

## CORROSIVE-RESISTANT TREATMENTS

By Todd Grevious

**There is a Range of Coatings Choices.  
Do You Know What to Ask for By Name  
for Your Application?**

[Link to Video](#) 

Corrosion of fasteners and steel connectors (joist hangers, tie downs, etc.) can result for any contact with water – especially salt water – or caustic chemicals like fertilizer and pool chemicals, so virtually every application is subject to corrosion risks. At the top of the list of risks to non-stainless steel fasteners and connectors is the copper that’s a common ingredient in treated wood. The steel starts to corrode when water in any form, even humidity, enables an “ionic exchange” between the copper and the steel.

To slow or stop this corrosion, manufacturers will A) coat the steel or B) offer stainless steel products. Although there is a new hybrid coating on the market, the most common anti-corrosive coating is zinc. It’s long been known that zinc is an effective “sacrificial” coating; it freely gives up its ions to protect the steel substrate. In the fastening and connector world, the most common types of zinc treatments – are zinc plating, and hot-dipped galvanized zinc coating. Zinc plating is typically not a long-term anti-corrosion treatment, unless the plating is mechanically applied. Most plating is merely done to keep the steel from rusting during transportation and storage. Some fasteners do have mechanically applied zinc platings for corrosion protection, however. Hot-dipped galvanized zinc coatings are either applied to the steel coil at the steel mill before it is stamped and formed into hangers, or it is applied after fabrication, in a manual hot-dipping process.



Corrosion of fasteners and steel connectors (joist hangers, tie downs, etc.) can result for any contact with water (especially salt water) caustic chemicals (like fertilizer and pool chemicals), and preservatives found in pressure treated wood. So, virtually every application is subject to corrosion risks. But with a range of anti-corrosion treatment options, corrosion can be reduced or entirely stopped.



The steel that does not have an adequate level of protection, left, corroded when water or moisture in this sea-side location enabled contact between the copper in treated lumber and the steel in the hanger. When the hanger has the proper level of protection (shown right), the corrosion is virtually unnoticeable.

## Three Classes of Anti-Corrosion Solutions

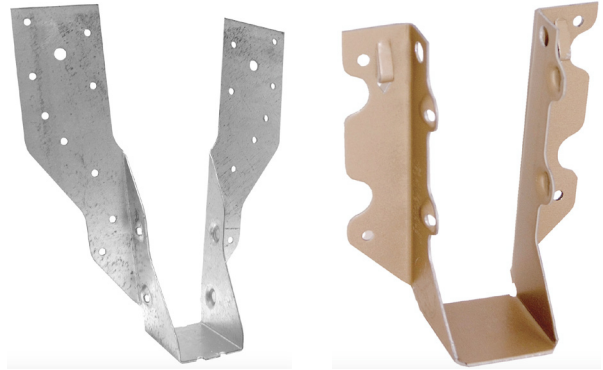
To survey the range of anti-corrosion treatments available for fasteners and steel connectors, let's take a look at the three classes of product: 1) zinc-coated, 2) stainless steel, and 3) zinc-polymer hybrids. For zinc-coated products, the thickness of the zinc determines the protection, and the product's rating depends on its compliance with ASTM standards. The zinc is physically applied by simply running the steel through (or dipping the steel in) molten zinc, before cleaning it with air knives.

**G90 Rated Zinc Coatings.** No matter the manufacturer, USP Structural Connectors or Simpson, you will see a G90 galvanized rating. The "90" in the label means that there's 0.9 ounces of zinc applied per square foot of steel surface. But this 0.9 ounces includes both sides of the steel. So each surface of G90 has 0.45 ounces/sq./ft. of zinc.

**G185 Rated Zinc Coatings.** The next step up in zinc protection is G185. These products have 1.85 ounces of zinc per square foot, with .925 ounces/sq/ft on each surface. G185 is also known as "triple zinc," or TZ. (To confuse matters, is used to be that G60 was the baseline treatment, not G90 as it is today. So G185 was "triple" the G60, and the "triple zinc" term never left the industry.) Simpson sells G185 as ZMAX, and USP Structural Connectors sells it as TZ.)

**Hot-Dip Galvanized (HDG).** Strictly speaking, G90 and G185, are all "hot-dipped" galvanized. But the term hot-dipped galvanized (HDG) has come to mean steel products that are dipped after fabrication. These are steel hangers that are not just stamped or folded into shape, but welded. If you welded zinc-coated steel, the surrounding zinc would melt off, so many heavy gauge steel connectors are fabricated from untreated steel and then hot-dipped. Hot dipped coatings applied this way are typically coated with a thickness on par with G-185 coatings.

**Stainless Steel.** If you are building in highly corrosive environments, like the sea side, near a pool, or in an industrial area where there's chemicals in the air, you may want to step up to stainless steel, rather than zinc-Coated



There are three classes of corrosion-resistant treatments available for fasteners and steel connectors: 1) zinc-coated (image, left), 2) zinc-polymer hybrids (image, right), and 3) stainless steel. For zinc-coated products, the thickness of the zinc determines the level of protection. For hybrids, an extra barrier is applied over the layer of zinc, offering protection near the level of stainless, but at less cost.



Match the fastener to the hanger: If you are using stainless steel hangers, use stainless steel fasteners. If you are using hot-dipped galvanized hangers, use hot-dipped galvanized fasteners. The "hybrid" Gold Coat hangers (above) can be installed using Gold Coat screws (shown).

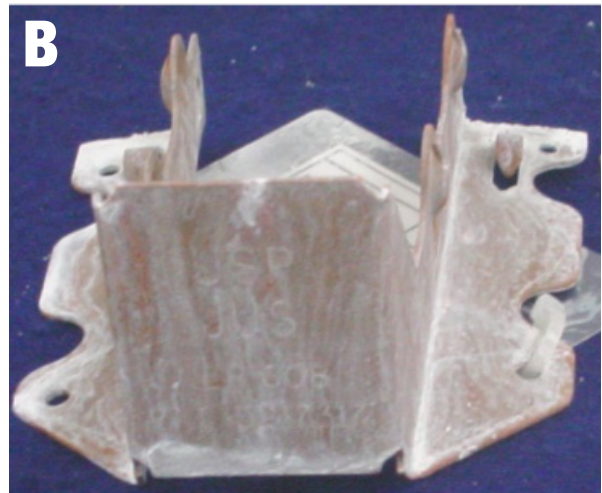
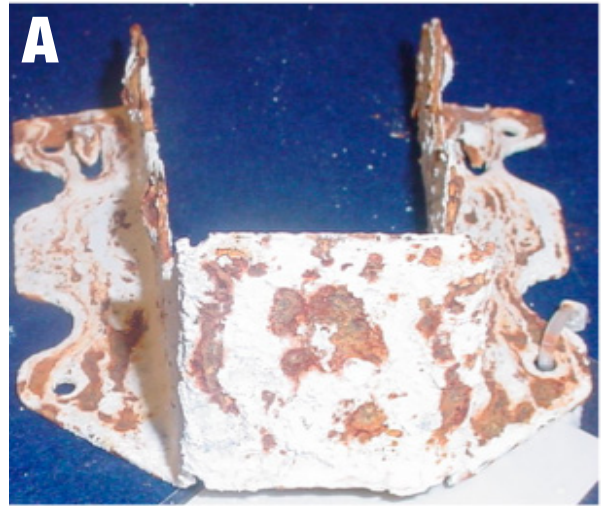
steel. Stainless steel is a “noble metal.” That means that the steel molecules do not freely “give” ions in reactions with dissimilar metals; so, stainless steel won’t corrode. (Gold is another noble metal; it’s highly stable. Copper is also on the noble end of the scale, which makes wood treatments corrosive.)

**Organic polymer – zinc hybrids.** If you don’t want to pay for stainless steel, but you want protection that exceeds G185, there is a new product, branded as Gold Coat by USP Structural Connectors. It takes a G90 zinc-coated steel product and adds an additional protective organic chemical coating. This provides a product that offers performance that’s between what you find in a G-185 product and a stainless steel product, but at a much lower price than stainless. The protective top-coat layer that is applied to make a Gold Coat product is 10 to 12 microns thick, rich in aluminum, and resistant to both acids and bases. It was developed as a proprietary system from Magni, a global company that has long specialized in protective coatings for metal.

**Fasteners.** For fasteners, always match the fastener metal or anti-corrosive treatment with the metal or anti-corrosive treatment of the connector. Stainless connectors call for stainless fasteners, period. You never want to have dissimilar metals in contact, if that can be avoided.

**Impact Drivers.** If you are using an impact driver, note that the repeating banging of the screw head as it turns can nick the anti-corrosion treatment, introducing an access point to the steel. This is typically not an alarming occurrence, as this is the head surface and not the bearing surface. Furthermore, the ASTM standard for corrosion resistance of fasteners does not require damaging or nicking of the fasteners when testing the anti-corrosive treatment. So, generally, minor nicks and chips in the head of the fastener should be of little concern when trying to protect your connection from corrosion.

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If you don’t want to pay for stainless steel, but you want protection that exceeds G185, there is a new product: Gold Coat by USP. It takes a G90 zinc-coated steel product and adds an additional protective organic chemical coating. Image A is a galvanized connector after just 480 hours of sea spray. Image B is a Gold Coat hanger, still intact, even after 1,500 hours of similar exposure.