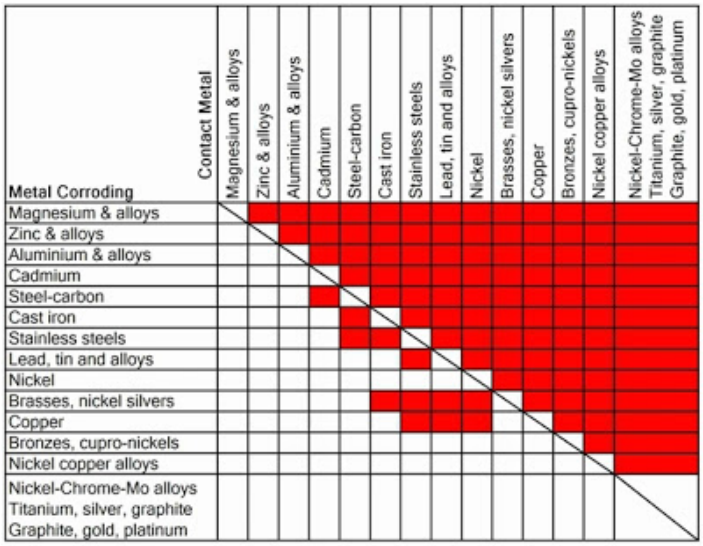
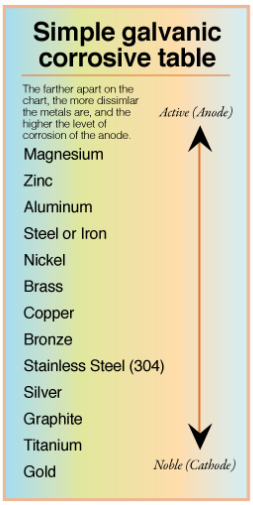
Galvanic Corrosion



Galvanic Corrosion Risk indicated with red.

Galvanic corrosion is an electrochemical reaction that takes place when two dissimilar metals are joined together in the presence of an electrolyte. The following conditions must exist for galvanic corrosion to happen:

- Two electromagnetically dissimilar metals. The chart above shows the galvanic corrosion risk for different pairs of metals.
- An electrolyte. Any non-metal, liquid substance that can conduct an electric current (such as saltwater or rainwater) can function as an electrolyte. Common examples are ordinary seawater, citric acid, and bases.
- An electrical path. This allows metal ions to move from the active metal to the less active metal. Typically, the metals merely touch one another.[1]



The simplified galvanic table to the left lists metals in the order of their relative activity in seawater environment. The list begins with the more active (anodic, less noble) metal and proceeds down the to the less active (cathodic, more noble) metal of the galvanic series. The further the metals are from each other, the higher the risk of galvanic corrosion.

As a basic example, if you join gold and magnesium together in the presence of an electrolyte, the gold will cause the magnesium to corrode faster than if it were alone or next to a metal closer to its position on the chart.

Galvanic corrosion is an important concept in the design of ships, water treatment plants, or SCUBA equipment, and can cause big problems if not properly addressed. Galvanic corrosion is one of the reasons the Statue of Liberty had to be restored in the 1980s. In the harsh, marine environment, The Lady's copper skin came into contact with her iron skeleton and caused her to corrode from the inside.

However, this concept can have impact on smaller-scale projects, as well. Consider the design of a fence made of metal for a seaside residence, where the fence would be in the presence of seawater spray. The fasteners made of anodic material can corrode quickly in a fence constructed of cathodic material.

For a more detailed discussion of galvanic corrosion and design guidelines for dealing with it, see this informative blog post on DesignNews.com.

If you'd like to discuss thoughtful ways of joining dissimilar metals in your project contact us at info@irongrain.com.

1. From Galvanic Corrosion - Int'l Association of Certified Home Inspectors (InterNACHI).