

GALVANIC CORROSION

The selection of gutter material must account for the potential of Galvanic or Electrolytic Corrosion at contact points with other metals and at supports. Also, special selection is required for corrosive environments such as coastal or polluted industrial atmospheres. Galvanic or Electrolytic Corrosion can occur when dissimilar metals are in contact in the presence of an electrolyte. An electrolyte is any non-metal substance that will conduct an electric current, especially a liquid solution. Water, particularly rainwater, is a good electrolyte.

A galvanic scale has been developed for metals. Metals that are more electropositive (anodic) will corrode more easily and metals that are more electronegative (cathodic) are more corrosion resistant. When two dissimilar metals are in contact in the presence of an electrolyte, the electropositive metal will corrode. The farther the two metals are from each other on the galvanic scale, the speed and effect of the reaction will increase.

GALVANIC SCALE

Electropositive / Anodic End
Zinc
Aluminum
Galvanized Steel
Cadmium
Mild Steel, Wrought Iron
Cast Iron
Stainless Steel, types 304 and 316 (active)
Tin - Lead Solder
Lead
Brass, Bronze
Copper
Stainless Steel, types 304 and 316 (passive)
Electronegative / Cathodic End

To reduce the tendency for galvanic corrosion to occur between dissimilar metals one or more of the following actions can be taken:

1. Avoid contact between metals that are farther apart on the scale.
2. Do not couple a small exposed area of a more electropositive (anodic) metal with a large area of a more electronegative (cathodic) metal. Fasteners are a particular concern in this regard.
3. Coat the electropositive (cathodic) metal with a suitable paint or other non-metallic coating (or coat both surfaces at their interface). Zinc chromate or bituminous coatings are often used.
4. Separate the metals by tape, gasket, waterproof paper, elastomeric sheet, sealant or other non-absorbent, non-conductive material.
5. Do not allow moisture runoff from a more electronegative (cathodic) metal to drain on a more electropositive (anodic) metal, even if the metals are not in contact.
6. Remove metal particles that are deposited from steel dies on formed metals (or prevent the deposits from occurring).

Miscellaneous Information about Galvanic Corrosion:

1. Passivated stainless steel has been chemically cleaned, usually with an acid solution.
2. Anodized aluminum is considered compatible with all other metals.
3. Salts increase the electrical conductivity of water. Copper should be used in salt air environments.
4. The discharge from drain pipes on rooftop air-conditioning units can be very corrosive, particularly if the piping is copper and the drainage goes into galvanized steel scuppers, conductor heads or gutters.
5. Copper nails / fasteners should not be used for fastening galvanized steel roof panels even though the contact area of the more electropositive (anodic) zinc coating is small compared to the more electronegative (cathodic) copper metal. Galvanized steel nails / fasteners will corrode rapidly if used on copper roofing.
6. Many organizations and individuals have published corrosion tables. All tend to rank corrosion rates in non-quantitative terms such as mild, moderate and severe. Rates of corrosion are also affected by conditions such as sea coast, dry inland, acid rain and polluted industrial atmospheres.

Additional information on galvanic corrosion prediction is found in ASTM Standard G82 and ASTM STP 576.