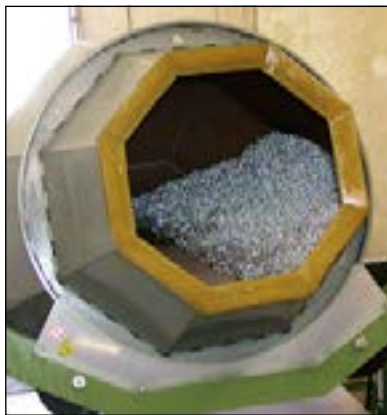


# Hot-Dip Galvanized Steel vs. Mechanical Plating



**Hot-Dip Galvanizing**



**Mechanical Plating**

Hot-Dip Galvanizing	Characteristic	Mechanical Plating (Sheradizing)
\$0.30/lb	<b>Cost</b>	\$0.30/lb
	<b>Coverage</b>	
Yes	Inside hollow section	Minimal
Yes	Difficult-to-reach corners/areas	No
Yes/Yes	<b>Cathodic/Barrier Protection</b>	Yes/Yes
No corrosion cell when in contact with all other zinc coatings	<b>Compatibility</b>	No corrosion cell when in contact with all other zinc coatings
~ 3,600 psi	<b>Bond Strength</b>	~ 400 - 600 psi
	<b>Durability (Service Life)</b>	
> 100 years	Mild - Rural/C2	~ 33 years
> 90 years	Moderate Industry/C3	~ 22 years
> 70 years	Severe Industrial/C5-I	~ 16 years
> 50 years	Seacoast - Heavy Industrial/C5-M	~ 16 years
	<b>Application</b>	
Independent of weather	Conditions	Independent of weather
In shop	Location	In shop
Series of standardized chemical cleaning in caustic, acid, and flux solutions	Surface Preparation	Tumble to remove scale & organic deposits
Timed, regulated, and error free	Procedure	Dependent on tumble time, glass bead size selection
Alloy layers are harder than base steel, with DPN hardness ranging from 179-250	<b>Abrasion Resistance (Hardness)</b>	Zinc coating DPN hardness of 70
	<b>Coating</b>	
> 3.9 mils for 1/4" thick steel	Thickness	0.2 to 4.3 mils
Uniform on flat surfaces, corners, threads & edges	Uniformity	Limited on edges, corners, & threads; uniform on flat surfaces
0.6 oz./ft <sup>2</sup> /mil	Density	~ 0.45 oz./ft <sup>2</sup> mil
70' L x 8' W x 10' D (contact galvanizer) Small parts (centrifuged)	<b>Size Range of Products/Fabrications</b>	Small parts only
< 24 hours	<b>Process Time</b>	< 24 hrs
100% recyclable Saves energy: 8,700 - 14,500 kWh per metric ton of steel produced	<b>Sustainability</b>	Recyclable

<sup>1</sup> 50 year project life, C3: Medium corrosion environment, typical mix of sizes & shapes (250ft<sup>2</sup>/ton.) 10,000 ft<sup>2</sup> project (40 tons,) 3% inflation, 7% interest  
<sup>2</sup> In environments per ISO 12944-2 "Classification of Environments"  
<sup>3</sup> Diamond Pyramid Number scale of hardness

## Characteristic Notes

### Cost

- Hot-dip galvanizing (HDG) accommodates all shapes, sizes and weights of steel in an efficient and cost effective manner. Many small parts, including fasteners, can be galvanized at the same time, and large structural members take a matter of minutes to run through the entire HDG process. The initial cost is significantly lower than the cost of zinc mechanical plating, and considering there are no maintenance costs over the life of most projects, the life-cycle cost of HDG steel is the same as the initial cost.
- Zinc mechanical plating is initially more expensive than hot-dip galvanizing. In addition, because the zinc mechanical plated coating is not as durable as an HDG coating, it periodically requires maintenance - thus life-cycle costs are significantly higher.

### Coverage

- HDG applies zinc throughout a small part/fastener, even into difficult-to-reach corners, crevices, and threads.
- Zinc mechanical plating does not reach into hidden corners, recesses, cavities, and holes, or small threaded pieces.

### Cathodic Protection

- Both HDG and mechanical plating provide cathodic protection; however, mechanical plating is slightly porous with a density of 0.45 oz./ft<sup>2</sup> compared to 0.6 oz./ft<sup>2</sup> for HDG.
- Zinc mechanical plating does not form intermetallic layers and thus, the maintenance-free period for HDG is considerably longer.

### Compatibility

- HDG and zinc mechanical plating are compatible because they are both zinc coatings, thus they can be used on different contacting surfaces without creating a corrosion cell.

### Bond Strength

- The bond of zinc to steel produced by the HDG process is approximately 3,600 psi, making it very difficult to damage the coating.
- Mechanical plating's bond to steel is mostly mechanical, depending on the kinetic energy of the peened particles of zinc and is approximately 500 psi.

### Durability (Service Life)

- HDG metal is maintenance free and commonly prevents any corrosion of the substrate steel for 50-75 years in most atmospheric environments (industrial, urban, marine, and rural) with millions of data points to support that statement.
- Zinc mechanical plating providers qualify such claims only with estimates of when field maintenance will be required in order to meet a designed service life. Estimates to first maintenance range from 16-33 years, depending on the environment.

### Application

- Both HDG and mechanical plating are factory-controlled and can be done 24 hours a day, 365 days a year.
- The HDG cleaning process and immersion in molten zinc are precisely controlled and scientifically founded. If substrate steel is not properly cleaned, the zinc will not react with the steel and imperfections will be immediately noticed and rectified.
- The quality of blasting or tumble cleaning of mill scale and rust on the steel prior to mechanical plating is based on operator expertise and correct selection of glass beads.

### Abrasion Resistance

- Hot-dip galvanized coatings include intermetallic layers harder than the base steel. The zinc-iron alloy layers are metallurgically bonded and difficult to damage and/or remove.
- Zinc mechanical plated coatings are completely zinc metal with a hardness less than one-half of steel, and thus susceptible to scratches and impact damage.

### Coating Thickness & Uniformity

- The HDG coating generally exceeds the minimum coating thickness requirement of ASTM standards; based largely on the chemistry of the substrate steel and surface condition of the steel prior to cleaning. The diffusion reaction between molten zinc and iron in steel is perpendicular to all surfaces and thus edge and corner coating thickness is the same as or greater than the coating thickness on flat surfaces.
- Zinc mechanical plating can be applied anywhere in the range of 0.2 to 4.3 mils, but coating variation is a possibility. Coatings may be thinner on corners, threads, and edges.

### Size Range of Products/Fabrications

- Hot-dip galvanizing is limited only by the size of the galvanizer's kettle of molten zinc. Sixty foot long, 8' wide, and 10' (18.3m x 2.44m x 3.05m) are commonly available. Small parts go through the identical process in a perforated basket so excess zinc can be spun off the parts.
- Mechanical Plating size limitations are < 1lb. and < 4-6"

### Sustainability

- HDG steel is 100% recyclable. The energy required to produce a metric ton of recycled HDG steel is 8,700 - 14,500kWh than that required to produce a metric ton of steel from virgin material. Zinc is the 27<sup>th</sup> most common element in the earth's crust and combined with recycling, a sustainable supply is forecast for many centuries.

