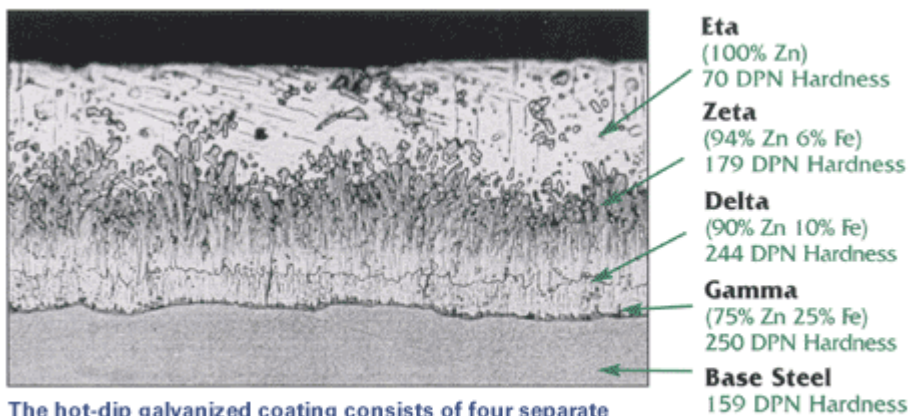


WHAT IS HOT DIPPED GALVANIZING?

Hot-dip galvanizing (HDG), as referenced on this site, is the process whereby fabricated steel, structural steel, castings, or small parts, including fasteners, are immersed in a kettle or vat of molten zinc, resulting in a metallurgically bonded alloy coating that protects the steel from corrosion.

Galvanizing forms a metallurgical bond between the zinc and the underlying steel or iron, creating a barrier that is part of the metal itself. During galvanizing, the molten zinc reacts with the surface of the steel or iron article to form a series of zinc/iron alloy layers. The figure below is a photomicrograph of a galvanized steel coating cross-section and shows a typical coating microstructure consisting of three alloy layers and a layer of pure metallic zinc.

Progressing from the underlying steel surface outward, these are:



The hot-dip galvanized coating consists of four separate layers. The first three layers have a mixture of iron and zinc, and the external top layer is typically composed of 100% zinc.

- The thin Gamma layer composed of an alloy that is 75% zinc and 25% iron
- The Delta layer composed of an alloy that is 90% zinc and 10% iron
- The Zeta layer composed of an alloy that is 94% zinc and 6% iron
- The outer Eta layer that is composed of pure zinc

The galvanizing process naturally produces coatings that are at least as thick at the corners and edges as the coating on the rest of the article. As coating damage is most likely to occur at the edges, this is where added protection is needed most. Brush- or spray-applied coatings have a natural tendency to thin at the corners and edges. The figure below is a photomicrograph showing a cross-section of a corner of a galvanized piece of steel.

Hot Dip Galvanizing is one of the oldest methods of zinc coating which involves immersion of a fastener in molten zinc to provide a corrosion protecting finish. This zinc coating provides sacrificial or cathodic protection to the steel. Because zinc is more reactive than iron, the zinc galvanized coating corrodes first, protecting the steel substrate. The appearance of the galvanized surface can vary from shiny silver to a dull matte gray finish depending upon variables such as the steel composition, rate of withdrawal from the molten zinc bath and cooling method. The dark gray matte finish will provide just as much corrosion protection as the shiny appearance

FACTS ABOUT HOT DIPPED GALVANIZING:

- Using zinc to protect steel from corrosion (hot-dip galvanizing) is a 150-year-old practice!
- Corrosion is caused by the inherent tendency of metals, when subjected to air and moisture, to revert to their original earthly forms, usually an ore state. They do this through a chemical or electrochemical reaction with the environment.
- Galvanizer's kettles (Galva Source) are set at temperatures ranging between 815 F and 850 F (435 C to 454 C).
- A galvanizer knows that a piece of steel should be immersed for a specific amount of time in order for the metallurgical reaction between zinc and iron to reach completion. The completion of the metallurgical reaction is observed when bubbling of the molten zinc in the kettle stops. At this point, the galvanizing is complete and the steel is removed from the kettle to cool.
- Galvanizers can hot-dip galvanize a piece of steel that is larger than the kettle dimensions; it's called [progressive dipping](#).
- Zinc seals the underlying steel from contact with its environment. If the steel is exposed to the elements due to mechanical damage, the surrounding zinc corrodes sacrificially, protecting the underlying steel from corrosive attack.
- The zinc coating on galvanized steel is uniform: inside, outside, corners and edges.
- The hot-dip galvanized reinforcing steel bond with concrete is at least as great as the bond of bare steel to concrete.
- When the Brooklyn Bridge was built, over 14,500 miles of hot-dip galvanized wire were used for its four main cables. Over 100 years later when the bridge underwent massive rehabilitation, the hot-dip galvanized wire was in excellent condition.