



## Hot-Dip Galvanized Steel

### **What is hot-dip galvanizing?**

Hot-dip galvanizing is the process of dipping fabricated steel into a kettle or vat containing molten zinc. The process provides a distinct advantage over other corrosion protection methods. The coating that develops during the galvanizing process is metallurgically bonded to the steel – virtually becoming a part of the steel itself. During the reaction in the kettle, the zinc interacts with the iron in the steel to form a series of zinc-iron alloy layers.

### **How does hot dip galvanization protect steel?**

Hot-dip galvanizing has a three-fold protective nature. As a barrier coating, it provides a tough, metallurgically-bonded zinc coating that completely covers the steel surface and seals the steel from the corrosive action of the environment. Additionally, zinc's sacrificial behavior protects the steel, even where damage or a minor discontinuity in the coating occurs. Finally, the natural weathering of the coating results in the development of an additional layer of protection on the surface.

### **How does zinc patina protect the hot dip galvanized surface?**

Freshly galvanized steel progresses through a natural weathering process when exposed to wet and dry cycles in the environment. The fully developed patina is a passive, stable film that adheres to the zinc surface and is not water soluble so it does not wash off in the rain or snow. Because of this, the zinc patina corrodes very slowly and protects the galvanized coating underneath, retarding the corrosion rate to about 1/30th that of steel in the same environment. As the zinc patina develops, the galvanized coating will turn a matte gray color. The zinc patina formation is critical in the long lasting corrosion resistance of hot-dip galvanizing.

### **How durable is the hot dip galvanized surface?**

The heart of hot-dip galvanization's durability is the metallurgical bond of the coating. The reaction in the kettle between the zinc and the iron in the steel is unique, and results in the coating becoming part of the steel rather than a surface element as with paint.

Hot-dip galvanizing's abrasion resistance provides unmatched protection against damage during transport as well as in service. Other coatings such as paint typically have bond strengths around 300-600 psi in comparison to galvanizing which is around 3,600 psi.

Hot-dip galvanizing is a total immersion process, meaning the steel is fully submerged into the molten zinc coating all interior and exterior surfaces evenly. Unlike painted tube, this complete coverage ensures even the insides of hollow and tubular structures are coated.

As corrosion tends to occur at an increased rate on the inside of hollow structures where humidity and condensation or submersion occur, interior coverage is very beneficial. Hollow structures that are painted have no corrosion protection on the inside.

Source [www.galvanizeit.org](http://www.galvanizeit.org)



# Sales Bulletin

## Hot Dip Galvanized Vs. Painted Steel

### Why is hot-dip galvanizing superior to paint for corrosion protection?

Hot-dip galvanizing is superior to paint and can provide decades of corrosion protection. Here's why:

- Hot-dip galvanizing is not just a coating like paint. It bonds zinc to the steel at the molecular level.
- In addition to the metallurgical bond, hot-dip galvanizing provides two other types of protection - Cathodic Protection and the Zinc Patina. Paint does not provide these extra protections.

The most serious drawback of paint systems is that if the coating is damaged and bare steel is exposed it will immediately begin to corrode. As the rust increases, it spreads under the remaining paint coating and separates it from the steel causing flaking and peeling. As the paint peels, more steel is exposed and the corrosion accelerates.

Source [www.whyrust.com](http://www.whyrust.com)

| Hot-Dip Galvanized           | vs.                                  | Paint                 |
|------------------------------|--------------------------------------|-----------------------|
| Factory controlled           | <b>Application</b>                   | Field or factory      |
| Inside and outside           | <b>Surface coverage</b>              | Outside               |
| Cathodic & barrier           | <b>Corrosion protection</b>          | Barrier               |
| Excellent                    | <b>Abrasion resistance</b>           | Poor to variable      |
| <3.9 mils (1/4" thick steel) | <b>Coating thickness</b>             | Variable              |
| 3600 psi                     | <b>Bond strength</b>                 | 300-600 psi           |
| Not required                 | <b>Field touch up maintenance</b>    | Required              |
| Not required                 | <b>Special handling for shipment</b> | Non-abrasive blocking |
| 75 years                     | <b>Service life - atmospheric</b>    | 12-15 years           |



Failed rusty painted trailer frame.



Typical galvanized trailer frame.