

## METAL CHARACTERISTICS

### Aluminum

This silver white metal is very malleable and quite corrosion resistant, since the surface reacts with oxygen to form a protective aluminum oxide coating. This coating is quite resistant to many chemicals—even acids, but can be penetrated by alkaline substances. It is lightweight and easy to machine, forge and cast. Alloys of aluminum are formed by adding a variety of other elements such as copper, manganese, zinc to produce products that can vary in strength, corrosion resistance, weight, and ease of forging.

### Brass

Brass is an alloy primarily of copper and zinc with trace elements typically including silicon and iron. Brass is a golden yellow and weathers to a green color but is relatively corrosion resistant.

### Bronze

An alloy of primarily copper and tin with traces typically including silicon and iron. Bronze was the first widely used metal strong enough for weapons and tools (hence the Bronze Age). Bronze is a reddish color and weathers to green but is relatively corrosion resistant. Adding beryllium produces an alloy hard enough for production of springs and hand tools.

### Cast Iron

Also called pig iron, cast iron describes a wide range of irons with 2% or more carbon. The high carbon content makes cast iron somewhat brittle. Cast iron cannot be forged, but must be formed by casting or machining.

### Copper

Copper is element #29, a reddish metal that is the primary metal in alloys of brass, bronze, and monel. Small amounts of copper added to aluminum, silver, and gold make those metals harder, and added to steel copper gives corrosion resistance. Copper pennies were actually bronze, not copper, since copper is too soft. Many modern copper coins are now zinc with a copper coating.

### Ductile Iron

Also known as malleable iron, this product is made from cast iron by adding magnesium during the casting process. The magnesium causes the carbon to collect as graphite specks, so that the surrounding iron is low enough to be ductile to some extent. (Ductile means capable of being hammered out thin without cracking). Many items identified as cast iron are actually ductile iron. Ductile iron can be arc welded.

### Iron

Pure iron is a soft ductile metal that rusts rapidly. Adding up to 1.5% carbon creates steel which can be hardened. Adding more carbon gives cast iron which is hard but brittle.

### Stainless Steel

Stainless steel is a generic name for a class of steels that are used primarily because of their corrosion resistance. All stainless steel alloys contain a minimum of 10.5% chromium. Other elements, particularly nickel and manganese, are added to produce different physical and mechanical properties such as hardness, ease of machining, and ease of welding. Molybdenum may be added to further increase corrosion resistance. While there are many grades of stainless, 70% of production is Type 304 (also known as 18/8, since it is 18% chromium and 8% nickel). The amounts of various elements affect other characteristics. Basically, alloys of principally chromium and iron are known as 400 series and are all magnetic. Alloys with both chromium and nickel are 300 series, and chromium, nickel, manganese alloys are known as 200 series. These two series are generally non-magnetic. For hose fittings and clamps, the major types are:

#### Type 201 and 202

Uses manganese in place of some of the nickel. Similar to 301 and 302 in corrosion resistance. Commonly found as band material for clamps.

#### Type 301, 302, and 304

General use stainless steel.

#### Type 316

For most chemicals — has a very high corrosion resistance. Used where harsh cleaning chemicals are used, or where chemical concentrations are high.

#### Type 410 and 420

Easily hardened by heat treatment. Used in machine parts and cutters as well as clamps.

### Steel

Iron with a small percentage of carbon is steel. The more carbon, the harder the steel can be made by heat treatment. Mild steel is 0.18 to 0.20% carbon. High carbon steels start at roughly 0.75% carbon and go up to around 1.5%. Alloy steels contain other ingredients for special purposes such as corrosion resistance.

### Wrought Iron

True wrought iron is pure iron with thin layers of silica slag that gives a grainy appearance. Wrought iron was the primary ductile form of iron for thousands of years, but it is no longer in common use. Today the term wrought iron is used to describe low carbon steel pipe and also decorative ironwork made of any metal.

### Zinc

Element #30 is a bluish white ductile metal that is the secondary alloy in brass. Zinc is used to harden aluminum alloys, and aluminum is used to make light strong zinc alloys.

## THREAD DIMENSIONS

The following tables give the actual outside dimension of male threads in inches as well as the pitch given in threads per inch. For fire hose thread dimensions, see detail listings next to G81 in our Fire Section.

### PIPE, STRAIGHT PIPE, & GARDEN HOSE THREADS

Pipe Size	Tapered Pipe		Straight Iron Pipe		Garden Hose	
	(NPT) O.D.	(NPSH) Pitch	O.D.	(GHT) Pitch	O.D.	Pitch
1/16	0.312	27				
1/8	0.405	27				
1/4	0.540	18				
3/8	0.675	18				
1/2	0.840	14				
3/4	1.050	14	1.035	14	1.062	11 1/2
1	1.315	11 1/2	1.295	11 1/2		
1 1/4	1.660	11 1/2	1.639	11 1/2		
1 1/2	1.900	11 1/2	1.878	11 1/2		
2	2.375	11 1/2	2.352	11 1/2		
2 1/2	2.875	8	2.841	8		
3	3.500	8	3.470	8		
3 1/2	4.000	8	3.970	8		
4	4.500	8	4.470	8		
5	5.563	8				
6	6.625	8				
8	8.625	8				
10	10.750	8				
12	12.750	8				

### TUBE FITTING THREADS

Tube O.D.	Brass Compression		SAE 45° Flare		Inverted Flare	
	O.D.	Pitch	O.D.	Pitch	O.D.	Pitch
1/8	5/16	24	5/16	24	5/16	28
3/16	3/8	24	3/8	24	3/8	24
1/4	7/16	24	7/16	20	7/16	24
5/16	1/2	24	1/2	20	1/2	20
3/8	9/16	24	5/8	18	5/8	18
7/16	5/8	24	11/16	16	11/16	18
1/2	11/16	20	3/4	16	3/4	18
5/8	13/16	18	7/8	14	7/8	18
3/4	1	18	1 1/16	14	1 1/16	16
7/8	1 1/8	18	1 1/4	12	1 3/16	16
1	1 1/4	16	1 3/8	12		

### DIMENSIONS OF 150lb ANSI FLANGES

Nominal Size	Flange O.D.	Flange Thickness	No. of Bolts	Bolt Size	Dia. of Bolt Holes	Dia. of Bolt Circle
1 1/4	4.25	9/16	4	1/2	5/8	3 1/8
1 1/2	5	11/16	4	1/2	5/8	3 7/8
2	6	3/4	4	5/8	3/4	4 3/4
2 1/2	7	7/8	4	5/8	3/4	5 3/4
3	7.5	15/16	4	5/8	3/4	6
4	9	15/16	8	5/8	3/4	7 1/2
5	10	15/16	8	3/4	7/8	8 1/2
6	11	1	8	3/4	7/8	9 1/2
8	13.5	1 1/8	8	3/4	7/8	11 3/4
10	16	1 3/16	12	7/8	1	14 1/4
12	19	1 1/4	12	7/8	1	17

### HOW TO MEASURE A MALE FIRE HOSE THREAD

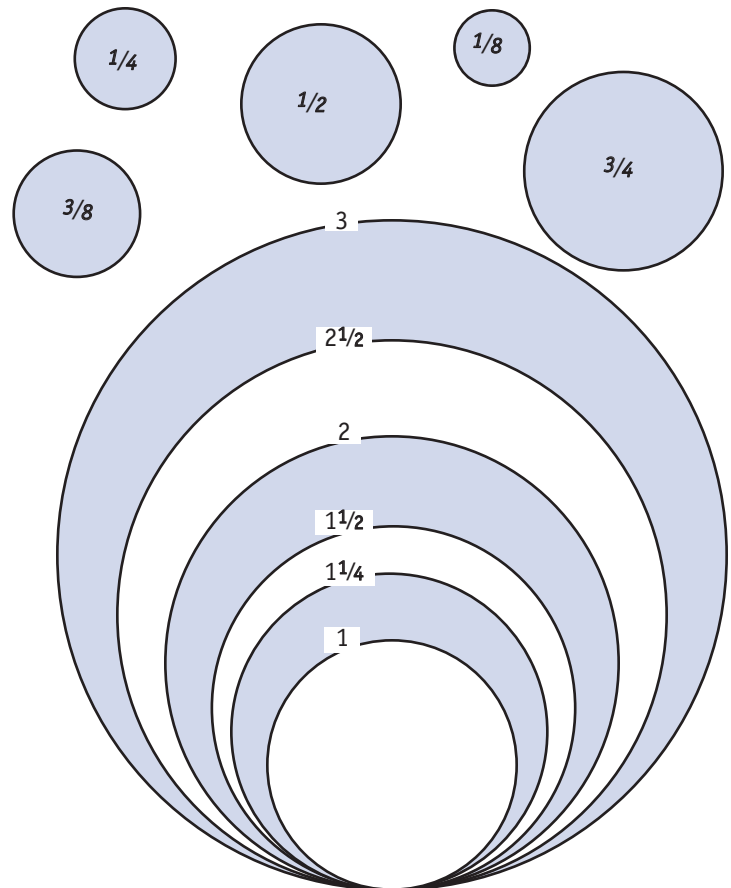
Take a strip of paper about 1 wide and wrap it around the male thread snugly so that it overlaps. Where the two ends overlap, use a pin to pierce the paper so that there is a hole in both ends. Press your thumb against the paper so that the threads leave an impression. Remove the paper and measure the distance between the pinholes. This distance, divided by 3.1416, equals the thread o.d. Count the number of thread impressions showing on the paper and divide by the total width of the impressions (in inches). This figure is the pitch in threads per inch.

### PRESSURE/TEMPERATURE RATINGS FOR MALLEABLE IRON FITTINGS

The standard malleable fittings shown in this catalog are Class 150 and meet the working pressures shown here for that class. Heavier Class 300 parts are available on special order.

°C	°F	Class 150	Class 300		
		Working Pressure	Working Pressure		
		All sizes	1/4-1	1 1/4-2	2 1/2-3
		300 psi	2000	1500	1000
93	200	265	1785	1350	910
121	250	225	1575	1200	825
149	300	185	1360	1050	735
185	366	150	1150	900	650
204	400	N/A	935	750	560
232	450	N/A	725	600	475
260	500	N/A	510	450	385
288	550	N/A	300	300	300

### ACTUAL MALE PIPE THREAD OUTSIDE DIAMETERS:



# CHEMICAL RESISTANCE CHART

Recommendations in this chart are based upon careful examination of published data. However please remember that chemical resistance is affected by temperature, concentration, environment, exposure to multiple chemicals, and other conditions. Other requirements, such as agency standards (CSA, FDA, etc) may also dictate selection. Therefore this table must only be used as a general guide.

### Chart key:

- E... excellent, no effect
- G... good, minor effect only
- C... conditional, moderate effect, may be suitable in limited applications
- X... severe effect, not recommended
- I... no data available

	302SS	304SS	316SS	440SS	Acetyl	Aluminum	Cast Bronze	Brass	Cast iron	Carbon Steel	Teflon	Nylon	Polyethylene	Polypropylene	Buna N Seal *	Viton Seal *
acetaldehyde	E	E	E	I	X	G	X	I	I	C	E	E	C	G	G	X
acetamide	I	G	E	I	I	I	I	I	I	C	I	I	I	I	E	E
acetate solvent	E	G	E	G	I	G	E	C	G	E	E	E	G	X	X	X
acetic acid	I	G	E	G	G	G	C	C	X	C	E	X	G	E	C	C
acetic acid 20%	I	G	E	I	G	I	I	C	I	I	E	X	I	E	C	E
acetic acid 80%	I	G	E	I	G	I	I	C	I	I	E	X	I	G	C	E
acetic acid, glacial	I	G	E	E	I	G	C	C	X	E	E	X	G	G	X	X
acetic anhydride	G	E	E	G	I	G	C	X	G	X	E	X	E	E	E	X
acetone	E	E	E	G	X	E	E	E	E	E	E	E	C	G	X	X
acetyl chloride	I	C	E	I	I	I	X	I	I	I	E	I	I	I	I	E
acetylene	E	E	E	E	X	E	G	I	E	E	I	E	I	X	E	E
acrylonitrile	E	E	C	I	I	G	E	I	C	I	I	I	I	G	X	C
alum potassium sulfate (alum), 10%	I	E	I	I	I	E	I	I	X	E	E	E	E	I	I	E
alum potassium sulfate (alum), 100%	I	X	E	G	I	G	C	I	I	E	E	X	G	E	E	E
aluminum chloride	C	X	C	I	X	X	C	I	X	G	E	X	I	E	E	E
aluminum chloride 20%	I	X	C	X	I	G	X	I	X	E	I	E	G	E	E	E
aluminum fluoride	I	X	C	X	I	I	I	I	I	E	E	X	G	E	E	E
aluminum hydroxide	I	E	E	E	I	E	E	I	X	E	E	E	I	E	E	E
aluminum sulfate	I	C	C	E	G	E	C	C	X	E	E	E	G	E	E	E
amines	E	E	E	I	I	E	G	I	E	G	E	E	I	I	X	X
ammonia 10%	I	I	E	I	I	I	I	I	I	I	E	E	I	E	X	E
ammonia, anhydrous	E	G	E	E	I	G	X	I	X	G	E	E	G	E	G	X
ammonia, liquids	I	E	E	E	I	X	X	I	E	E	E	I	X	E	G	X
ammonia, nitrate	I	E	E	E	I	C	X	I	I	E	I	I	I	E	E	I
ammonium bifluoride	I	C	E	I	I	X	I	I	I	I	I	I	I	E	E	E
ammonium carbonate	G	E	E	E	X	C	G	I	C	G	E	E	I	E	X	G
ammonium casenite	I	I	E	I	I	I	I	I	I	I	I	I	I	I	I	I
ammonium chloride	C	E	C	E	X	C	X	C	X	X	E	E	G	E	E	E
ammonium hydroxide	E	E	E	E	X	C	X	X	E	C	E	E	G	E	G	G
ammonium nitrate	E	E	E	E	G	G	X	X	E	X	E	X	G	E	E	X
ammonium oxalate	I	E	E	E	I	I	I	I	I	E	I	I	I	I	E	I
ammonium persulfate	I	E	E	E	I	C	E	I	X	E	E	X	I	E	E	C
ammonium phosphate, dibasic	G	E	E	E	I	G	C	I	I	X	E	E	G	E	E	E
ammonium phosphate, monobasic	I	E	E	E	I	G	X	I	I	E	E	E	G	E	E	E
ammonium phosphate, tribasic	G	E	E	E	I	G	C	I	C	X	E	E	G	E	E	E
ammonium sulfate	C	X	G	E	I	G	G	C	C	C	E	X	G	E	E	X
ammonium thio-sulfate	I	I	E	I	I	I	I	I	X	E	I	I	I	I	E	I
amyl alcohol	E	E	E	I	G	C	E	G	C	C	E	E	G	G	G	G
amyl chloride	I	C	G	I	I	X	E	I	I	E	E	C	X	X	X	E
amyl-acetate	G	E	E	C	X	G	C	I	I	C	E	G	X	X	X	X
aniline	G	E	E	E	X	C	C	I	I	C	E	C	C	G	X	C
aniline oil	I	E	E	I	I	C	E	I	E	I	E	C	I	E	X	E
anise oil	I	E	E	I	I	I	I	I	I	I	I	I	I	I	I	I
anti-freeze	I	E	E	I	I	E	G	G	G	C	E	E	G	E	E	E
antimony trichloride	I	X	X	I	I	X	I	I	I	I	E	X	E	I	I	E
aqua regia (80%, hcl, 20%, hno)	I	X	X	I	I	X	X	I	I	I	E	X	X	C	X	C
aromatic hydrocarbons	I	I	E	I	I	E	E	I	E	E	I	I	C	I	X	E
arsenic acid	G	E	E	I	I	X	X	G	X	X	E	E	G	E	E	E
asphalt	I	G	E	I	C	C	E	I	C	I	I	E	I	E	G	E
barium carbonate	G	E	E	E	I	G	G	I	G	G	E	E	G	E	E	E
barium chloride	C	X	E	E	I	X	G	I	I	C	E	G	G	E	E	E
barium cyanide	I	I	E	I	I	I	C	I	I	E	I	I	G	I	C	E
barium hydroxide	G	C	E	E	I	X	G	I	C	C	E	E	G	E	E	E
barium nitrate	I	E	E	I	I	I	X	I	E	E	I	I	I	E	E	E
barium sulfate	G	E	E	E	I	X	C	I	C	C	E	E	G	E	E	E
beet sugar liquids	E	E	E	I	I	E	E	G	E	I	E	E	I	E	E	E
benzaldehyde	E	E	E	I	X	G	E	I	G	E	E	C	X	X	X	X
benzene	G	E	E	E	X	G	G	E	G	C	E	E	X	X	X	E

\* NOTE: The ratings given for BUNA N and VITON rubber are based on their use as seals in couplings. For Chemical Resistance of Hose components refer to the tables in our Hose Catalog.

# CHEMICAL RESISTANCE CHART

	302SS	304SS	316SS	440SS	Acryel	Aluminum	Cast Bronze	Brass	Cast iron	Carbon Steel	Teflon	Nylon	Polyethylene	Polypropylene	Buna N Seal *	Viton Seal *
benzoic acid	G	E	E	E	X	G	G	I	X	I	E	X	G	X	X	E
benzol	I	E	E	I	I	G	G	E	I	I	E	E	I	E	X	X
benzyl alcohol	I	E	E	I	I	G	E	C	I	I	I	E	X	E	X	E
bone oil	I	E	E	I	I	I	E	I	I	I	I	I	I	I	E	E
borax (sodium borate)	I	E	E	E	G	C	E	G	E	C	E	E	G	E	G	E
boric acid	G	E	E	E	E	G	G	C	X	I	E	E	G	E	E	E
brewery slop	I	I	E	I	I	I	E	I	E	I	I	I	I	I	E	E
bromine (wet)	X	X	X	X	X	X	C	I	X	X	E	X	X	X	X	E
butadiene	E	E	E	I	I	E	C	E	C	C	E	E	I	I	E	E
butane	E	E	E	I	X	E	E	E	C	C	E	E	C	X	E	E
butanol	I	E	E	I	I	G	G	C	C	C	E	E	G	G	E	E
butter	I	G	E	I	E	E	X	I	X	I	I	I	I	I	E	E
buttermilk	E	E	E	E	I	E	X	I	X	I	E	E	I	I	E	E
butyl acetate	I	I	C	I	X	E	E	I	I	E	E	I	C	X	G	X
butyl alcohol	E	E	E	I	I	G	G	C	C	C	E	E	G	G	E	E
butylene	E	G	E	I	I	E	E	E	E	E	E	I	I	I	G	E
butyric acid	G	G	E	E	I	G	C	I	X	I	E	X	I	E	X	X
calcium bisulfate	C	X	E	I	I	X	X	X	X	I	E	E	I	I	E	E
calcium bisulfide	I	I	G	I	I	C	C	I	I	I	E	E	G	E	E	E
calcium bisulfite	I	G	E	I	I	C	C	I	I	I	E	E	I	E	E	E
calcium carbonate	G	E	E	E	I	C	C	I	X	I	E	E	G	E	E	E
calcium chlorate	I	G	E	I	I	I	C	I	I	I	E	E	E	I	I	E
calcium chloride	C	E	X	C	G	C	G	I	C	I	E	E	G	E	E	E
calcium hydroxide	G	E	E	I	I	C	G	I	I	I	E	E	G	E	E	E
calcium hypochlorite	X	X	C	C	X	C	X	I	X	I	E	X	G	E	G	E
calcium sulfate	G	E	E	E	I	G	G	I	I	I	E	E	G	E	E	E
calgon	I	E	E	I	I	I	C	I	X	I	I	I	I	E	E	E
cane juice	I	E	E	I	I	G	G	C	E	I	I	E	I	X	E	I
carbolic acid (see phenol)	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I
carbon bisulfide	G	E	E	E	I	E	C	I	G	I	I	E	I	X	X	E
carbon dioxide (wet)	I	E	E	I	G	C	C	C	C	I	E	I	I	I	I	I
carbon monoxide	I	E	E	I	I	E	I	I	I	I	I	E	G	E	E	E
carbon tetrachloride	G	G	G	E	X	C	C	E	C	X	E	E	X	X	C	E
carbonated water	G	E	E	E	I	E	G	I	X	I	I	E	I	E	E	E
carbon disulfide	I	G	E	I	I	C	C	C	G	C	E	E	X	X	X	E
carbonic acid	G	E	G	E	I	E	G	I	X	I	E	E	G	E	G	E
castor oil	I	E	E	I	I	E	E	I	E	I	I	I	I	I	E	E
chloracetic acid	X	X	X	X	I	C	X	I	X	I	E	X	X	X	X	X
chloric acid	I	X	X	I	I	I	I	I	I	I	E	I	I	I	X	I
chlorinated glue	I	E	E	I	I	X	C	I	X	I	I	C	I	I	C	E
chlorine (dry)	G	E	E	I	X	X	E	G	E	I	E	I	I	I	I	X
chlorine water	X	I	X	I	X	X	X	X	X	I	E	X	I	X	X	E
chlorine, anhydrous liquid	I	X	X	X	I	X	X	I	C	I	E	X	X	X	X	E
chlorobenzene (mono)	E	E	E	I	I	G	G	I	G	C	E	E	X	X	X	E
chloroform	E	E	E	E	X	X	G	I	X	C	E	C	X	X	X	E
chlorosulfonic acid	X	X	I	X	I	X	X	I	I	X	E	X	X	X	X	X
chlorox (bleach)	I	E	E	I	I	C	E	I	X	C	E	X	I	X	C	E
chocolate syrup	I	E	E	I	I	E	I	I	X	I	I	E	I	E	E	E
chromic acid 5%	I	E	E	G	X	C	X	X	X	I	I	X	G	E	X	E
chromic acid 10%	I	G	I	I	X	I	I	X	I	I	E	X	I	E	X	E
chromic acid 30%	I	G	I	I	X	I	I	X	I	I	E	X	I	E	X	E
chromic acid 50%	C	G	G	I	X	C	X	X	X	I	E	X	C	G	X	E
cider	I	E	E	E	I	G	E	I	X	I	I	I	G	I	E	E
citric acid	I	E	E	E	C	C	X	C	X	I	E	C	G	G	X	E
citric oils	I	E	E	I	I	C	G	I	I	I	I	I	I	E	E	E
cod liver oil	I	E	E	I	I	G	I	I	I	I	I	E	I	E	E	E
coffee	E	E	E	E	I	E	G	I	C	I	E	E	I	E	E	E
copper chloride	C	X	X	G	I	X	X	I	X	I	E	X	G	E	E	E
copper cyanide	I	E	E	E	I	X	C	I	X	I	E	E	G	E	G	G
copper floroborate	I	X	X	I	I	X	X	I	X	I	E	I	E	I	G	E
copper nitrate	G	E	E	G	I	X	X	I	I	I	E	X	G	E	E	E
copper sulfate	G	G	I	I	I	I	C	X	I	I	E	C	I	E	G	G
copper sulfate (5% sol)	I	E	E	E	E	X	X	X	X	I	E	X	G	E	E	E
corn oil	I	E	E	E	I	G	G	I	E	I	I	E	I	E	E	E
cotton seed oil	G	E	E	E	E	G	G	I	E	C	E	E	I	E	E	E
cream	I	E	E	I	I	E	C	I	X	I	I	E	I	E	E	E

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# CHEMICAL RESISTANCE CHART

	302SS	304SS	316SS	440SS	Acrytel	Aluminum	Cast Bronze	Brass	Cast iron	Carbon Steel	Teflon	Nylon	Polyethylene	Polypropylene	Buna N Seal*	Viton Seal*
creosote	I	E	E	I	G	E	I	I	I	I	I	I	I	X	E	E
cresols	I	E	E	I	I	G	X	C	I	I	I	I	X	C	X	X
cresylic acid	G	E	E	I	I	C	C	I	I	I	E	X	C	I	X	E
cyanic acid	I	E	I	I	I	I	I	I	I	I	I	I	I	I	C	I
cyclohexane	I	E	I	I	I	E	E	I	I	E	I	I	I	X	E	E
detergents	I	E	E	I	G	E	E	I	I	E	I	E	G	E	E	E
diacetone alcohol	I	E	E	I	I	E	E	C	I	E	I	E	I	X	X	X
dichlorethane	I	E	E	I	I	I	I	I	I	I	E	E	X	I	I	G
diesel fuel	E	E	E	I	I	E	E	I	E	E	I	I	I	X	E	E
diesel fuel (2d, 3d, 4d, 5d)	I	E	E	I	I	E	E	I	I	I	I	E	I	E	E	E
diethylamine	E	E	I	I	I	E	E	I	I	I	E	I	I	C	G	X
diethylene glycol	I	E	I	I	I	I	E	I	I	I	I	E	G	I	E	E
diphenyl oxide	I	E	I	I	I	I	E	I	I	I	I	I	I	I	X	E
dyes	I	E	E	I	I	G	C	I	I	I	I	I	I	I	I	E
epsom salts (magnesium sulfate)	G	E	E	E	I	E	G	I	I	I	I	I	I	E	E	E
ethane	E	E	I	I	I	E	E	I	I	I	I	I	I	I	E	E
ethanol	I	E	E	E	E	G	E	C	E	E	I	E	G	E	E	E
ethanolamine	I	E	E	I	I	I	I	I	I	C	I	I	I	I	G	X
ether	E	E	E	E	I	E	G	E	I	G	I	C	I	I	X	C
ethyl acetate	I	E	E	I	X	G	G	I	I	C	E	E	C	C	X	X
ethyl chloride	I	E	E	E	I	G	G	I	C	X	E	E	X	X	X	E
ethyl sulfate	I	X	I	I	I	I	I	I	I	I	I	I	I	I	E	E
ethylene chloride	I	E	E	I	I	C	E	I	C	C	E	I	I	X	X	E
ethylene dichloride	I	E	E	I	I	X	C	I	I	C	E	E	X	E	X	E
ethylene glycol	I	E	E	I	E	E	G	G	G	C	E	E	G	E	E	E
ethylene oxide	I	I	E	I	I	E	E	I	I	I	E	E	I	I	X	X
fatty acids	I	E	E	I	I	G	C	I	X	I	E	E	G	E	C	E
ferric acid	I	X	X	X	I	X	X	X	X	I	E	X	G	E	X	E
ferric nitrate	I	E	E	E	I	X	X	I	I	E	X	G	E	E	E	E
ferric sulfate	I	E	C	E	I	X	X	X	X	I	E	E	I	E	G	E
ferrous chloride	I	X	X	I	X	X	C	I	X	I	E	X	G	E	G	E
ferrous sulfate	G	E	C	I	G	X	C	I	X	X	E	X	G	E	G	E
fluoboric acid	I	X	G	I	I	I	I	I	X	I	E	C	G	E	G	E
fluorine	X	X	X	I	I	X	X	I	X	X	C	X	C	I	I	I
fluosilicic acid	I	I	G	I	I	X	I	I	X	I	E	X	G	E	E	G
formaldehyde	E	E	E	I	I	E	E	G	X	E	E	E	G	E	C	X
formaldehyde 40%	I	I	E	I	X	I	I	I	I	E	X	I	E	G	X	X
formic acid	C	E	G	G	X	X	C	C	X	X	E	X	G	E	X	G
freon 11	E	I	E	I	I	G	G	I	C	G	E	E	C	I	C	G
freon 113	I	I	E	I	I	G	G	I	I	I	I	E	I	I	E	C
freon 12 (wet)	I	I	X	I	I	G	G	I	I	I	E	E	C	E	E	E
freon 22	I	I	E	I	I	G	G	I	I	I	I	E	I	I	X	X
freon t.f.	I	I	E	I	I	G	G	I	I	I	I	E	I	X	E	G
fruit juice	E	E	E	E	I	G	G	I	X	X	X	E	G	E	E	E
fuel (1,2,3,5a, 5b, 6)	I	E	E	I	I	E	E	I	I	I	E	I	I	G	G	E
fuel oils	E	E	E	I	I	E	G	I	C	G	E	E	X	G	E	E
furan resin	I	E	E	I	I	E	E	I	E	E	E	I	I	I	X	E
furfural	E	E	E	I	I	E	E	I	I	E	E	E	X	X	X	X
gallic acid	G	E	E	E	I	E	E	I	X	X	E	E	I	I	E	G
gasoline	E	E	E	E	I	E	E	I	E	E	E	E	X	C	E	E
gelatin	E	E	E	E	I	E	E	C	X	X	E	E	I	E	E	E
glucose	E	I	E	I	E	E	E	E	G	G	E	E	G	E	E	E
glue p.v.a.	G	G	E	I	I	G	E	I	I	E	E	E	I	I	E	E
glycerine	E	E	E	E	I	E	E	G	G	G	E	E	I	E	E	E
glycolic acid	I	I	I	I	I	I	I	I	I	I	I	I	G	E	E	E
gold monocyaniide	I	I	E	I	I	I	E	I	X	I	I	I	I	I	E	E
grape juice	I	E	E	I	I	G	G	I	X	I	I	I	G	I	E	E
grease	E	E	E	I	I	E	G	I	E	E	E	E	I	I	E	E
heptane	E	I	E	I	I	E	E	I	I	G	E	E	X	X	E	E
hexane	E	E	E	I	I	E	G	I	I	G	E	E	I	C	E	E
hexyl alcohol	I	E	E	I	I	E	E	C	I	E	I	E	I	E	E	E
honey	I	E	E	I	I	E	E	I	E	I	I	E	I	E	E	E
hydraulic oils (petroleum)	E	E	E	I	I	E	G	I	E	E	E	E	I	X	E	E
hydraulic oils (synthetic)	I	E	E	I	I	E	E	I	E	I	I	E	I	X	C	E
hydrazine	I	E	E	I	I	I	I	I	C	I	I	I	I	I	G	E
hydrobromic acid	X	X	X	X	X	X	X	I	X	X	E	X	G	G	X	E

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# CHEMICAL RESISTANCE CHART

	302SS	304SS	316SS	440SS	Acetyl	Aluminum	Cast Bronze	Brass	Cast iron	Carbon Steel	Teflon	Nylon	Polyethylene	Polypropylene	Buna N Seal *	Viton Seal *
hydrobromic acid 20%	I	I	X	I	I	I	I	I	I	I	E	X	I	E	X	E
hydrochloric acid (dry gas)	X	C	E	I	I	X	I	I	I	X	E	I	I	I	I	I
hydrochloric acid 100%	I	X	X	I	I	X	X	I	X	I	E	X	E	I	X	C
hydrochloric acid 20%	I	X	X	X	X	X	X	I	X	I	E	X	E	E	C	E
hydrochloric acid 37%	I	X	X	X	X	X	X	I	X	I	E	X	E	E	C	E
hydrocyanic acid	E	E	E	C	I	E	X	X	I	C	E	E	G	E	C	E
hydrocyanic acid (gas 10%)	I	X	X	I	I	I	I	I	I	I	E	I	I	I	I	I
hydrofluoric acid 100%	X	X	X	I	X	X	X	I	X	X	E	I	X	I	X	I
hydrofluoric acid 20%	I	X	X	X	X	X	X	I	X	I	E	X	C	E	X	E
hydrofluoric acid 75%	I	C	X	I	X	X	X	I	X	I	E	X	C	G	X	E
hydrofluosilicic acid	I	X	X	I	I	C	X	I	I	I	E	I	I	I	I	I
hydrofluosilicic acid 20%	I	X	X	I	I	X	E	I	X	I	E	X	I	E	G	E
hydrogen gas	E	E	E	I	X	E	E	I	G	G	E	I	I	I	I	E
hydrogen peroxide	I	E	G	E	I	E	X	X	X	X	E	X	G	E	X	E
hydrogen peroxide 10%	I	C	C	I	I	E	X	X	X	I	E	X	E	I	E	I
hydrogen peroxide 30%	I	I	G	I	I	I	I	X	I	I	E	X	I	E	X	E
hydrogen sulfide (dry)	E	C	E	I	X	X	X	C	G	G	E	X	I	I	I	X
hydrogen sulfide, aqueous solution	I	X	E	C	X	C	X	C	X	I	E	X	G	E	C	X
hydroxyacetic acid (70%)	I	I	I	I	I	X	I	I	I	I	I	I	I	I	E	E
indium sulfamate plating r.t.	I	I	C	I	I	I	I	I	I	I	E	X	I	E	E	E
ink	E	E	E	I	I	C	C	I	X	X	I	E	G	I	E	E
iodine	I	X	X	X	X	X	X	I	X	I	E	X	X	X	G	E
iodine (in alcohol)	I	I	G	I	I	I	I	I	I	I	E	X	I	G	X	E
iodoform	G	C	E	I	I	E	C	I	C	G	E	E	I	I	I	E
isobutyl alcohol	I	E	E	I	I	G	E	C	I	E	I	E	I	E	C	E
isopropyl acetate	I	I	G	I	I	C	I	I	I	I	I	I	I	I	X	X
isopropyl alcohol	I	E	E	I	G	G	E	C	C	E	I	E	I	E	C	E
isopropyl ether	E	I	E	I	I	E	E	I	I	E	E	I	I	X	G	X
isotane	I	I	I	I	I	E	I	I	I	I	I	I	I	X	E	E
jet fuel (jp#, jp4, jp5)	E	E	E	I	I	E	E	I	E	E	E	E	I	X	E	E
kerosene	E	E	E	E	E	E	E	E	E	G	E	E	X	X	E	E
ketones	E	E	E	I	I	G	E	I	E	E	E	E	X	X	X	X
lacquer thinners	I	I	E	I	I	I	I	C	I	I	E	E	I	G	X	I
lacquers	E	E	E	I	I	E	E	C	C	C	I	E	I	E	X	X
lactic acid	E	E	G	C	C	C	X	I	X	X	E	C	G	E	G	G
lard	G	E	E	E	I	E	E	I	E	C	I	E	I	E	E	E
latex	I	E	E	I	I	E	E	I	I	I	I	E	G	I	E	E
lead acetate	G	E	E	I	G	X	C	I	I	X	E	E	G	E	G	X
lead sulfamate	I	I	I	I	I	I	I	I	I	I	I	I	I	E	G	E
lime	I	E	E	I	I	C	E	I	E	I	I	I	I	I	E	E
linseed oil	I	E	E	E	E	E	E	I	E	I	I	E	I	E	E	E
lubricants	I	E	E	I	I	E	G	I	I	I	E	E	I	E	E	E
magnesium carbonate	I	E	E	E	I	I	I	I	I	I	I	I	G	E	E	I
magnesium chloride	G	G	G	E	G	X	G	C	X	C	E	E	G	E	E	E
magnesium hydroxide	E	E	E	I	G	X	C	G	G	G	E	E	G	E	G	E
magnesium nitrate	I	E	E	E	I	I	I	I	I	I	E	E	G	E	E	E
magnesium oxide	I	E	E	I	I	I	I	I	I	I	I	I	I	I	E	I
magnesium sulfate	G	G	E	I	I	G	G	G	C	G	E	E	G	E	E	E
maleic acid	C	E	E	E	I	G	C	I	I	G	E	E	I	C	X	E
maleic anhydride	I	I	I	I	I	I	I	I	I	I	I	I	I	I	X	E
malic acid	G	E	E	I	X	C	X	I	I	X	E	E	I	I	I	G
melamine	I	X	X	I	I	I	X	I	I	I	I	I	I	I	C	I
mercuric cyanide	E	E	E	I	I	X	X	I	I	X	E	I	G	E	E	I
mercuric chloride (dilute solution)	X	X	X	X	X	X	X	X	X	X	E	E	G	E	E	E
mercury	E	E	E	E	G	C	X	X	E	E	E	E	G	E	E	E
methanol	I	E	E	E	X	G	E	C	E	E	E	E	G	E	G	C
methyl acetate	E	I	E	I	I	E	E	I	I	G	E	I	I	I	X	X
methyl acetone	E	I	E	I	I	E	E	I	E	E	E	I	I	I	X	X
methyl acrylate	I	I	I	I	I	I	I	I	I	I	I	I	I	I	X	X
methyl alcohol 10%	E	I	E	I	I	C	C	I	I	G	E	E	I	I	G	I
methyl bromide	I	I	I	I	I	I	I	I	I	I	I	I	X	I	G	E
methyl butyl ketone	I	I	E	I	I	E	I	I	I	I	I	I	I	I	X	X
methyl cellosolve	I	I	I	I	I	E	E	I	I	I	I	I	I	E	X	X
methyl chloride	I	E	E	I	X	X	E	I	I	I	E	E	X	X	X	E
methyl dichloride	I	I	I	I	I	I	I	I	I	I	I	I	I	I	X	E
methyl ethyl ketone	I	E	E	I	I	E	E	I	I	I	E	E	X	E	X	X

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# CHEMICAL RESISTANCE CHART

	302SS	304SS	316SS	440SS	Acetyl	Aluminum	Cast Bronze	Brass	Cast iron	Carbon Steel	Teflon	Nylon	Polyethylene	Polypropylene	Buna N Seal *	Viton Seal *
methyl isobutyl ketone	I	I	E	I	I	I	I	I	I	I	E	E	I	C	X	X
methyl isopropyl ketone	I	I	E	I	I	I	I	I	I	I	I	E	I	I	X	X
methyl methacrylate	I	I	I	I	I	I	I	I	I	I	I	I	I	I	X	X
methylamine	E	I	E	I	I	E	X	I	G	G	I	I	I	I	G	I
methylene chloride	E	E	E	I	I	E	E	C	I	G	E	X	X	X	X	X
milk	E	E	E	E	G	E	C	C	X	X	I	E	G	E	E	E
mineral oil	E	E	E	E	I	E	E	I	E	G	I	E	I	G	E	E
molasses	E	E	E	E	I	E	E	G	E	E	I	E	G	E	E	E
naptha	E	E	E	E	I	E	G	I	G	G	E	E	X	E	G	E
naphthalene	G	E	G	I	I	G	C	I	G	E	E	I	X	G	X	G
nickel chloride	I	E	G	I	I	X	X	I	X	I	E	E	G	E	E	E
nickel sulfate	G	E	G	I	I	X	C	C	X	X	E	E	G	E	E	E
nitric acid (10% solution)	E	E	E	E	X	X	X	I	X	X	E	X	G	E	X	E
nitric acid (20% solution)	I	E	E	E	X	X	X	I	X	I	E	X	G	E	X	E
nitric acid (50% solution)	I	E	E	E	X	X	X	I	X	I	E	X	C	X	X	E
nitric acid (concentrated solution)	I	X	G	E	X	G	X	X	X	I	E	X	X	X	X	G
nitrobenzene	G	E	G	I	X	C	X	I	G	G	E	C	X	C	X	X
octyl alcohol	I	E	E	I	I	E	E	C	I	E	I	E	I	I	G	E
oleic acid	G	E	E	G	G	G	G	C	C	C	E	E	X	C	G	X
oleum	G	I	E	I	I	G	C	C	I	G	E	I	I	X	C	E
oleum 25%	I	I	I	I	I	I	I	I	I	I	E	I	I	I	X	E
olive oil	E	E	E	I	G	E	G	I	E	G	E	E	I	E	E	E
oxalic acid (cold)	C	E	G	E	G	C	G	C	X	X	E	X	E	E	G	E
paraffin	E	E	E	E	I	E	E	I	G	G	E	E	I	E	E	E
peanut oil	I	E	E	I	I	E	E	I	E	I	I	I	I	X	E	E
pentane	E	C	C	I	I	E	E	I	G	G	E	E	I	I	E	E
perchloroethylene	G	E	E	I	I	E	C	I	G	G	E	I	I	X	C	E
petrolatum	E	I	E	I	I	G	G	I	C	C	E	E	I	I	E	E
phenol (carbolic acid)	G	E	E	E	I	G	G	X	X	X	E	X	X	G	X	E
phenol 10%	G	E	E	I	X	E	C	I	G	X	E	X	I	I	X	G
phosphoric acid (crude)	I	X	C	C	X	X	X	X	X	X	E	X	C	I	X	E
phosphoric acid (to 40% solution)	I	G	E	E	X	X	X	X	X	I	E	X	G	E	X	E
phosphoric anhydride (dry or moist)	I	E	E	I	I	I	I	X	I	I	E	I	I	I	X	X
photographic (developer)	I	C	E	C	I	C	I	I	X	I	I	I	G	E	E	E
phosphoric acid (40-100% solution)	I	C	G	G	I	X	X	X	X	I	E	X	C	E	X	E
phosphoric anhydride (molten)	I	E	E	I	I	X	X	X	I	I	E	E	X	I	C	X
phthalic anhydride	G	E	G	I	I	G	G	I	C	C	E	E	I	I	C	E
picric acid	G	E	E	I	I	C	X	X	X	X	E	E	E	I	E	E
pine oil	E	E	E	I	I	E	X	I	C	G	E	I	I	I	E	E
<b>plating solutions:</b>																
- antimony plating 130°f	I	I	E	I	I	I	I	I	I	I	E	X	I	E	E	E
- arsenic plating 110°f	I	I	E	I	I	I	I	I	I	I	E	E	I	E	E	E
- brass bath 100°f	I	I	E	I	I	I	I	I	I	I	E	E	I	E	E	E
- bronze	I	I	E	I	I	I	I	I	I	I	E	E	I	E	E	E
- cadmium cyanide bath 90°f	I	I	E	I	I	I	I	I	I	I	E	E	I	E	E	E
- cadmium fluoborate bath 100°f	I	I	E	I	I	I	I	I	I	I	E	X	I	E	G	E
- chromium barrel chrome bath 95°f	I	I	X	I	I	I	I	I	I	I	E	X	I	E	X	C
- chromium black chrome bath 115°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	X	C
- chromium chromic-sulfuric bath 130°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	X	C
- chromium fluoride bath 130°f	I	I	X	I	I	I	I	I	I	I	E	X	I	E	X	C
- chromium fluosilicate bath 95°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	X	C
- copper (electroless) 140°f	I	I	I	I	I	I	X	I	I	I	E	E	I	E	X	E
- copper acid fluoborate bath 120°f	I	I	X	I	I	I	I	I	I	I	E	X	I	E	G	E
- copper acid sulfate bath r.t.	I	I	X	I	I	I	I	I	I	I	E	X	I	E	E	E
- copper cyanide rochelle salt bath 150°f	I	I	E	I	I	I	I	I	I	I	E	E	I	E	E	E
- copper cyanide high speed bath 180°f	I	I	E	I	I	I	I	I	I	I	E	E	I	E	E	E
- copper pyrophosphate 140°f	I	I	E	I	I	I	I	I	I	I	E	E	I	E	E	E
- gold acid 75°f	I	I	C	I	I	I	I	I	I	I	E	E	I	E	E	E
- gold cyanide 150°f	I	I	E	I	I	I	C	I	I	I	E	E	I	E	E	E
- gold neutral 75°f	I	I	C	I	I	I	I	I	I	I	E	E	I	E	E	E
- iron ferrous am. sulfate bath 150°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	E	E
- iron ferrous chloride bath 190°f	I	I	X	I	I	I	I	I	I	I	E	X	I	C	G	E
- iron ferrous sulfate bath 150°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	E	E
- iron fluoborate bath 145°f	I	I	X	I	I	I	I	I	I	I	E	X	I	E	G	E
- iron sulfamate 140°f	I	I	X	I	I	I	I	I	I	I	E	X	I	E	E	E
- iron sulfate-chloride bath 160°f	I	I	X	I	I	I	I	I	I	I	E	X	I	E	G	E

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# CHEMICAL RESISTANCE CHART

	302SS	304SS	316SS	440SS	Acetyl	Aluminum	Cast Bronze	Brass	Cast iron	Carbon Steel	Teflon	Nylon	Polyethylene	Polypropylene	Buna N Seal *	Viton Seal *
- lead fluoborate	I	I	C	I	I	I	I	I	I	I	E	X	I	E	G	E
- nickel electroless 200°f	I	I	I	I	I	I	I	I	I	I	E	X	I	X	X	E
plating solutions:																
- nickel fluoborate 100-170°f	I	I	C	I	I	I	X	I	I	I	E	X	I	E	G	E
- nickel high chloride 130-160°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	E	E
- nickel sulfamate 100-140°f	I	I	C	I	I	I	I	I	I	I	E	E	I	E	E	E
- nickel watts type 115-160°f	I	I	C	I	I	I	I	I	I	I	E	E	I	E	E	E
- rhodium plating 120°f	I	I	X	I	I	I	I	I	I	I	E	X	I	E	E	E
- silver plating 80-120°f	I	I	E	I	I	I	I	I	I	I	E	E	I	E	E	E
- tine-lead plating 100°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	G	E
- tin-fluoborate plating 100°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	G	E
- zinc acid chloride 140°f	I	I	X	I	I	I	I	I	I	I	E	X	I	E	E	E
- zinc acid fluoborate bath r.t.	I	I	I	C	I	I	I	I	I	I	E	X	I	E	G	E
- zinc acid sulfate bath 150°f	I	I	C	I	I	I	I	I	I	I	E	X	I	E	E	E
- zinc alkaline cyanide bath r.t.	I	I	I	E	I	I	I	I	I	I	E	E	I	E	E	E
potash	I	E	I	E	I	C	C	I	G	I	I	E	G	E	E	E
potassium bicarbonate	I	E	I	G	I	C	G	I	X	I	E	E	G	E	E	E
potassium bromide	E	E	I	G	I	C	C	I	X	X	E	C	G	E	E	E
potassium carbonate	G	E	I	E	I	C	C	I	G	G	E	E	G	E	G	E
potassium chlorate	G	E	E	E	I	G	G	I	G	G	E	X	G	E	E	E
potassium chloride	C	E	E	G	I	G	C	C	G	G	E	G	G	E	E	E
potassium chromate	I	I	G	G	I	E	E	I	E	I	I	I	G	I	E	E
potassium cyanide solutions	G	E	G	E	I	X	X	I	G	G	E	E	G	E	E	G
potassium dichromate	G	E	E	E	I	E	C	I	G	C	E	X	G	E	E	G
potassium ferrocyanide	G	E	I	E	I	C	E	I	I	C	E	E	E	I	X	I
potassium hydroxide (50%)	E	G	G	G	I	X	X	X	C	E	E	E	G	E	G	X
potassium nitrate	G	E	G	E	I	G	G	I	I	G	E	C	G	E	E	G
potassium permanganate	G	E	G	G	I	G	G	I	G	G	E	X	G	G	E	G
potassium sulfate	G	E	G	G	I	E	G	G	G	G	E	C	G	E	E	E
potassium sulfide	E	E	I	E	I	G	G	I	G	G	E	I	I	I	E	I
propane (liquified)	E	E	I	E	X	E	E	E	I	G	E	E	I	X	E	E
propyl alcohol	I	E	E	I	I	E	E	I	I	E	E	E	I	E	E	E
propylene glycol	G	G	I	E	I	E	G	I	G	G	E	G	G	I	E	E
pyridine	I	C	I	G	X	G	I	I	G	E	E	I	C	G	X	X
pyrogalllic acid	G	E	E	E	I	G	G	I	G	G	E	E	I	I	E	E
rape seed oil	I	E	E	I	I	I	E	I	I	I	I	I	I	I	G	E
rosins	E	E	E	E	I	E	E	C	I	C	E	E	I	E	E	I
sea water	E	E	C	E	E	C	C	I	I	X	E	E	G	E	E	E
shellac (bleached)	E	E	I	E	I	E	E	G	G	E	E	E	I	E	E	I
shellac (orange)	E	E	I	E	I	E	E	C	C	E	E	E	I	E	E	I
silicone	I	G	I	E	I	G	E	I	I	I	I	E	I	E	E	E
silicone oil	I	E	E	I	I	I	E	I	E	I	I	E	I	E	E	E
silver bromide	I	C	C	G	I	X	I	I	I	I	I	I	I	I	I	I
silver nitrate	G	E	G	E	G	X	X	I	X	X	E	E	G	E	C	E
soap solutions	E	E	C	E	E	G	E	I	G	G	E	E	E	E	I	G
sodium acetate	G	E	E	G	I	G	G	I	C	C	E	E	G	E	X	X
sodium aluminat	G	I	I	E	I	C	G	I	I	C	E	E	I	I	E	E
sodium bicarbonate	G	E	E	E	I	E	G	E	C	C	E	E	G	E	E	E
sodium bisulfate	E	E	I	E	X	X	C	C	X	X	E	C	G	E	E	G
sodium bisulfite	I	I	I	I	X	X	X	G	X	X	E	E	G	E	E	E
sodium borate	G	E	I	E	E	C	E	I	C	C	E	E	E	I	I	E
sodium carbonate (soda ash)	G	E	G	G	I	C	G	G	G	G	E	E	G	E	E	E
sodium chlorate	G	E	I	E	I	G	G	I	I	C	E	E	G	E	X	E
sodium chloride	G	E	C	G	E	C	G	C	G	C	E	E	G	E	E	E
sodium chromate	E	E	E	I	I	X	G	I	G	G	E	E	I	E	E	G
sodium cyanide	G	E	I	E	C	X	X	X	G	G	E	C	G	E	E	E
sodium fluoride	G	C	I	C	I	C	C	I	X	X	E	E	C	I	X	G
sodium hydrosulfite	I	I	I	I	I	E	C	I	I	I	E	E	I	I	I	E
sodium hydroxide (20%)	I	E	E	E	C	X	C	X	E	I	E	C	G	E	E	E
sodium hydroxide (50% solution)	I	E	G	I	C	X	C	X	G	I	E	C	C	E	X	E
sodium hydroxide (80% solution)	I	E	X	I	C	X	C	X	C	I	E	C	C	E	X	G
sodium hypochlorite	X	I	E	I	I	X	X	I	X	X	E	E	I	E	G	G
sodium hypochlorite (to 20%)	I	C	C	C	I	C	X	X	X	I	E	E	G	X	C	E
sodium hyposulfate	I	E	E	I	I	X	X	I	I	I	E	I	I	I	I	I
sodium metaphosphate	E	I	E	I	I	E	C	C	G	G	E	E	I	X	E	E
sodium metasilicate	E	I	E	I	I	G	G	I	C	C	E	I	I	I	E	E

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# CHEMICAL RESISTANCE CHART

	302SS	304SS	316SS	440SS	Acryel	Aluminum	Cast Bronze	Brass	Cast iron	Carbon Steel	Teflon	Nylon	Polyethylene	Polypropylene	Buna N Seal *	Viton Seal *
sodium nitrate	G	E	E	E	I	E	G	C	E	G	E	E	G	E	C	X
sodium perborate	G	I	C	I	I	G	C	C	G	G	E	E	I	E	G	E
sodium peroxide	G	E	E	I	I	C	C	C	X	C	E	X	I	I	C	E
sodium polyphosphate (mono, di, tribasic)	I	E	E	I	I	X	C	I	I	I	E	I	I	I	E	E
sodium silicate	G	E	G	E	I	C	C	C	I	G	E	E	I	E	E	E
sodium sulfate	G	E	E	C	I	G	G	G	E	G	E	E	G	E	E	E
sodium sulfide	G	E	G	I	I	X	X	X	E	G	E	E	G	E	C	E
sodium sulfide	I	C	C	I	I	C	C	I	E	I	E	X	E	I	E	E
sodium tetraborate	I	I	E	I	I	I	I	I	I	I	I	I	I	I	E	E
sodium thiosulphate (hypo)	E	E	E	I	I	G	X	X	C	G	E	E	I	E	G	E
sorghum	I	E	E	I	I	I	I	I	E	I	I	E	I	I	E	E
soy sauce	I	E	E	I	I	E	E	I	X	I	I	E	I	I	E	E
soybean oil	I	E	E	I	I	E	G	I	E	I	I	E	I	E	E	E
stannic chloride	X	X	X	I	I	X	X	I	X	X	E	E	G	E	E	E
stannic fluoborate	I	I	E	I	I	I	I	I	X	I	I	I	I	I	E	E
stannous chloride	X	X	C	I	I	X	X	I	X	X	E	X	E	I	C	G
starch	G	E	E	I	I	E	G	I	C	C	E	E	G	I	E	E
stearic acid	G	E	E	E	G	G	C	C	C	E	E	E	G	X	G	E
stoddard solvent	E	E	E	E	I	E	E	E	G	G	E	E	X	X	G	E
styrene	E	E	E	I	I	E	E	I	I	E	E	I	I	I	X	G
sugar (liquids)	E	E	E	E	I	E	E	I	G	G	E	E	I	E	E	E
sulfate liquors	I	C	C	I	I	G	C	I	I	I	I	I	I	E	I	I
sulfur chloride	I	X	X	X	X	X	C	X	I	I	E	E	E	X	X	E
sulfur dioxide	I	E	E	C	X	E	G	I	I	I	E	X	C	X	X	X
sulfur dioxide (dry)	E	E	E	I	I	E	E	C	E	G	E	E	X	I	I	X
sulfur trioxide (dry)	E	E	E	C	I	E	G	I	G	G	E	X	I	I	X	E
sulfuric acid (to 10%)	I	X	C	C	I	C	X	X	X	I	E	X	G	E	C	E
sulfuric acid 10%-75%	I	X	X	X	I	X	X	X	X	I	E	X	C	E	X	E
sulfuric acid 75%-100%	I	I	X	I	X	I	I	X	I	I	E	X	I	G	X	E
sulfurous acid	C	C	G	C	X	C	X	I	X	X	E	X	G	E	C	E
sulfuryl chloride	I	I	I	I	I	I	I	I	I	I	E	I	I	I	I	I
syrup	I	E	E	E	I	E	X	I	I	I	I	E	I	E	E	E
tallow	I	E	E	I	I	E	I	I	I	I	I	E	C	I	E	E
tannic acid	G	E	E	E	G	C	G	I	C	C	E	X	G	E	X	E
tanning liquors	I	E	E	I	I	C	E	I	I	I	E	I	I	E	C	E
tartaric acid	G	E	G	G	X	C	E	C	X	X	E	E	G	E	X	E
tetrachlorethane	I	I	E	I	I	I	I	I	I	I	E	E	I	E	X	E
tetrahydrofuran	I	E	E	I	I	X	X	I	X	E	E	E	X	C	X	X
toluene, toluol	E	E	E	I	X	E	E	E	E	E	E	E	X	X	X	C
tomato juice	E	E	E	I	I	E	C	I	C	C	E	E	I	E	E	E
trichlorethane	I	C	E	I	X	C	C	I	C	I	E	I	I	I	X	E
trichlorethylene	G	E	E	I	I	G	G	E	C	G	E	C	X	X	X	E
trichloropropane	I	I	E	I	I	I	E	I	I	I	I	I	I	I	E	E
tricresylphosphate	I	I	E	I	I	I	E	I	I	I	E	I	I	I	X	G
triethylamine	I	I	I	I	I	I	E	I	I	I	I	I	I	I	E	E
turbine oil	I	E	E	I	I	E	E	I	E	I	I	I	I	I	E	E
turpentine	G	E	E	I	G	C	G	C	G	G	E	E	X	G	X	E
varnish	E	E	E	E	G	E	E	G	I	C	E	E	I	E	G	E
vegetable juice	I	E	E	I	I	E	C	I	X	I	I	E	I	I	E	E
vinegar	E	E	E	E	G	X	G	G	C	X	E	E	G	C	E	E
water, acid, mine	I	E	E	I	I	C	C	X	C	I	I	E	I	E	E	E
water, distilled, lab grade 7	I	E	E	I	I	G	E	I	X	I	E	E	I	E	E	E
water, fresh	E	E	E	I	I	E	E	C	G	I	E	E	X	E	E	E
water, salt	I	E	E	I	I	G	G	C	X	I	I	E	I	E	E	E
weed killers	I	E	E	I	I	C	C	I	I	I	I	E	I	I	G	E
whey	I	E	E	I	I	G	I	I	I	I	I	I	I	I	E	E
whiskey & wines	E	E	E	E	I	X	G	G	X	X	E	E	G	E	E	E
white liquor (pulp mill)	I	E	E	I	I	I	X	I	C	I	E	E	I	E	E	E
white water (paper mill)	I	E	E	I	I	I	E	I	I	I	I	E	I	E	I	E
xylene	E	E	E	I	X	E	E	E	E	G	E	E	X	X	X	E
zinc chloride	X	X	G	G	X	X	X	X	X	X	E	E	G	E	E	E
zinc hydrosulphite	I	I	E	I	I	X	X	I	X	I	I	I	I	I	E	I
zinc sulfate	G	E	E	E	I	X	G	C	C	X	E	E	G	E	E	E

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G32	22	G41R	71	G6363CV	87	G65VS	13	G81NS1	60	MEGR	138
G32B	22,61	G42	71	G6393	87	G65VX	13	G81QMT	60	Model 80	138
G32BAT	59	G4300	82	G6396	86	G65X	13	G81SS	60	OILPAD	141
G32BLS	21	G4316	82	G6396X	86	G65Y	13	G81SS	14	P..B	135
G32BNST	61	G4316G	82	G63T16X	86	G6603	87	G81WCT	60	P-1	103
G32NK	64	G4330	82	G63T33	87	G6616	86	G81V	14	P-1000	103
G33	20	G4331	82	G63T63X	86	G6621	87	G82	14	P-38	103
G33A	15,20	G4331G	82	G64C	5	G66LB	6	G82BAT	60	PC	103
G33B	20	G4332	82	G64E	5	G66LC	6	G82CSA	60	PGC	104
G33C	21	G4333	82	G64SSC	11	G66LD	6	G82NS1	60	PG	132
G33G	20	G4334	82	G64SSE	11	G66LDC	6	G82QMT	60	PGB	132
G33N	20,92	G43L	71	G65A	3,4	G67	16	G82WCT	60	PGD	132
G33SS	20,127	G43R	71	G65AA	5	G67P	16	G83	14	PGP	133
G33SSC	21	G45F	30	G65AFL	6	G67PB	16	G84	56	PGSS	133
G33V	20	G45M	30	G65B	3,4	G68	16	G84A	56	PL	136
G33VG	21	G46F	30	G65BRA	9	G68A	16	G84C	56	PRV	114
G33VLG	21	G46M	30	G65BRB	9	G68AUL	16	G84E	56	PW	65,66
G33W	21	G47F	30	G65BRC	9	G69	17	G84NK	56	QCPG CROSS-OVER	49
G34	23	G47M	30	G65BRD	9	G6HD	107	G84SZ	56	QKF	136
G34EFV	22	G48	30	G65BRDC	9	G6N	107	G84U	56	R..R	135
G34F	23	G5	97	G65BRDP	9	G6T	108	G85	57	RG-1002-BK	139
G34FV	22	G53	128	G65BRE	9	G7	96	G85B	57	S-150	67
G34FVB	22	G53C	128	G65BRF	9	G7000	84	G86	57	SB	105
G34FVL	22	G53CB	128	G65C	3,4	G7001	84	G86N	57	SC	105
G34FVS	22	G53CSN	128	G65CA	5	G7008	84	G87	57	TG	133
G34L	23	G53G	128	G65CA90	5	G7008P	83	G87N	57	TK-M	138
G34P	23	G53GS	128	G65CV	6	G7016	84	G87S	57	TPG	140
G34SQ	23	G53L	128	G65D	3,4	G7016P	83	G87WT	57	TSG	140
G35FC	24	G53S	128	G65DC	4	G7046	84	G88	57	UCS	140
G35FFL	25	G54	129	G65DCL	6	G7046P	83	G88C	57	V10	68,112
G35FFLA	25	G54G	129	G65DD	5	G7070	84	G88R	58	V12	112
G35FH	24	G54GT	129	G65DFL	6	G7070P	83	G89	100	V14	113
G35FHA	25	G54N	129	G65DP	4	G7070PBH	83	G8L	98	V16	113,114
G35FP	25	G59	129	G65E	3,4	G7090	85	G8M	96	V18	112
G35G	24	G5A	99	G65F	3,4	G7090P	83	G9	141	V201	109
G35GA	25	G5AB	99	G65LC	6	G7096	84	G91JM	61	V201PVC	114
G35L	24	G5AM	99	G65LD	6	G7096P	83	G91MC	61	V202	109
G35LA	25	G5A-RACK	97	G65LDC	6	G7096PX	83	G92	101	V202L	109
G35MC	24	G5M	98	G65LY	13	G7098	84	G92JM	61	V202LB	109
G35MF	25	G6	107	G65NA	7	G7098P	83	G92MC	61	V203	110
G35MFL	25	G6T	108	G65NB	7	G70T00	85	G92-RACK	97	V205	110
G35MFLA	25	G6000	80	G65NC	7	G70T00P	83	G94	101	V207	110
G35MH	24	G6001	80	G65ND	7	G70T06	85	G95	57	V215L	114
G35MHA	25	G6008	80	G65NDC	7	G70T06PX	83	G95NK	61	V215P	114
G35MP	25	G6008P	89	G65NDP	7	G70T60	85	G95SZ	61	V302	109
G35SC	24	G6016	80	G65NE	7	G70T60PX	83	G97	56	V302W	109
G36BFH	68	G6016N	93	G65NF	7	G7103	84	G97B	56	V303	110
G36BLF	68	G6016P	89	G65PA	8	G72	130	G97B-GHT	56,67	V305	110
G36BLM	68	G6046	81	G65PB	8	G72B	130	G97G	56	V306	110
G36BM	68	G6060	80	G65PC	8	G72M	130	G97-GHT	56,67	V307	110
G36NF	92	G6060P	89	G65PD	8	G73H	131	G97JM	62	V308	110
G36NM	92	G6090	80	G65PDC	8	G73NPT	131	G97MC	62	V401	111
G36RG	68	G6090P	89	G65PDP	8	G73V	131	G97NK	62	V402	111
G36SG	68	G6096	81	G65PE	8	G75	130	G97SZ	62	V412	111
G36VG	68	G6096N	93	G65PF	8	G75B	130	G98JM	64	V432	111
G37	56	G6096P	89	G65R	13	G77	130	G98JMA	62	V601	111
G37-GHT	56,67	G6098	81	G65SBDC	12	G77B	130	G98JMC	63	V605	111
G37AB-GHT	67	G60T00	81	G65SBDP	12	G78	130	G98MC	64	V610	112
G37JM	63	G60T00P	90	G65SBY	12	G79	131	G98MCA	62	V611	112
G37MC	63	G60T06	81	G65SC	13	G79G	131	G98NHC	63	V611M	112
G37M-GHT	67	G60T06P	90	G65SL	12	G79M	131	G98NHP	63	V63AW	88
G37NK	63	G60T60	81	G65SSA	10	G7ET	98	G98NK	64	V6406	88
G37NST	63	G60T60P	90	G65SSAA	11	G7ETM	98	G98NKA	62	V6416W	88
G37P	56	G61	15	G65SSB	10	G7M	96	G98NKC	62	V6498W	88
G37SZ	63	G61C	15	G65SSC	10	G7RACK	97	G98NPSHA	63	V64W	88
G37T	62	G61CX	15	G65SSCA	11	G8	96	G98NSTA	62	V803	114
G37TJM	62	G6100	80	G65SSD	10	G80	58	G98SZ	64	V825	114
G37TMC	62	G6100P	90	G65SSDC	10	G80B	58	G98SZA	62	V853	114
G37TNK	62	G6103	80	G65SSDD	11	G80BF	58	G98SZC	63	XP100	140
G37TNST	62	G62	15	G65SSDP	10	G80BM	58	G99	140		
G37TSZ	62	G63	15	G65SSE	10	G80F	58	G99B	140		
G38	94	G63C	15	G65SSF	10	G80M	58	G99TSNIP	140		