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Frequently Asked Questions

Galvanic Action by Ryan Dexter

ANODIC END (Negative "Base Metals")	CATHODIC END (Positive "Noble Metals")
• Magnesium	• Chromium
• Zinc, including zinc galvanized finishes	• Lead
• Aluminum 1100	• Tin
• Cadmium	• Nickel
• Aluminum Magnesium Silicon alloys	• Brass
• Copper Aluminum alloys	• Bronze
• Iron and Mild Steel	• Copper
	• Stainless Steel
	• Silver
	• Titanium
	• Gold
	• Platinum

Table 1. Abbreviated Galvanic Series for Metals

All metals have specific relative electrical potential. If two dissimilar metals come together in the presence of moisture, they act as a short circuited galvanic cell and corrosion will occur—thus the term "galvanic action."

QUESTION:

Can I connect a light gauge steel truss directly to an aluminum wall? Can I use zinc primer as a barrier between the two metals? I have heard of the term "galvanic action" and wondered if I needed to be concerned with corrosion?

ANSWER:

Whether or not zinc can act as a barrier between a light gauge steel truss and aluminum can be answered by looking at an abbreviated Galvanic Series for metals (Table 1). The amount of

corrosion depends on where the metals are in the Galvanic Scale.

If mild steel and zinc come together in the presence of water, what will happen to each metal? The zinc will be corroded away (as it is above the mild steel in Table 1). The further apart materials are on the scale, the greater the possibility for corrosion. So stainless steel and zinc will corrode more than stainless steel and chromium.

Galvanic action can be reduced between two metals by:

1) Avoiding damp conditions all together,
2) Introducing a separation layer such as an inert spacer like rubber between the metals,
3) Or by introducing a third, "sacrificial," material near the two metals (e.g., sacrificial zinc bar placed near the bronze propeller of a ship to prevent corrosion between the propeller and the steel hull).

This idea of a "sacrificial" material is exactly what you are proposing by adding the zinc primer. Finishes that can be put on mild steel to prevent corrosion vary from hot dip galvanized where the whole object is dipped into a vat of molten zinc (problems of heat distortion can be serious) to zinc sprayed where an air blast shoots a spray of molten zinc onto the steel object (effectiveness of coating depends on the evenness of cover).

According to Coastal Fasteners, Ltd. (www.coastalfasteners.co.nz/galvanic_action.htm) if the base metal is aluminum a fastener metal of zinc or galvanized steel will not increase the corrosion of the aluminum.

According to the United States Steel Corporation (www.ussteel.com), coatings protect steel from corrosive attack by acting as a barrier to exclude air, water and other corrosion promoters from contact with the steel substrate. Zinc (galvanized), galvannealed (zinc-iron alloy), zinc-aluminum (GALVALUME®), terne (lead-tin alloy coating) and paints provide excellent barrier protection. In addition to barrier protection, zinc and zinc alloys have the ability to react at scratches and other damage through an electrochemical (galvanic) action between steel and zinc. This galvanic action makes it possible for the zinc to protect breaks in the coating and prevent further damage.

So, to answer the question, yes a zinc primer could be used as a barrier between steel and aluminum, but a non-metal barrier would be preferred.

Finally, these concepts also apply to the combination of stainless steel hangers and galvanized connectors or vice versa. Notice how far stainless steel and zinc are on the chart above. Mixing these two metals will lead to corrosion issues.

To pose a question for this column, email us at faq@woodtruss.com. To view other questions visit the WTCA website.

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