

: Frequently Asked Questions : GALVANIZING Process :

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The following is a list of **frequently asked questions** about hot-dip galvanizing & COLD Galvanizing of MILD STEEL.

1: How does galvanizing protect steel from corrosion ?

Zinc metal used in the galvanizing process provides an impervious barrier between the steel substrate and corrosive elements in the atmosphere. It does not allow moisture and corrosive chlorides and sulfides to attack the steel. Zinc is more importantly anodic to steel . This means it will corrode before the steel, until the zinc is entirely consumed.

2. What are the steps in the galvanizing process ?

There are four steps:

Pre-inspection – where the fabricated structural steel is viewed to ensure it has, if necessary, the proper venting and draining holes, overall design parameters which are necessary to yield a quality galvanized coating

Cleaning – steel is immersed in a caustic solution (Degreasing Solution) to remove oil. Grease, dust and dirt, This is followed by dipping in an acid bath (hydrochloric) to remove mill scale, rust, & finally dipped in bath of flux that promotes zinc & steel reaction, retards further oxidation (steel will not react with zinc unless it is perfectly clean)

Galvanizing – the clean steel is dipped into a kettle containing 450°C molten zinc where the steel. zinc metallurgically reacts to form three zinc-iron inter-metallic layers and one pure zinc layer

Final inspection – the newly galvanized steel is sight-inspected, followed up by measurement of coating thickness with a magnetic thickness gauge

3. How does the cost of hot-dip galvanizing compare to other corrosion protection systems, such as paints?

When compared with paint systems, hot-dip galvanizing after fabrication has comparable initial application costs. In fact, the lower life-cycle costs of a hot-dip galvanized project makes galvanizing the smart choice for future.

4. How long can I expect my galvanized steel project to last in service ?

Hot-dip galvanized steel resists corrosion in numerous environments extremely well. It is not uncommon for galvanized steel to last more than 70 years under certain conditions.

5. Does the galvanized steel coating of zinc resist abrasion ?

The three intermetallic layers that formed by Fusion Bonding between IRON and ZINC Metals during the galvanizing process are all harder than the substrate steel and have excellent abrasion resistance.

6. What causes wet storage stain and how can it be prevented ?

Zinc on newly galvanized steel is very reactive and wants to form zinc oxide and zinc hydroxide corrosion products on exposure to Air, UV Radiation and moisture and Water vapours in the atmosphere. This eventually become the stable zinc carbonate. When galvanized steel is tightly stacked or stored in wet boxes that don't allow for free flowing air, the zinc forms excessive layers of zinc hydroxide, otherwise known as wet storage stain. Most wet storage stain can be easily removed with a cleaner or nylon brush. To prevent wet storage stain, store galvanized steel indoors or block it so that there is ample free flowing air between each galvanized article.

7. Why do galvanized steel appearances differ from project to project and galvanizer to galvanizer and is there any difference in the corrosion protection offered by the different appearing coatings ?

The steel chemistry is the primary determinant of galvanized coating thickness and appearance. Continuously cast steel produced by the steel companies has a wide variety of chemistries, thus the different coating appearances. There are several different additives galvanizers may put in their zinc kettle to enhance the coating appearance by making it shiny, spangled or matte gray. The appearance of the coating (matte gray, shiny, spangled) does nothing to change the corrosion protection of the zinc coating.

8. Can galvanized steel in service withstand high temperatures for long periods of time ?

Constant exposure to temperatures below 390 F (200 C) is a perfectly acceptable environment for hot-dip galvanized steel. Good performance can also be obtained when hot-dip galvanized steel is exposed to temperatures above 390 F (200 C) on an intermittent basis.

9. Why would you want to paint over galvanized steel ?

Called duplex coatings, zinc and paint in combination (synergistic effect) produce a corrosion protection approximately 2 Times the sum of the corrosion protection that each alone would provide. Additionally, duplex coatings make for easy repainting, excellent safety marking systems, and good color-coding. Painting over galvanized steel that has been in service for many years also extends the life of the zinc coating.

10. What are the specifications governing hot-dip galvanized steel ?

Structural steel (plate, wide-flange beams, angles, channels, pipe, tubing) are galvanized to ASTM A 123/A 123M. Fasteners and small parts that fit into a centrifuging basket are galvanized to ASTM A 153/A 153M. Reinforcing steel is galvanized to ASTM A 767/A 767M.

11. Isn't galvanizing more expensive than paint ?

Depending on the product mix, square feet per ton, and condition of the steel surface, galvanizing is often less expensive on an initial cost basis. However the lifetime costs should be considered when making a project decision on the corrosion prevention system to utilize. And, with galvanizing, the life-cycle cost, i.e. the cost per year to maintain, is almost always less than any conventional painting system. Paint systems require maintenance, partial repainting and full repainting several times over a 30-year project life. The costs can be staggering, making the decision to paint a costly one in the long run.

12. What if the article to be galvanized is larger than the dimensions of the galvanizer's kettle? Can it still be galvanized ?

As a routine practice, Hot Dip Galvanizers can progressively dip such a fabrication or article of steel. They dip one half in the molten zinc bath, remove it, turn it around or over and immerse the other half in the zinc.

13. What is the difference between hot-dip galvanized fasteners and zinc-plated fasteners ?

Hot-dip fasteners generally have about 10 times as much zinc on the surface and are suitable for use in all exterior and interior applications. Zinc-plated fasteners will provide a dis-satisfactory anti-rust performance if used outside, especially when used to connect hot-dip galvanized structural steel members.

14. How long will hot-dip galvanizing protect my steel from corrosion ?

The corrosion rate of zinc and how long it will provide protection is a function of the coating thickness and the amount of corrosive elements in the atmosphere. For example, in rural settings where there is less automotive/truck exhaust and plant emissions, galvanized steel can easily last for 100 – 150 years without maintenance. Industrial and marine locations contain significantly more aggressive corrosion elements such as chlorides and sulfides and galvanized steel may last for 50 – 100 years in those cases.

15. Are there any special design and fabrication considerations required to make steel ready for hot-dip galvanizing ?

Yes. Specifically, fabricated steel must allow for easy flow of the cleaning chemicals and molten zinc metal over and through it. This means that gussets must be cropped, holes put in the proper location for draining and venting of zinc from tubular configurations, weld flux removed, overlapping surfaces must be seal-welded, and light gauge material temporarily braced.

16. Where are galvanized steel products used ?

First of all, the variety of things galvanized is broad. Structural steel (angles, channels, wide-flange beams, I-beams, H-beams), grating, expanded metal, corrugated sheets, wire, cables, plate, castings, tubing, pipe, bolts & nuts. The industries that utilized hot-dip galvanized steel range from Infra & EPC Projects, water & wastewater treatment plants architectural Steel Structures (Canopies, facades, exposed structural steel, lentils, reinforcing steel for concrete decks, exposed structural steel columns & barriers, pulp & paper plants (structural steel, walkways, handrail), motor housings, electrical cabinets, frames, heat exchanger coils) : Transmission towers, distribution poles, substations, wind turbine poles), Signal Antennas, cell towers, rail transportation (poles, switchgear, miscellaneous hardware), chemical/petrochemical plants, Off-Shore constructions, (pipeline hardware manufacturing buildings, storage tanks, walkways) SILOS, tank Farms, Chemical & Steam Pipelines, FENCE poles, boats, trailers, stadiums, arenas, Road Crash Guards, racetrack fences) Pre Engineered Metal Buildings and almost every MILD STEEL Fabrications.

17. What are the size limitations of steel that is to be galvanized ?

The hot-dip galvanizing process can accommodate various different shapes and sizes of steel. Kettle sizes will vary in length, breadth & height dimensions from one galvanizer to the other.

18. What types of products can be galvanized ?

Almost any and every type of Mild Steel fabrications for a variety of applications are Hot Dip Galvanized.

19. Sometimes, the galvanized coating is shinier in some places than others. Why is that ?

The galvanized coating appearance may either be bright and shiny resulting from the presence of an outer layer of pure zinc, or duller, matte gray as the result of the coating's intermetallic layers being exposed. Performance is not affected. Coating appearance depends on the amount of zinc in the coating. Shining also results on the percentage of Aluminium in the Galvanizing bath as well as the Composition of FLUX.

20. Is the zinc coating's thickness consistent over the entire piece ?

Coating thickness depends on the thickness, roughness, chemistry, and design of the steel being galvanized. Any one or all of these factors could produce galvanized coatings of non-uniform thickness.

21. What can I do to minimize possible warping & distortion? Is it possible to determine – prior to galvanizing – which pieces might be prone to this occurrence?

Minimizing potential warpage and distortion is easily done in the project's design stages by selecting steel of equal thicknesses for use in every separate subassembly that is to be hot-dip galvanized, using symmetrical designs whenever possible, and by avoiding the use of light-gage steel (<1/16" / 1.6 mm). Some structures may benefit from the use of temporary bracing to help maintain their shape and / or alignment.

22. Can I paint right over the galvanized coating? If so, what procedure should be followed?

Galvanized coatings can be easily and effectively painted, not only for aesthetics but also to extend the structure's service life. The age and extent of weathering of the galvanized coating dictate the extent of surface preparation required to produce a quality paint system over galvanized steel. ASTM D 6386, Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting, should be referred for suggested surface preparation methods for galvanized coatings of varying ages.

23. How much weight will my material gain from galvanizing ?

As an average, the weight of the article will increase by about 2 to 3% due to zinc picked up in the galvanizing process. **However, that figure can vary greatly based on numerous factors.** The fabrication's shape, size, and steel chemistry all play a major role, and other factors like the black weight, the different types of steel that get welded together, and the galvanizing bath chemistry can also have an effect.

24. Are slip-critical connections a concern when the steel is to be galvanized ?

When galvanized parts are used for slip-critical connections, they must either be brushed, abrasive blasted, or painted with zinc-silicate paint to increase the surface roughness and, thus, the slip factor.

25. I'm interested in specifying hot-dip galvanizing for reinforcing steel. Are there any concerns with fabricating rebar after galvanizing ?

Rebar is commonly fabricated after galvanizing. In order to minimize the possibility for coating damage, avoid bending the rebar at a radius of more than 8 times its radius. ASTM A 767, *Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement*, has a table that provides maximum bend diameters for various-sized rebar.

26. Can I specify how much zinc to put on the steel ?

No, the steel chemistry and surface condition are the primary determinants of zinc coating thickness. Leaving the steel in the molten zinc a little longer than optimal may have one of two effects : (1) it may increase the coating thickness, but only marginally; (2) It may significantly increase the coating thickness and cause a brittle coating.

27. What does it mean to "double-dip" steel ?

"Double-dipping" is the progressive dipping of steel that is too large to fit into the kettle in a single dip. Double-dipping cannot be used to produce a thicker hot-dip galvanized coating.

28. What is the reason for incorporating venting & drainage holes into a project's design ?

The primary reason for vent holes is to allow otherwise trapped air and gases to escape; the primary reason for drain holes is to allow cleaning solutions and molten zinc metal to flow entirely into, over, and throughout the part, and then back into the tank or kettle.

29. If I stitch-weld, will there be uncoated areas after galvanizing ?

When stitch-welding is used, there is a possibility of gas release between gaps, which will prevent the galvanized coating from forming in these areas. By leaving at least a 3/32" (2.4 mm) gap between the contacting surfaces, gases are allowed to escape and cleaning solutions and molten zinc are allowed to flow in between the surfaces for a complete and uniform coating.

30. What is "white rust" and how can it be avoided ?

"White rust" is the term mistakenly applied to wet storage stain, which actually is a milder corrosion product than white rust. Wet storage stain can be avoided by properly stacking freshly galvanized articles, avoiding unprotected exposure to wet or humid climates, or by using a surface passivation treatment (Dip in very dilute Dichromate Solution) after galvanizing. Wet storage stain typically weathers away once the part is in service. WHITE RUST is most commonly associated with galvanized cooling towers structures and Marine , Off-shore Fabrications.)

31. Is there any environmental impact when the zinc coating sacrificially corrodes ? Is zinc a safe metal ?

There are no known studies to suggest zinc corrosion products cause any harm to the environment. Zinc is a naturally occurring element (25th most abundant element in the earth), and necessary for all organisms to live.

32. Should I be concerned when galvanized steel comes in contact with other metals ?

Zinc is a noble metal and will sacrifice itself (i.e. corrode, give up its electrons and create a bi-metallic couple) to protect most metals. So, it is recommended to insulate galvanized steel so that it doesn't come in direct contact with dissimilar metals. Rubber or plastic, both non-conductive, are often used to provide this insulation.

33. What is the difference between hot-dip galvanizing after fabrication and continuous hot-dip galvanized sheet ?

The process steps are similar but the production equipment is very different. After fabrication galvanizing is a more manual process where structural steel (fabricated plate, wide-flange beams, angles, channels, tube, pipe, fasteners) is suspended by wire, chain or hook from crane hoists and immersed in the cleaning solutions and zinc. Continuous sheet galvanizing involves uncoiling sheet, passing it through the cleaning steps and molten zinc bath at speeds up to 500 feet per minute, drying and recoiling. The uses of after-fabrication galvanized steel are usually exterior in nature because the zinc coating is relatively thick (3.0 – 6 mils, 75 – 150 microns, 1.7 to 3.6 oz/sq. ft.) and will protect steel from corrosion in most severe & Corrosive atmospheric conditions for 50 to 100 years. Galvanized sheet is suitable for interior applications because of the relatively thin coating (0.45 oz on each side), unless it is painted after galvanizing.

34 . Is a salt spray test in a laboratory appropriate to estimate the corrosion rate of zinc coated steel ?

In order for zinc to develop its protective patina of zinc carbonate that is very stable and non-reactive, it requires a wetting and drying cycle like that produced by nature. Salt spray tests keep the zinc wet and essentially wash the zinc corrosion products off as they develop, inflating corrosion rate of zinc. **This lab test is not reflective of real -Life performance of zinc coatings.**

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37. What is "Cold Galvanizing " ?

There is no such thing as cold galvanizing. The term is often used in reference to painting the MILD STEEL Fabrication or damaged galvanized structure or object with 99% pure zinc-rich paint. Galvanizing by definition means a metallurgical reaction between zinc and iron to create a METALLIC bond between the zinc and the steel of approximately 3600 psi. There is no such reaction when zinc-rich paints are applied and the bond strength is only several hundred psi. Application of ZINC RICH PAINTs will Completely SEAL THE EXPOSED , SCRATCHED , WELDED , DAMAGED Surface (resulting from REMOVAL OF Zinc Layer on Mild Steel . Such damaged surfaces are VIRGIN and are much more prone to atmospheric Corrosion. Corrosion and RUSTING are a SUB-SURFACE Phenomenon and will propagate under the Galvanized Zinc Coating layer. Hence it is Customary and Mandatory to coat such areas with ZOLD GALVANIZING Zinc Rich Paints :

38 . How are ZINKOTE 20 GP & Premium ZINC RICH Paints Different than Conventional Zinc Phosphate , Zinc Silicate , Zinc Chromate Paints ; For TOUCH UP of Damaged galvanized steel products ? Our ZINKOTE 20 GP and ZINKOTE Premium Paints are manufactured using 99% PURE ZINC METAL DUST/FLAKES. As these are extremely Pure ZINC METALS based, with Instant Air Drying Pure Acrylic Resins blended paints, these paints offer a MUCH SUPERIOR & UNIQUE ANTI-CORROSION, compared to the normal ZINC PIGMENTS based paints. **More-Over, Hot DIP Galvanizing is a PURE ZINC MOLTEN FILM METAL to METAL Bond Between Iron metal and ZINC Metal. Hence ZINKOTE 20 Grades Zinc Rich Paints are a very superior option to Zinc Compound based paints, in terms of VERY LONG ANTI CORROSION LIFE to the GI and STEEL Fabricated Structures :**

APPLICATION AREAS : TARGET BUYERS : POTENTIAL USER INDUSTRIES



STANDARDS for Reference : Confirms to the requirements of ASTM A – 780 / IS 4759 / BS : 729

39 . WHICH are the National And International Standards for Galvanizing Process ?

: Various INDIAN Standard Specifications for GALVANIZING INDUSTRY :

- IS 4826 – 1968** Galvanized Coating on Washers.
- IS 5358 – 1969** Hot Dip Galvanized Coating on Bolts and Nuts and FASTNERS.
- IS 2629 – 1966** Recommended practice for Hot Dip Galvanizing of Iron & Steel.
- IS 4736 – 1968** Hot Dip Galvanizing on Steel TUBES.
- IS 4759 – 1968** Hot Dip Galvanized Coating on Transmission Line Towers & STRUCTURAL STEEL .

: British Standard Specifications (B S) for Galvanized Products:

- BS 729 – 1971** Recommended practice for Hot Dip Galvanizing of Iron & Steel articles.
- BS 2989 – 1967** Hot Dip Galvanized Plain Sheet and Coil .
- BS 3083 – 1959** Hot Dip Galvanized Corrugated Sheet for general purposes .
- BS 1775 – 1964** Steel Tubes for mechanical, Structural & General Use
- BS 443 – 1969** Galvanized Coating on WIRES.
- BS 2763 – 1968** Galvanized Coating on Rounded Steel Wires for Ropes.

: AMERICAN Standard Specifications (ASTM) for Galvanized Products :

- A 53 – 67** Hot Dip Zinc Galvanized coating on Welded & Seamless Steel Pipes .
- A 123 – 71** Hot Dip Zinc Galvanized coating on products fabricated from Rolled , pressed & forged Steel Shapes, plates , Bars & Strips. .
- A 153 – 71** Hot Dip Zinc Galvanized coating on iron & Steel hardware.
- A 392 – 71a** Hot Dip Zinc Galvanized coating on Chain Link Fence Fabric.
- A 394 – 65** Hot Dip Zinc Galvanized coating on Transmission Tower Bolts & Nuts.
- A 446 – 71** Hot Dip Zinc Galvanized coating for Structural Quality Steel.
- ASTM A-780** Standard Practice for Repair of Damaged Hot Dip Galvanized Coatings.
- ASTM A-123** Zinc (Hot Galvanized) Coatings on Iron and Steel Products.
- ASTM A-153** Zinc Coating (Hot Dip) on Iron and Steel Hardware.

40 : WHICH are the Products offered by PROMTECH (Innovative : Pune) for Galvanizing Process ?

INNOVATIVE COATING INDUSTRIES : Offers the following products for COLD GALVANIZING Touch Up applications . These are extensively used for Repairs, Over-Coating and extended Anti – Rust Protections as well as Aesthetic looks on all Galvanized Metal Fabrications and Surfaces. These ZINC RICH PAINTS can also be used as a Highest grade Primer Coat or a FINISH COAT for ALL MILD STEEL FABRICATIONS: The Products offered are :

			
Light Grey Finish 500 ml Aerosol Spray Rs 275 per aerosol	Made using ZINC DUST GP & Premium grades Zinc Rich Paints 20 Ltr Drums Rs 390 / Litre	Made using Zinc Flakes 20 Ltr Drums Rs 630 per Litre	Silver Bright Finish 500 ml Aerosol Spray Rs 320 per Aerosol

Vat 12.5 % Extra + Forwarding : All products available Ex Stock from our PUNE and THANE locations :

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