

## 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	1 1/16	16	1 1/16	18
1/2	1 1/16	20	3/4	16	3/4	18
5/8	1 3/16	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	1 1/16	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	1 5/16	4	5/8	3/4	6
4	9	1 5/16	8	5/8	3/4	7 1/2
5	10	1 5/16	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

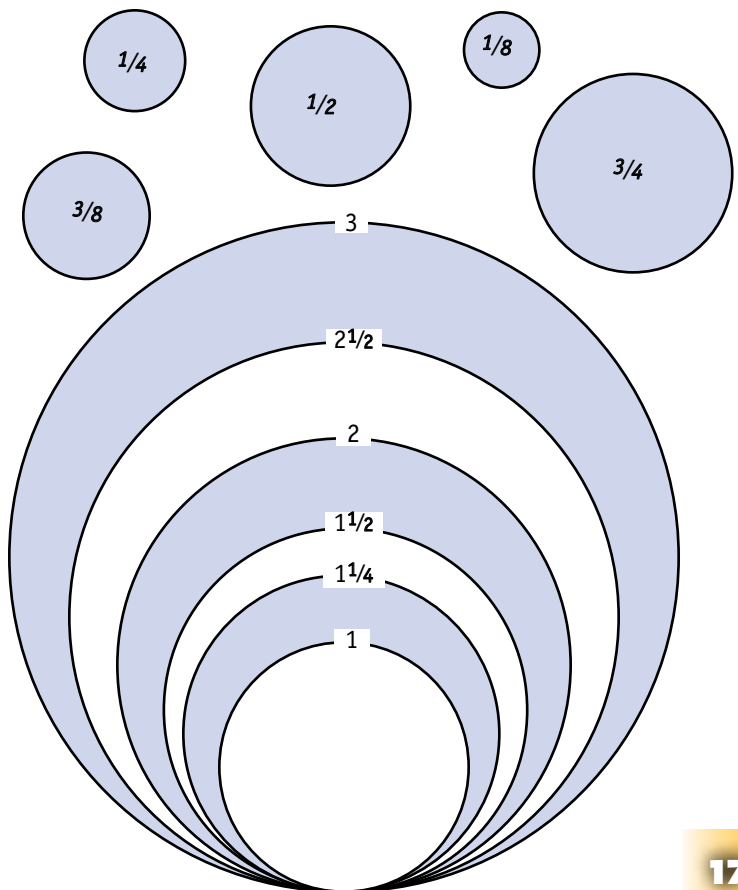
Take a strip of paper about 1 wide and wrap it around the male thread snugly so that it overlaps. Where the two ends overlap, use a pin to pierce the paper so that there is a hole in both ends. Press your thumb against the paper so that the threads leave an impression. Remove the paper and measure the 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	X	I	E	E	E	I	I	I	I	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	Acetyl	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	E	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	E	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	E	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
chlolorox (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	E	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	C	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

\* 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 *
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	I	E	X	G	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	I	E	X	I	E	G	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	I	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	E	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 monocyanide	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

\* 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	40SS	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

\* 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	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
napthalene	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	X	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	X	I	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	C	I	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

\* 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	Acetyl	Aluminum	Cast Bronze	Brass	Cast iron	Carbon Steel	Teflon	Nylon	Polyethylene	Polypropylene	Buna N Seal *	Viton Seal *
- lead fluoroborate	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 fluoroborate 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	I	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 aluminate	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

\* 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	Acetyl	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 fluoride	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	C	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	C	I	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

\* 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.

# NUMERICAL INDEX

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
100	136	800PM	36	C509	43	G0008SS	125	G08T88SS	125	G16T66B	74
101	136	800SF	36	C509H	43	G0008XH	124	G08T88V	122	G16T88B	74
104	136	800SH	36	C6	32	G0012	77	G08X88B	74	G17	29
107	136	800SM	36	C60	34	G0012S	77	G08X88G	119	G1708B	68
108	136	AKF	135	C601	43	G0012SL	77	G08X88M	119	G1716B	68
119	136	AS	140	C602	43	G0014	75	G10L	141	G1717B	68
126	136	B30	34	C61	34	G0014F	75	G10LM	141	G17L	29
127	136	B32	34	C65	34	G0014L	75	G10P	141	G18	29
150	136	B32E	34	C66	34	G0019FG	122	G10PG	141	G18SL	29
151	136	B33	34	C7	32	G0019MG	122	G10PH	141	G18V	29
200	138	B33E	34	C701	44	G0202	78	G10PSS	141	G19DS	27
201	138	B34	34	C701BOP	46	G0208	78	G10PW	141	G19F	27
202	138	B35	34	C701H	44	G0216	78	G11	39,142	G19N	27
208	138	B36	34	C701VEP	44	G0246	78	G11KIT	142	G19S	27
209	138	B37	34	C702	44	G0296	78	G1200	77	G1SS	101
211	138	C..D	134	C702BOP	46	G0298	78	G12PT	141	G2	101
221	138	C-001	104	C702H	44	G02T00	78	G13C	143	G2000	71
235	138	C1	32	C702VEP	44	G02T06	78	G13CHD	143	G2001	71
240	138	C10	32,33	C708H	44	G0400	75	G13KIT	143	G2002	71
528	66	C101	40	C709H	44	G0404	75	G13M	143	G2004	71
711	139	C101BOP	46	C711	45	G0404SW	75	G13NPT	143	G2005	71
902	136	C102	40	C712	45	G0414	75	G13PC	143	G2006	71
908	136	C102BOP	46	C718	45	G0416	75	G13UNF	143	G2008	71
3404	136	C1-03	32	C719	45	G0700B	68	G1400	75	G2012	71
3406	136	C108	40	C791	45	G0707BSW	68	G1408	76	G2014	71
3408	136	C111B	40	C792	45	G0708B	68	G1412	77	G2015	71
50502	66	C112B	40	C8	32	G0708BSW	68	G1414	76	G2016	71
64008	64	C1B	32	C801	45	G0716B	68	G1416	76	G20B	19,69
74008	64	C2	32	C802	45	G0716BS	68	G1446	76	G20B90	69
74016	64	C20	33	C9	32,33	G0716SX	66	G1494	76	G20BT	69
11-208	138	C20SS	33	CM2F	37	G07Y77B	67	G1496	76	G20M	19
1608GR	143	C201	41	CM2M	37	G07Y77BV	67	G1498	77	G20N	19,90
1648GR	143	C202	41	CM4F	37	G07Y77PV	67	G14C	143	G20N90	90
1698GR	143	C208	41	CM4M	37	G07Y77PVG	67	G14NPT	143	G20NT	91
2000L	18	C208D	41	CP1	32	G07Y77Z	67	G14T44	77	G20NTM	91
200NT	138	C209	41	CP10	32	G07Y77ZV	67	G14T46	77	G20S	19
200T	138	C20B	33	CP17	33	G0800B	72	G14T64	77	G20SL	19
204-30A	138	C21	33	CP18	33	G0800G	120	G14X44	77	G21B	69
20PF	36	C21B	33	CP1B	32	G0800M	120	G15L	29	G21B45	69
20PH	36	C21SS	33	CP2	32	G0800SS	125	G16	29	G21B90	69
20PM	36	C25	33	CP20	33	G0808A	124	G1600B	72	G21BL	69
20SF	36	C26	33	CP20B	33	G0808B	72,74	G1600EM	139	G21BLM	69
20SH	36	C27	35	CP20SS	33	G0808BBH	72	G1600G	120	G21BRI	69
20SM	36	C28	35	CP21	33	G0808BBHS	72	G1600HB	72	G21BRS	69
2500L	18	C2B	32	CP21B	33	G0808BH	72	G1600M	120	G21C	15
2CMF1	37	C301	40	CP21SS	33	G0808BHL	72	G1600N	92	G21CC	15
30PF	36	C302	40	CP25	33	G0808BV	17	G1600SB	72	G21CCLM	15
30PH	36	C308	40	CP26	33	G0808G	117	G1600SLB	72	G21CRLM	15
30PM	36	C309	40	CP27	35	G0808GU	119	G1600SS	125	G21N	90
30SF	36	C35	35	CP28	35	G0808HLLU	123	G1600VB	139	G21N90	91
30SH	36	C36	35	CP2B	32	G0808M	117	G1601TV	137	G21SAE	70
30SM	36	C37	35	CP35	35	G0808MC	124	G1601TVL	137	G21SS	126
400PF	36	C37B	35	CP36	35	G0808MU	119	G1608B	73	G21TVB	137
400PH	36	C38	35	CP37	35	G0808SS	125	G1608XA	18	G21XS	137
400PM	36	C38B	35	CP38	35	G0808SSU	125	G1608XAU	18	G21Z	15
400SF	36	C400C	42	CP5	32	G0808XH	124	G1608XB	137	G22B	70
400SH	36	C401	42	CP6	32	G0816B	72,74	G1608XS	137	G22BFS	70
400SM	36	C401P	42	CP60	34	G0816BH	72	G1616	114	G22N	91
40PF	36	C402	42	CP61	34	G0816G	118	G1616B	73	G22SAE	70
40PH	36	C402P	42	CP65	34	G0816M	118	G1616BC	73	G22TVB	137
40PM	36	C403	42	CP66	34	G0816N	92	G1616BL	73	G23C	26
40R	136	C403P	42	CP7	32	G0816SS	125	G1616G	115	G23S	26
40SF	36	C404	42	CP8	32	G0819M	120	G1616PC	116	G23SSX	66
40SH	36	C404P	42	CP9	32	G0819RF	122	G1616S80	116	G23T	21
40SM	36	C405	42	CPST	38	G0819V	121	G1616SS	126	G25	27,28
4CMF4	37	C405P	42	CPST-GHTB	37	G0848B	73,74	G1616SW	116	G25B	28
4CMM4	37	C406	42	CPST-WB	37	G0848G	118	G1616V	122	G26	28
500AV	18	C406MR	42	CST	38	G0848M	118	G1619AB	81	G26B	28
525AV	18	C408R	42	CST-GHTB	37	G0848SS	125	G1648B	73,75	G27	27,28
571TFRL	66	C409R	42	CST-KEW	37	G0848V	122	G1648G	118	G27B	28
572TFRL	66	C5	32	CST-WB	37	G0898B	73,74	G1648M	118	G28	27,28
600PF	36	C501	43	CT	141	G0898G	117	G1696B	73	G28C	28
600PH	36	C501BOP	46	CTB	141	G0898M	117	G1698B	74,75	G28L	28
600PM	36	C501H	43	DKF	135	G0898SS	125	G1698G	118	G28P	28
600SF	36	C502	43	EKF	135	G0898V	122	G1698M	118	G28SC	28
600SH	36	C502BOP	46	F..B	134	G08T86B	74	G1698SS	125	G28SP	28
600SM	36	C502H	43	F..D	134	G08T88B	74,75	G1698XA	137	G28Y	28
800PF	36	C508	43	G0008B	72	G08T88G	119	G1698XB	137	G29C	26,94
800PH	36	C508H	43	G0008MC	124	G08T88M	119	G16L	29	G29DS	25

# NUMERICAL INDEX

Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page	Part No.	Page
G29F	25	G3LS	104	G6300MC	87	G65SSLB	12	G80F	57	G99	139
G29M	25	G3S	105	G6304	86	G65SSLC	12	G80M	57	G99B	139
G29N	25	G3SS	105	G6308	86	G65SSLD	12	G80WT	56	G99TSNIP	139
G29R	27	G3SSF	105	G6316	85	G65SSLDC	12	G81	14	GBIN	139
G29S	25	G4	70	G6361	86	G65SST	13	G81BAT	59	HB	139
G3	105	G40L	70	G6363	86	G65SSY	13	G81BZF	59	ID101	140
G30G	24	G40R	70	G6363BH	86	G65SSZ	13	G81CSA	59	J	103
G30NK	63	G41L	70	G6363CV	86	G65ST	13	G81FL	14	J-001	104
G31	23	G41R	70	G6393	86	G65THX	13	G81FLSS	14	L..L	135
G31B	23,60	G42	70	G6396	85	G65VS	13	G81FM	59	L-30	136
G31BAT	58	G4300	81	G6396X	85	G65VX	13	G81MM	59	MBR	139
G31BLS	24	G4316	81	G63T16X	85	G65X	13	G81NS1	59	OILPAD	141
G31BNST	60	G4316G	81	G63T33	86	G65Y	13	G81QMT	59	P..B	134
G32	23	G4330	81	G63T63X	85	G6603	86	G81SM	59	P-1	102
G32B	23,60	G4331	81	G64C	5	G6616	85	G81SS	14	P-1000	102
G32BAT	58	G4331G	81	G64E	5	G6621	86	G81WCT	59	P-38	102
G32BLS	24	G4332	81	G64SSC	11	G66LB	6	G82	14	PC	102
G32BNST	60	G4333	81	G64SSE	11	G66LC	6	G82BAT	59	PCO	103
G32NK	63	G4334	81	G65A	3,4	G66LD	6	G82CSA	59	PG	131
G33	20	G43L	70	G65AA	5	G66LDC	6	G82NS1	59	PGB	131
G33A	15,20	G43R	70	G65AFL	6	G67	16	G82QMT	59	PGD	131
G33B	20	G45F	29	G65B	3,4	G67P	16	G82WCT	59	PGP	132
G33C	21	G45M	29	G65BRA	9	G67PB	16	G83	14	PGSS	132
G33G	20	G46F	29	G65BRB	9	G68	16	G84	55	PL	135
G33N	20,92	G46M	29	G65BRC	9	G68A	16	G84A	55	PRV	113
G33SS	20,126	G47F	29	G65BRD	9	G68AUL	16	G84C	55	PW	64,65
G33SSC	21	G47M	29	G65BRDC	9	G69	17	G84E	55	QCPG CROSS-OVER	48
G33V	20	G48	29	G65BRDP	9	G6HD	106	G84NK	55	QKF	135
G33VG	21	G5	96	G65BRE	9	G6N	106	G84SZ	55	R..R	134
G33VLG	21	G53	127	G65BRF	9	G6T	107	G84U	55	S-150	66
G33W	21	G53C	127	G65C	3,4	G7	95	G85	56	SB	104
G34	22	G53CB	127	G65CA	5	G7000	83	G85B	56	SC	104
G34EFV	23	G53CSN	127	G65CA90	5	G7001	83	G86	56	TG	132
G34F	22	G53G	127	G65CV	6	G7008	83	G86N	56	TPG	139
G34FV	23	G53GS	127	G65D	3,4	G7008P	82	G87	56	TSG	139
G34FVB	23	G53L	127	G65DC	4	G7016	83	G87N	56	UCS	139
G34FVL	23	G53S	127	G65DCL	6	G7016P	82	G87S	56	V10	67,111
G34FVS	23	G54	128	G65DD	5	G7046	83	G87WT	56	V12	111,112
G34L	22	G54G	128	G65DFL	6	G7046P	82	G88	56	V14	112
G34P	22	G54GT	128	G65DP	4	G7070	83	G88C	56	V16	112,113
G34SQ	22	G54N	128	G65E	3,4	G7070P	82	G88R	57	V201	108
G35FH	24	G59	128	G65F	3,4	G7070PBH	82	G89	99	V201PVC	113
G35FP	24	G5A	98	G65LC	6	G7090	84	G8L	97	V202	108
G35G	24	G5AB	98	G65LD	6	G7090P	82	G8M	95	V202L	108
G35MH	24	G5AM	98	G65LDC	6	G7096	83	G9	140	V202LB	108
G35MP	24	G5A-RACK	96	G65LY	13	G7096P	82	G91JM	60	V203	109
G35SC	24	G5M	97	G65NA	7	G7096PX	82	G91MC	60	V205	109
G36BFH	67	G6	106	G65NB	7	G7098	83	G92	100	V207	109
G36BLF	67	G6T	107	G65NC	7	G7098P	82	G92JM	60	V215L	113
G36BLM	67	G6000	79	G65ND	7	G70T00	84	G92MC	60	V215P	113
G36BM	67	G6001	79	G65NDC	7	G70T00P	82	G92-RACK	96	V302	108
G36NF	92	G6008	79	G65NDP	7	G70T06	84	G94	100	V302W	108
G36NM	92	G6008P	88	G65NE	7	G70T06PX	82	G95	56	V303	109
G36RG	67	G6016	79	G65NF	7	G70T60	84	G95NK	60	V305	109
G36SG	67	G6016N	92	G65PA	8	G70T60PX	82	G95SZ	60	V306	109
G36VG	67	G6016P	88	G65PB	8	G7103	83	G97	55	V307	109
G37	55	G6046	80	G65PC	8	G72	129	G97B	55	V308	109
G37-GHT	55,66	G6060	79	G65PD	8	G72B	129	G97B-GHT	55,66	V401	110
G37AB-GHT	66	G6060P	88	G65PDC	8	G72M	129	G97G	55	V402	110
G37JM	62	G6090	79	G65PDP	8	G73H	130	G97-GHT	55,66	V412	110
G37MC	62	G6090P	88	G65PE	8	G73NPT	130	G97JM	61	V432	110
G37M-GHT	66	G6096	80	G65PF	8	G73V	130	G97MC	61	V601	110
G37NK	62	G6096N	92	G65R	13	G75	129	G97NK	61	V605	110
G37NST	62	G6096P	88	G65SBDC	12	G75B	129	G97SZ	61	V610	111
G37P	55	G6098	80	G65SBDP	12	G77	129	G98JM	63	V611	111
G37SZ	62	G60T00	80	G65SBY	12	G77B	129	G98JMA	62	V611M	111
G37T	62	G60T00P	89	G65SC	13	G78	129	G98JMC	63	V63AW	87
G37TJM	61	G60T06	80	G65SL	12	G79	130	G98MC	63	V6406	87
G37TMC	61	G60T06P	89	G65SSA	10	G79G	130	G98MCA	62	V6416W	87
G37TNK	61	G60T60	80	G65SSAA	11	G79M	130	G98NHK	63	V6498W	87
G37TNST	61	G60T60P	89	G65SSB	10	G7ET	97	G98NHP	63	V64W	87
G37TSZ	61	G61	15	G65SSC	10	G7ETM	97	G98NK	63	V803	113
G38	93	G6100	79	G65SSCA	11	G7M	95	G98NKA	62	V825	113
G38-GL	141	G6100P	89	G65SSD	10	G7RACK	96	G98NKC	63	V853	113
G38V	121	G6103	79	G65SSDC	10	G8	95	G98NPSHA	62	XP100	139
G38W	93	G62	15	G65SSDD	11	G80	57	G98NSTA	62		
G39	99	G63	15	G65SSDP	10	G80B	57	G98SZ	63		
G3A	104	G6300	86	G65SSE	10	G80BF	57	G98SZA	62		
G3F	105	G6300LC	87	G65SSF	10	G80BM	57	G98SZC	63		