

## CORROSION

All metal surfaces are affected by corrosion. Depending on the physical properties of the metal and the environment to which it is exposed, chemical or electromechanical corrosion may occur.

### Atmospheric Corrosion

Atmospheric corrosion occurs when metal is exposed to airborne liquids, solids or gases. Some sources of atmospheric corrosion are moisture, salt, dirt and sulphuric acid. This form of corrosion is typically more severe outdoors, especially near marine environments.

### Chemical Corrosion

Chemical corrosion takes place when metal comes in direct contact with a corrosive solution. Some factors which affect the severity of chemical corrosion include: chemical concentration level, duration of contact, frequency of washing, and operating temperature.

### Storage Corrosion

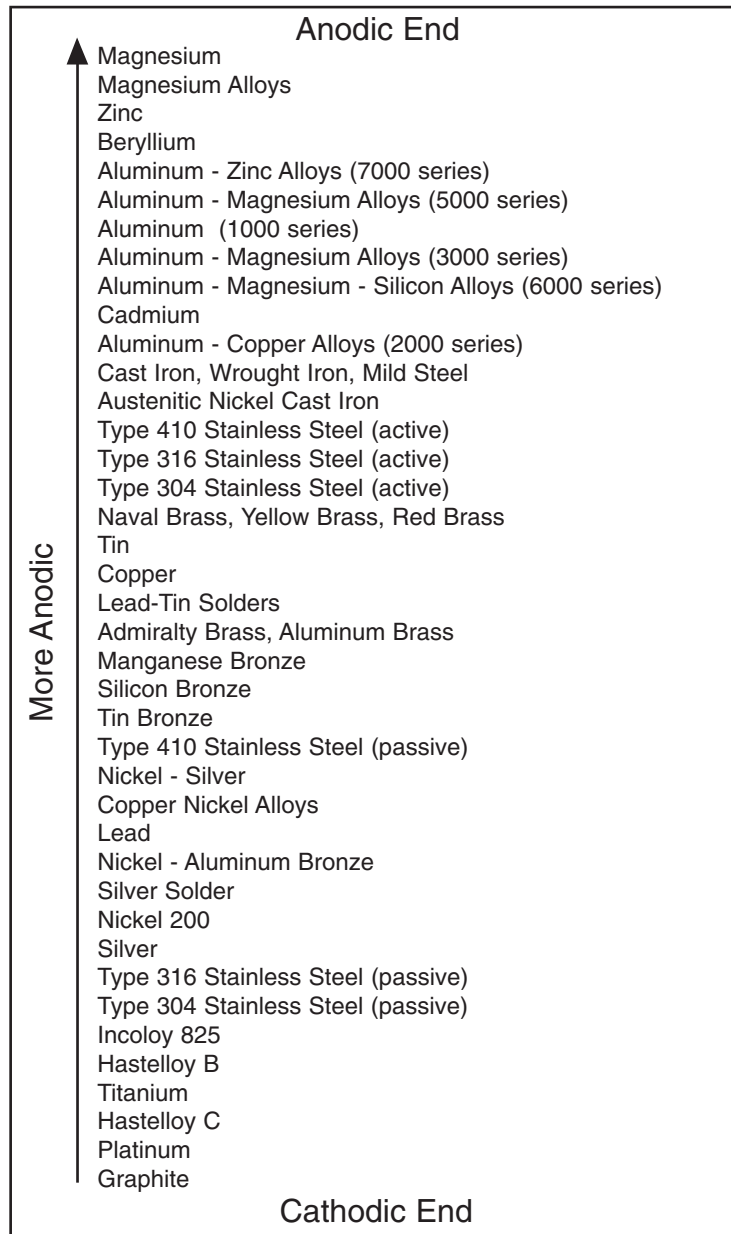
Wet storage stain (white rust) is caused by the entrapment of moisture between surfaces of closely packed and poorly ventilated material for an extended period. Wet storage stain is usually superficial, having no affect on the properties of the metal.

Light staining normally disappears with weathering. Medium to heavy buildup should be removed in order to allow the formation of normal protective film. Proper handling and storage will help to assure stain-free material. If product arrives wet, it should be unpacked and dried before storage. Dry material should be stored in a well ventilated "low moisture" environment to avoid condensation formation. Outdoor storage is undesirable, and should be avoided whenever possible.

### Galvanic Corrosion

Galvanic corrosion occurs when two or more dissimilar metals are in contact in the presence of an electrolyte (ie. moisture). An electrolytic cell is created and the metals form an anode or a cathode depending on their relative position on the Galvanic Series Table. The anodic material will be the one to corrode. Anodic or cathodic characteristics of two dissimilar metals will depend on the type of each material. For example: If zinc and steel are in contact, the zinc acts as the anode and will corrode; the steel acts as the cathode, and will be protected. If steel and copper are in contact, the

## GALVANIC SERIES IN SEA WATER



Metals in descending order of activity in the presence of an electrolyte.

steel is now the anode and will corrode. The rate at which galvanic corrosion occurs depends on several factors:

1. The relative position on the Galvanic Series Table - the further apart materials are in the Galvanic Series Table, the greater the potential for corrosion of the anodic material.
2. The amount and concentration of electrolyte present - an indoor, dry environment will have little or no galvanic corrosion compared to a wet atmosphere.

3. The relative size of the materials - a small amount of anodic material in contact with a large cathodic material will result in greater corrosion. Likewise, a large anode in contact with a small cathode will decrease the rate of attack.

Chemical	Aluminum	Dura-Green	PVC	Type 304 Stainless	Type 316 Stainless	Zinc Coated Steel
Acetic Acid 10%	R	NR	R	R	R	NR
Acetic Acid 2%	R	F	R	R	R	NR
Acetone	R	R	NR	R	R	R
Ammonium Hydroxide-Conc.	R	R	R	R	R	-
Ammonium Hydroxide 10%	F	R	R	R	R	-
Ammonium Hydroxide 2%	R	R	R	R	R	-
Benzene	R	R	NR	R	R	-
Bromine Water	NR	R	R	NR	NR	-
Butanol (Butyl Alcohol)	R	R	R	R	R	R
Carbon Disulfide	R	R	NR	R	R	-
Carbon Tetrachloride	F	R	F	R	R	-
Chlorine Water	R	R	R	NR	F	R
Cutting Oil	-	R	-	-	-	-
Diethanolamine	R	R	NR	-	-	NR
Ethanol	R	R	R	R	R	R
Ethyl Acetate	R	R	NR	-	-	R
Ethylene Dichloride	F	R	NR	-	-	R
Formaldehyde 20%	R	R	R	R	R	R
Gasoline	R	R	R	R	R	R
Glycerine	R	R	R	R	R	R
Household Detergent 10%	F	R	R	R	R	-
Hydrochloric Acid 40%	NR	NR	R	NR	NR	NR
Hydrochloric Acid 10%	NR	F	-	NR	NR	NR
Hydrochloric Acid 2%	NR	F	-	NR	NR	NR
Hydrogen Peroxide 30%	R	NR	R	R	R	-
Hydrogen Peroxide 3%	R	R	-	R	R	-
Hydrogen Sulfide (Gas)	R	R	R	F	R	-
JP-4 Jet Fuel	R	R	R	R	R	-
Lactic Acid 85%	F	R	R	NR	-	-
Latex	R	R	-	R	R	NR
Linseed Oil Fatty Acid	R	F	R	R	R	-
Methanol	R	R	R	R	R	R
Methyl Ethyl Ketone	R	R	NR	-	-	R
Methyl Isobutyl Ketone	R	R	NR	-	-	R
Mineral Spirits	R	R	-	-	-	-
Motor Oil-10W	R	R	R	R	R	R
Naphtha, VM&P	R	R	R	R	R	R
Nitric Acid 2%	F	NR	R	R	R	-
Perchloroethylene	R	R	-	-	-	NR
Petroleum Ether	-	R	-	R	R	R
Phenol 10%	R	R	NR	R	R	R
Phosphoric Acid 2%	F	NR	R	R	R	NR
Potassium Hydroxide 50%	NR	R	R	R	R	-
Potassium Hydroxide 10%	NR	R	R	R	R	-
Potassium Hydroxide 2%	NR	R	R	R	R	-
Sodium Chloride 25%	F	R	R	R	R	F
Sodium Hydroxide 50%	NR	R	R	R	R	NR
Sodium Hydroxide 10%	NR	R	R	R	R	F
Sodium Hydroxide 2%	NR	R	R	-	-	-
Sodium Hypochlorite-C1. 10%	F	R	R	-	-	-
Sodium Hypochlorite-C1. 6%	F	R	R	NR	R	-
Sulfuric Acid 2%	F	NR	R	NR	R	NR
Tall Oil Fatty Acid (Syfate 94)	R	R	R	-	-	-
Tannic Acid 50%	F	R	R	R	R	F
Water-Deionized	R	R	R	R	R	F
Water-Sea	F	F	R	R	R	F
Water-Tap	R	R	R	F	F	R
Xyol	R	R	NR	-	-	-

Technical Data

Fiberglass corrosion chart on page 183.

The corrosion data given in this table is for general comparison only.

The presence of contaminants and the effect of temperature in chemical environments can greatly affect the corrosion of any material.

B-Line strongly suggests that field service tests or simulated laboratory tests using actual environmental conditions be conducted in order to determine the proper materials and finishes to be selected.

R=Recommended

F=May be used under some conditions

NR=Not Recommended

-Information not available