Hot-Dip Galvanized Steel vs. Paint

Metrolina Greenhouses Galvanized in 1971

HDG Steel	Vs.	Paint
No	Special Handling	Paper interleve, cloth slings, wood separators
No	Field Touch-Up	Required
Factory	Application	Field or Factory
No	Weather Dependent	Yes
-75F to 392F	Temperature Range	< 200F
Cathodic & Barrier	Corrosion Protection	Barrier
> 3.9 Mils (1/4" thick steel)	Coating Thickness	Variable
3600 psi	Bond Strength	300-600 psi
179 to 250 DPN	Hardness/Abrasion Resistance	Varies by Type
75 Years	Service Life - Atmospheric	12-15 Years

Painted Parking Garage Stairs after (8 years of service)

Initial and Life-Cycle Cost Analysis[1]

Coating System	Initial Cost Per ft²	Initial Cost Total	Life-Cycle Cost[2] (30 years) Per ft²	Life-Cycle Cost[2] (30 years) Total
Galvanized Steel	$1.76	$110,000	$1.76	$110,000
IOZ / HB Epoxy	$2.85	$178,375	$6.67	$416,875
Epoxy Zinc/Polyurethane	$3.16	$197,750	$7.45	$465,625
IOZ/Epoxy/Polyurethane	$4.17	$260,625	$9.56	$597,500
Epoxy/Epoxy	$2.61	$163,250	$10.69	$668,125

[1] This table represents a practical maintenance cycle of expected service life in an industrial environment. It also represents a 250-ton project of typical size/shape, and a 30-year service life. The paint costs are based on a conventional spray, SP6 surface preparation in eastern U.S. exposure.
Source: NACE Paper C2014-4088 *Expected Service Life and Cost Considerations for Maintenance and New Construction Protective Coatings Work* (2014)

[2] Life-Cycle Cost Based on 4% Interest Rate and 3% Inflation

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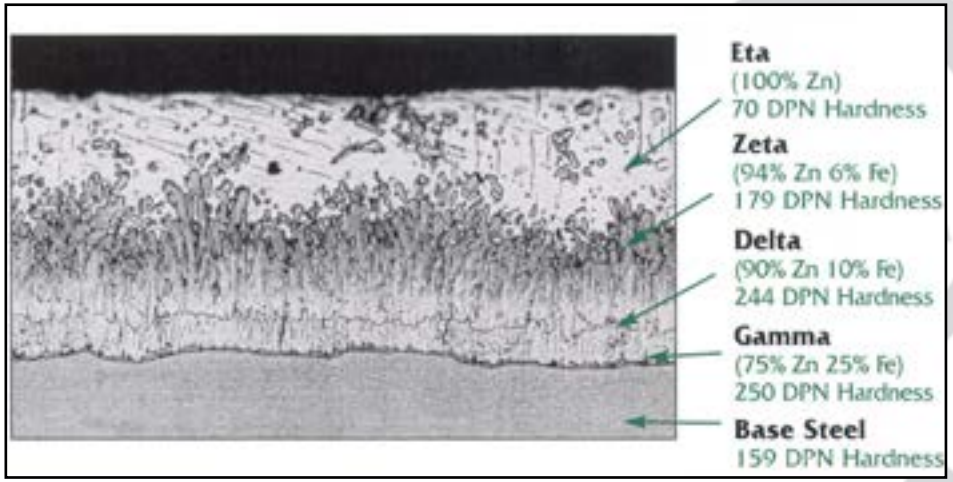
Performance Notes

Special Handling

- The zinc-iron alloy layers of the hot-dip galvanizing (HDG) steel coating are harder than steel and are unaffected by rough handling typical during shipment and erection. Bending of HDG steel pieces in contact with each other is common and acceptable.
- There are significant material and labor costs associated with packaging painted structural steel or steel assemblies for shipping, including wood dunnage and soft material (paper, cardboard) interleave to prevent contact between individual pieces.



Field Touch-Up

- Rarely needed for HDG steel unless for cosmetic reasons to hide a chain mark or to provide corrosion protection to a field-modified area.
- There is usually a time-consuming inspection and field touch-up necessary to repair damaged areas of painted bare steel.

Application

- Galvanizing is always factory-controlled, with a precise, scientific methodology that ensures complete coverage and corrosion protection.
- Whether the application of paint is done in the factory or field, the internal tubular sections and hard-to-reach areas of bare steel remain unprotected; these areas are where corrosion usually begins.

Weather Dependent

- Hot-dip galvanizing can be done 24/7/365, the process is totally independent of weather conditions.
- Painted systems often experience project delays because of unpredictable weather. When the parameters of safe and quality painting (temperature, humidity, wind) are stretched or compromised, coating failure is almost assured.

Corrosion Protection

- Hot-dip galvanizing provides both cathodic and barrier protection to steel, delivering a rust-and-maintenance-free system in most environments for 75 years or more.
- Paint is a barrier protector only, and when scratches and cracks occur, corrosion of the underlying steel is immediate.

Coating Thickness

- The metallurgical reaction between 840F molten zinc and iron in steel ensure a uniform and guaranteed coating thickness, documented in ASTM specifications
- Paint coating thickness on all surfaces is a variable and uniform as the applicator, with corners and edges highly susceptible to corrosion because of thin films.

Bond Strength

- The alloying of zinc and iron in the HDG coating means the zinc and steel metallurgically become one, yielding a coating bond ten times greater than the strictly mechanical bond of paint to steel.

Hardness/Abrasion Resistance

- With a coating hardness greater than the steel alone, galvanized steel provides a durable, scratch-resistant coating that maintains the integrity of overall corrosion protection system.
- Paints are generally not resistant to scratching, cracking, or impact, resulting in a compromised coating where corrosion begins and maintenance painting is required.

Time to First Maintenance

- Hot-Dip Galvanized steel commonly provides maintenance-free corrosion protection for 75 years or more in atmospheric use, especially as our environment and air have become cleaner as a result of regulation.
- Sun, heat, wind and weathering are constants that result in paint typically requiring touch-up and replacement in 12-15 years, costing far more than galvanizing over the intended life of the project.