D	A	A	B	A	B	A	A		A	D	B	C	A	A*
Sodium Hydroxide 50% Hot	D	A	B	B	A	C	A	B		B	D		C	A	A*
Sodium Hydroxide 70% Cold	D	A	A	A	A	B	B	A		B	D	B	C	A	A*
Sodium Hydroxide 70% Hot	D	B	B	B	A	C	B	B		D	D	B	C	A	A*
Sodium Hypochlorite (Bleach)	D	D	D	D	D	D	C	D	A		D		A		A
Sodium Hyposulfite	B				B		B	B			A				A
Sodium Lactate	D				A		A	B			A				A
Sodium Metaphosphate	A	C	B	C	B	B	B		A	A	B	B		A	A
Sodium Metasilicate Cold	B	B	C	C	A		A	A		B	A		B		A
Sodium Metasilicate Hot	B	B	D	D	A		A	A	A		A				A
Sodium Nitrate	A	B	B	B	A	B	A	B	B	C	A	B	A		A
Sodium Nitrite	A				B		B	C	B	C	B	A	B		A
Sodium Perborate	B	B	B	B	B	B	B	B	B	C	A	A	A		A
Sodium Peroxide	C	D	C	C	B	B	B	B	B	C	A	A	A		A
Sodium Phosphate	D	C	C	C	B	B	B	B	B	B	B	A	A		A
Sodium Phosphate Di-basic	D	C	C	C	B		B	B	B	A	A	A	A		A
Sodium Phosphate Tri-basic	D	C	C	C	B		B	B	B	B	A	A	A		A
Sodium Polyphosphate					B		B	B	B	B		A	A		A
Sodium Salicylate					A		A				A	A			A
Sodium Silicate	B	B	B	B	B		B	B		A	A	B	A		A
Sodium Silicate, Hot	C	C	C	C	B		B	B			A	B			A
Sodium Sulfate	B	B	B	B	A	B	A	A		A	A	A	A		A
Sodium Sulfide	C	D	B	B	A	A	B	B		A	A	B	A		A
Sodium Sulfite	B	C		A	A	A	A	B	B	A	A	B	B		A
Sodium Tetraborate				A	A		A			A	A	B			A
Sodium Thosulfate	B	B	B	C	B	A	B	B		A	A	A	A		A
Soybean Oil	B	B	C	C	A		A	A		A	B	B	A		A
Starch	B	B	C	C	B		A	A		A	A	C	A		A
Steam (212°F)	A	A	A	A	A	A	A	B		D	D	B	C	A	A

Ratings: A=Excellent B=Good C=Poor 125 D=Do not use Blank =No Information

* Not with reinforced or polyfill

Chemical compatibility



Doc: ChemComp/01

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Chemicals

	Aluminum	Brass	Carbon Steel	Ductile Iron / Cast Iron	316 Stainless Steel	17-4PH	Alloy20	Monel	Hastelloy C	Buna N (Nitrile)	Delrin	EPDM/EPR	Viton	Flexible Graphite	Teflon-Reinforced
Stearic Acid	A	C	C	C	B		B	B	A	A	A	B	A	A	A
Styrene	A	A	A	B	A		A	B	A	D	A	D	B		A
Sugar Liquids	A	A	B	B	A		A	A		A	A	B	A		A
Sugar, Syrups & Jam	B	B		C		A	A			A	A				A
Sulfate, Black Liquor	C	C	C	C	B	A	B	B		C	C	B	C		A
Sulfate, Green Liquor	B	C	C	C	B	A	B	B		C	A		C		A
Sulfate, White Liquor	B	C	C	C	B	B	D	C		C	D		C		A
Sulfur	A	D	C	C	B		A	B		D	A	B	B		A
Sulfur Chlorides	D	B	D	D	D		A	B		D	A	C	A	A	A
Sulfur Dioxide, dry	A	B	B	B	A	A	B	B	A	D	A	A	A	A	A
Sulfur Dioxide, wet	C	D			A	C	B	A	B	D	D	B		A	A
Sulfur Hexafluoride	A	B			A		A			A	A				A
Sulfur, Molten	A	D	C	B	B		A	D	B	D	D	B	B		A
Sulfur Trioxide		B	B	B	B	B	B		B	D	D		B	D	A
Sulfur Trioxide, dry	A	B	B	B	B	B	B	B	B	D	A	B	A	D	A
Sulfuric Acid 0 to 77%	C	C	D	D	C		B	B		B	D		A	A	A
Sulfuric Acid 100%	D	C	C	B	A	B	A	D		D	D	C	B	D	A
Sulfurous Acid	C	D	D	D	B		B	D		C	C	C	A	A	A
Tall Oil	C	B	B	B	B		B	B	A	B	A	D	A		A
Tannic Acid (Tannin)	C	B	C	C	B	B	B	B	B	B	A	B	A		A*
Tanning Liquors	A				B		B			B	D				A*
Tar & Tar Oils	A	A	A	A	A	A	A	A		C	A	D	A		A*
Tartaric Acid	B	B	D	D	A	A	A	B	B	C	A	B	A		A*
Tetraethyl Lead	B	B	C	C	B		B	A		A	A				A*
Toluol (Toluene)	A	A	A	A	A		A	A	A	D	C	D	B		A*
Tomato Juice	A	C	C	C	A		A	B		A	A		A		A
Transformer Oil	A	B	A	B	A		A	A		A	A		A		A
Tributyl Phosphate	A	A	A	A	A		A	A		D	A	B	D		A
Trichlorethylene	A	B	B	C	B	A	B	B	A	D	A	D	B	A	A
Trichloroacetic Acid	D	B		D	D		B	B	A	C	D		D		A
Triethanolamine	B				B		B	B	A	C	A	B			A
Triethylamine		B			B		B		A	B	C				A
Trisodium Phosphate	D				B		B		A	A	A	B	B		A
Tung Oil	B	B	B	B	A		A	C	A	A	A	D	A		A
Turpentine	B	B	B	B	B	A	B	D	A	B	A	D	A		A
Urea	B	B	C	C	B		B	B	A	C	A	B	D		A
Uric Acid	D				A		A		A		B				A
Varnish	A	A	C	C	A		A	A	A	C	A	D	B		A
Vegetable Oils	A	B	B	B	A		A	B	A	A	A	D	A		A
Vinegar	C	B	D	D	A		A	B	A	D	B	A	D		A
Vinyl Acetate	B	B		B	B		B	B	A		D	A		A	A
Water, Distilled	A	A	D	D	A	A	A	A	A	C	A	B	A	A	A
Water, Fresh	A	A	C	C	A	A	A	A	A	C	A	B	A		A
Water, Acid Mine	D	D	D	D	B	B		D	C	B	A	A	D	A	A
Waxes	A	A	A	A	A		A	A	A	A	A	C	A		A
Whiskey & Wines	D	B	D	D	A		A	A	A	B	A	A	A		A
Xylene (Xylol), Dry	A	A	B	B	A		A	A	A	D	A	D	B		A
Zinc Bromide	D	B		D	B		B	B	A	B	A	B	B	A	A
Zinc Hydrosulfite	D	C	A	B	A		A	B	A	A	A	A	A		A
Zinc Sulfate	D	B	D	D	B		A	B	A	A	A	A	A	A	A

Ratings: A=Excellent B=Good C=Poor ¹²⁶ D=Do not use Blank =No Information

* Not with reinforced or halffill