CORROSION

The metal gauge of an Expansion Joint Bellows is generally the thinnest element of the entire piping system so attention must be given to the possible corrosive attack by the medium being conveyed. To merely increase the metal thickness of the bellows is not a satisfactory solution to the problem as reduced cycle life can be incurred by such an approach.

It is better to select a bellows alloy that is more resistant to the corrodent than the metal used in the overall piping system. This is one of the reasons Expansion Joints of stainless steel are normal in carbon steel piping. However, the use of alloy piping often may require a more compatible corrosion resistant bellows.

Although Anaconda's standard alloy is Type 321 stainless steel, Anaconda Expansion Joints are made of many other alloys, a few of which are shown in the following corrosion resistance reference tables. While every alloy is not practical for Expansion Joint manufacture, selection of alloy or alloys should be part of the engineering considerations when designing or specifying Expansion Joints.

CORROSION RESISTANCE REFERENCE TABLES

The following tables should be used only as a guide in the selection of the most suitable bellows and fitting material when conveying a given medium. The listed media are in general considered to be pure, at room temperature and, unless otherwise specified, dry. A change in any one of these conditions may change the rating. No attempt has been made to account for variations in service conditions since these variables are innumerable and complex.

Additional information on service life, etc. is keyed to the notes at the top of page 39. The numbers appear as superscripts to the upper right of the rating as: Acetic Acid, B^2, 321 Stainless Steel, Susceptible to intergranular corrosion.

When there is a question on this reference table or you have unusual service conditions or media, contact us before ordering.

CAUTION—certain chemicals and highly reactive materials normally require special cleaning which should only be performed in accordance with the hose manufacturer's established procedures.

FOR YOUR SAFETY and further details, you should write Anaconda Metal Hose, Box 2618, Waterbury, Connecticut, 06723.

CORROSION RESISTANCE REFERENCE TABLE

RATING CODE:

A—Suitable (normal conditions)
B—Limited Service
C—Unsuitable

NOTES:

1. Susceptible to intergranular corrosion
2. May cause explosive reaction
3. Susceptible to stress corrosion cracking
4. Susceptible to pitting type corrosion
5. Discolors
6. Concentration over 50% and/or temperature over 200°F, refer to our Engineering Dept.

	CUPRO NICKEL 706	MONEL 400	INCONEL 625	321 STAINLESS	316 STAINLESS
Acetaldehyde	A	A	A	A	A
Acetanilide	B	B	B	B	B
Acetic Acid	B	B	A	B[1]	A[1]
Acetic Anhydride	B	B	A	B	B
Acetone	A	A	A	B	B
Acetophenone	A	A	A	B	B
Acetylene	C	A	A	A	A
Acrylates	B	B	B	B	B
Acrylic Acid	B	B	A	B	B
Acrylonitrile	A	A	A	A	A
Alcohols	A	A	A	A	A
Alum	B	B	A	B	B
Alumina	A	A	A	A	A
Aluminum Acetate	B	B	B	B	B
Aluminum Chloride (Dry)	B	A	A	A	A
Aluminum Chloride (Moist)	C	B	A	C[3,4]	C[3]
Aluminum Fluoride	B	B	C	C	C
Aluminum Hydroxide	A	B	B	B	B
Aluminum Sulfate	B	B	B	B[1,3]	A[3]
Ammonia - Dry	A	A	A	A	A
Ammonia - Moist	C	C	B	A	A
Ammonium Acetate	B	A	A	A	A
Ammonium Bromide	C	B	B	C[4]	C[4]
Ammonium Chloride - Dry	C	A	A	A	A
Ammonium Chloride - Moist	C	B	B	C[3,4]	C[3]
Ammonium Hydroxide	C	A	A	B	B
Ammonium Nitrate	C	C[2]	B	B[3]	B[3]
Ammonium Sulfate	C	B	C	C[1]	B
Amyl Acetate	A	A	A	A	A
Amyl Alcohol	A	A	A	A	A
Amyl Chloride - Dry	C	A	A	A	A
Amyl Chloride - Moist	C	B	C	C[3,4]	C[3]
Aniline	C	A	B	B	B
Aniline Dyes	C	A	B	B	B
Asphalt	A	A	A	A	A
Atmosphere - Industrial	A	A	A	B[4]	A[4]
Atmosphere - Marine	A	A	A	B[4]	B[4]
Atmosphere - Rural	A	A	A	A	A
Barium Carbonate	A	B	B	B	B
Barium Chloride - Dry	B	A	A	A	A
Barium Chloride - Moist	C	B	C	C[3,4]	C[3]
Barium Hydroxide	A	B	B	B	A
Barium Sulfate	B	B	B	B	B
Barium Sulfide	C	C	B	B	B
Beer	A	A	A	A	A
Beet Sugar Syrups	A	A	A	A	A
Benzaldehyde	A	B	B	B	B
Benzene (Benzol)	A	A	A	A	A
Benzoic Acid	A	B	A	A	A
Benzylamine	C	B	B	B	B
Benzyl Chloride - Dry	A	A	A	A	A
Benzyl Chloride - Moist	B	B	B	C[3,4]	C[3]
Black Liquor, Sulfate Process	C	A	B	B	B
Bleaching Powder - Dry	A	A	A	A	A
Bleaching Powder - Moist	B	B	B	C[1,3,4]	C[3,4]
Borax	A	A	A	A	A
Bordeaux Mixture	A	A	A	A	A
Boric Acid	A	B	A	A	A
Boron Trichloride - Dry	B	B	B	B	B
Boron Trichloride - Moist	B	B	C	C[3,4]	C[3]
Boron Trifluoride - Dry	A	B	A	B	B
Brines	A	B	B	C[3,4]	C[3]
Bromic Acid	C	C	C	C	C
Bromine, Dry	A	A	A	B	B
Bromine, Moist	B	B	B	C	C
Butadiene	A	A	A	A	A
Butane	A	A	A	A	A
Butanol (Butyl Alcohol)	A	A	A	A	A
Butyl Phenols	B	A	B	B	B
Butylamine	B	A	A	A	A
Butyric Acid	A	B	A	B	B
Cadmium Chloride - Moist	B	B	B	C[3,4]	C[3]
Cadmium Chloride - Dry	A	A	A	A	A
Cadmium Sulfate	A	A	A	A	A
Calcium Bisulfite	B	B	B	B[1]	B
Calcium Bromide	A	B	A	C[3]	C[3]
Calcium Chloride - Moist	A	B	A	C[3,4]	C[3]
Calcium Chloride - Dry	A	A	A	A	A
Calcium Fluoride	B	B	B	C	C
Calcium Hydroxide	A	B	A	B	B
Calcium Hypochlorite - Moist	B	B	B	C[3,4]	C[3,4]
Calcium Hypochlorite - Dry	A	A	A	A	A
Calcium Nitrate	B	B	A	B[1]	B
Calcium Oxide	A	A	A	A	A
Cane Sugar Syrups	A	A	A	A	A
Carbolic Acid (Phenol)	B	B	B	B	B
Carbon Dioxide - Dry	A	A	A	A	A
Carbon Dioxide - Moist	B	A	A	A	A
Carbonated Beverages	B	A	A	A	A
Carbonated Water	B	A	A	A	A
Carbon Disulfide	B	B	B	B	B
Carbon Tetrachloride - Dry	A	A	A	A	A
Carbon Tetrachloride - Moist	B	B	B	C[3,4]	C[4]
Castor Oil	A	A	A	A	A
Chlorine - Dry	A	A	A	A	A
Chlorine - Moist	C	B	C	C[3,4]	C[3]

CORROSION RESISTANCE REFERENCE TABLE (cont'd)

	CUPRO NICKEL 706	MONEL 400	INCONEL 625	321 STAINLESS	316 STAINLESS
Chloroacetic Acid	B	B	B	C[3,4]	C[3]
Chloric Acid	C	C	C	C[3]	C[3]
Chlorine Dioxide - Moist	C	B	B	C[3,4]	C[3]
Chlorine Dioxide - Dry	B	A	A	A	A
Chloroform - Dry	A	A	A	A	A
Chloroform - Moist	B	B	B	C[3,4]	C[3]
Chromic Acid	C	C	B	C[1,4]	C
Chromic Fluoride	C	B	B	C	C
Chromic Hydroxide	B	B	B	B	B
Chromium Sulfate	B	B	B	B	B
Cider	A	A	A	A	A
Citric Acid	A	B	A	B	B
Coffee	A	A	A	A	A
Copper Chloride - Dry	A	A	A	A	A
Copper Chloride - Moist	C	B	C	C[3,4]	C[3]
Copper Nitrate	C	C	B	A	A
Copper Sulfate	B	B	B	B[1]	B
Corn Oil	A	A	A	A	A
Cottonseed Oil	A	A	A	A	A
Creosote	A	A	A	A	A
Crude Oil	B	A	A	C[1]	B
Cyclohexane	B	B	B	B	B
DDT	B	B[4]	B	B	B
Dichloroethane - Dry	A	A	A	A	A
Dichloroethane - Wet	B	B	B	C[4]	C[4]
Dichloroethylene - Dry	A	A	A	A	A
Dichloroethylene - Moist	B	B	B	C[4]	C[4]
Dichlorophenol	B	B	B	B[3]	B[3]
Diisocyanate	A	A	A	A	A
Dimethyl Sulfate	B	B	A	B	B
Epichlorohydrin - Dry	A	A	A	A	A
Epichlorohydrin - Moist	B	B	B	C[3,4]	C[3]
Ethane	A	A	A	A	A
Ethers	A	A	A	A	A
Ethyl Acetate	A	B	A	B	B
Ethyl Alcohol	A	A	A	A	A
Ethyl Benzene	B	B	A	B[3]	B
Ethyl Chloride - Moist	B	B	B	C[3,4]	C[3]
Ethyl Chloride - Dry	A	A	A	A	A
Ethylene	A	A	A	A	A
Ethylene Chlorohydrin - Dry	A	A	A	A	A
Ethylene Chlorohydrin - Moist	B	B	B	C[4]	C[4]
Ethylene Diamine	B	B	A	B	B
Ethylene Glycol	A	A	A	A	A
Ethylene Oxide	C	B	B	B	B
Fatty Acids	B	B	B	B[1,4]	A
Ferric Chloride - Moist	C	B	B	C[1,3,4]	C[3,4]
Ferric Chloride - Dry	A	A	A	A	A
Ferric Nitrate	C	C	B	B	B
Ferric Sulfate	C	C	B	B[1]	A
Ferrous Chloride - Moist	C	B	B	C[3,4]	C[3]
Ferrous Chloride - Dry	A	A	A	A	A
Ferrous Sulfate	B	A	B	B[4]	B
Fluorine, Dry	A	A	A	A	A

	CUPRO NICKEL 706	MONEL 400	INCONEL 625	321 STAINLESS	316 STAINLESS
Fluorine, Moist	C	B	C	C	C
Formaldehyde	A	A[5]	B	B	B
Formic Acid	A	B	A	B[1]	A
Freon	A	A	A	A	A
Fruit Juices	B	A	A	A	A
Fuel Oil	A	A	A	A	A
Furfural	A	A	B	A	A
Gasoline	A	A	A	A	A
Gelatine	A	A	A	A	A
Glucose	A	A	A	A	A
Glue	A	A	A	A	A
Glutamic Acid	B	B	A	B[3,4]	B[3,4]
Glycerin (Glycerol)	A	A	A	A	A
Heptane	A	A	A	A	A
Hexachloroethane - Dry	A	A	A	A	A
Hexachloroethane - Moist	B	B	B	C[4]	C[4]
Hydrazine	C	C	A	A	A
Hydrobromic Acid	C	C	B	C[4]	C
Hydrocarbons, Pure	A	A	A	A	A
Hydrochloric Acid	C	B	C	C[4]	C[4]
Hydrocyanic Acid	C	B	B	B[1]	B
Hydrofluoric Acid	C	B	B	C[1,3]	C
Hudrofluorsilicic Acid	B	B	B	C	C
Hydrogen	A	A	A	A	A
Hydrogen Chloride - Dry	A	A	A	A	A
Hydrogen Chloride - Wet	C	B	C	C[4]	C[4]
Hydrogen Peroxide	B	B	A	A	A
Hydrogen Sulfide - Dry	A	A	A	A	A
Hydrogen Sulfide - Moist	C	B	B	B[4]	A
Hydroquinone	B	B	B	B	B
Kerosine (Kerosene)	A	A	A	A	A
Lacquers	A	A	A	A	A
Lacquer Solvents	A	A	A	A	A
Lactic Acid	A	B	B	B[1,4]	B[1]
Lime	A	A	A	A	A
Lime - Sulfur	C	B	B	B	B
Linseed Oil	B	A	A	A	A
Lithium Chloride - Moist	C	B	B	C[3,4]	C[3]
Lithium Chloride - Dry	A	A	A	A	A
Lithium Hydroxide	B	B	B	B	B
Magnesium Chloride - Moist	B	B	B	C[3,4]	C[3]
Magnesium Chloride - Dry	A	A	A	A	A
Magnesium Hydroxide	A	A	A	A	A
Magnesium Sulfate	A	A	A	B	A
Maleic Acid	C	B	B	B[1]	B
Mercuric Chloride - Moist	C	B	A	C[3,4]	C[3]
Mercuric Chloride - Dry	C	A	A	A	A
Mercurous Nitrate	C	B[3]	B	B	B
Mercury	C	B[3]	B	B	B
Methyl Alcohol	A	A	A	A	A
Methane	A	A	A	A	A
Methyl Chloride - Dry	A	A	A	A	A
Methyl Chloride - Moist	B	B	B	C[3,4]	C[3]
Methyl Ethyl Ketone	A	B	A	B	B

CORROSION RESISTANCE REFERENCE TABLE (cont'd)

	CUPRO NICKEL 706	MONEL 400	INCONEL 625	321 STAINLESS	316 STAINLESS
Milk	A	A	A	A	A
Mine Water	C	B	A	B	B
Naphthalene	B	B	A	A	A
Natural Gas	A	A	A	A	A
Nickel Chloride - Moist	B	B	B	C[3,4]	C[3]
Nickel Chloride - Dry	A	A	A	A	A
Nitric Acid	C	C	B	A	A
Nitrotoluene	B	B	B	B	B
Nitrogene	A	A	A	A	A
Oleic Acid	B	A	B	B[4]	B
Oleum (Fuming H2SO4)	C	C	B	B	B
Oxalic Acid	A	B	B	C[1]	B[1]
Oxygen	A	A	A	A	A
Palmitic Acid	B	A	A	A	A
Parafin	A	A	A	A	A
Pentane	B	B	B	B	B
Phosphoric Acid	B	B	B	C[1]	B[1]
Phthalic Acid	B	B	B	B[1]	B
Picric Acid	C	C	B	B	B
Potassium Bromide	A	B	B	C	C
Potassium Carbonate	A	A	A	A	A
Potassium Chloride - Moist	B	B	B	C[3,4]	C[3]
Potassium Chloride - Dry	A	A	A	A	A
Potassium Chromate	A	B	A	B	B
Potassium Cyanide	C	B	B	B	B
Potassium Dichromate	C	A	A	A	A
Potassium Fluoride	C	B	B	C	C
Potassium Hydroxide	B	B[3]	A	B[3]	B[3]
Potassium Nitrate	A	B	A	B	A
Potassium Permanganate	B	B	B	B	B
Potassium Sulfate	A	B	A	B	B
Propane	A	A	A	A	A
Propylene	A	A	A	A	A
Propylene Dichloride - Dry	A	A	A	A	A
Propylene Dichloride - Moist	B	B	B	C[4]	C[4]
Pyridine	B	B	B	B	B
Pyrrolidine	B	B	A	B	A
Quinine	B	B	A	B	B
Rosin	A	A	A	A	A
Sea Water	A	B	A	C[3,4]	C[3]
Sewage	A	A	A	A	A
Silver Salts	C	A	A	B	B
Silver Nitrate	C	C	A	B	B
Soap Solutions	A	A	A	A	A
Sodium	A	A	A	A	A
Sodium Acetate	B	B	B	B[4]	B
Sodium Bicarbonate	A	A	A	A	A
Sodium Bisulfate	B	B	B	B[1,4]	B
Sodium Bisulfite	B	B[4]	B	B	B
Sodium Bromide	C	B	B	C	C
Sodium Carbonate	A	A	A	A	A
Sodium Chlorate - Moist	B	B	B	C[3,4]	C[3]
Sodium Chlorate - Dry	A	A	A	A	A
Sodium Chloride - Moist	A	B	A	C[3,4]	C[3]
Sodium Chloride - Dry	A	A	A	A	A
Sodium Chromate	B	B	B	B	B
Sodium Citrate	B	B	B	B	B

	CUPRO NICKEL 706	MONEL 400	INCONEL 625	321 STAINLESS	316 STAINLESS
Sodium Cyanide	C	B	B	B	B
Sodium Dichromate	C	B	B	B	B
Sodium Fluoride	B	B	B	C[4]	C
Sodium Hydroxide	B[3]	B[3]	A	B[3]	B[3]
Sodium Hypochlorite - Moist	C	B	B	C[1,4]	C[4]
Sodium Hypochlorite - Dry	A	A	A	A	A
Sodium Metasilicate	A	A	A	A	A
Sodium Nitrate	A	A	A	A	A
Sodium Nitrite	B	B	B	B	B
Sodium Peroxide	B	B	B	B	B
Sodium Phosphate	A	A	B	B	B
Sodium Silicate	A	A	A	A	A
Sodium Sulfate	A	A	A	B[3]	B
Sodium Sulfide	C	B	B	B[4]	B
Sodium Sulfite	B	B	B	B	B
Sodium Thiosulfate	C	B	B	B	B
Stannic Chloride - Moist	C	B	B	C[3,4]	C[3]
Stannic Chloride - Dry	A	A	A	A	A
Stannous Chloride - Moist	C	B	B	C[3,4]	C[3]
Stannous Chloride - Dry	A	A	A	A	A
Steam	A	A[3]	A	A	A
Stearic Acid	B	B	B	B	B
Strontium Nitrate	B	B	B	B	B
Sulfate Black Liquor	B	B	B	B	B
Sulfate Green Liquor	B	B	B	B[3]	B[3]
Sugar Solutions	A	A	A	A	A
Sulfur - Dry	B	A	A	A	A
Sulfur - Molten	C	B	A	A	A
Sulfur Chloride - Dry	A	A	A	A	A
Sulfur Chloride - Wet	B	B	B	C[3,4]	C[3]
Sulfur Dioxide - Dry	B	B	B	C[1]	B
Sulfur Dioxide - Moist	C	C	C	C[1]	B
Sulfur Trioxide - Dry	A	A	A	A	A
Sulfuric Acid, 95-100%	B	B	A	A	A
Sulfuric Acid, 80-95%	B	B	B	B	B
Sulfuric Acid, 40-80%	C	C	B	C[1]	C[1]
Sulfuric Acid, 40%	B	C	B	C[1]	C[1]
Sulfurous Acid	C	B	B	C[1,4]	C[1,4]
Tall Oil	B	B	B	B	B
Tannic Acid	B	B	B	B	B
Tar	A	A	A	A	A
Tartaric Acid	B	B	B	B	B
Tetraphosphoric Acid	C	C	B	B	B
Toluene	A	A	A	A	A
Trichloroacetic Acid	B	B	B	C[3,4]	C[4]
Trichloroethane - Dry	A	A	A	A	A
Trichloroethane - Moist	B	B	B	C[4]	C[4]
Trichloroethylene - Dry	A	A	A	A	A
Trichloroethylene - Moist	B	B	B	C[4]	C[4]
Turpentine	A	A	A	A	A
Varnish	A	A	A	A	A
Vinegar	B	B	B	B	B
Water, Potable	A	A	A	A	A
Xylene	A	A	A	A	A
Zinc Chloride - Moist	C	B	B	C[3,4]	C[3]
Zinc Chloride - Dry	A	A	A	A	A
Zinc Sulfate	B	B	B	B	A