

How to Minimise Distortion when hot-dip galvanizing.

WHY GALVANIZE?

Hot dip galvanized coatings are applied to steel to improve the anti-corrosion performance of the steel to ensure that it lasts as long as possible with a minimum of maintenance

COATINGS DIFFER

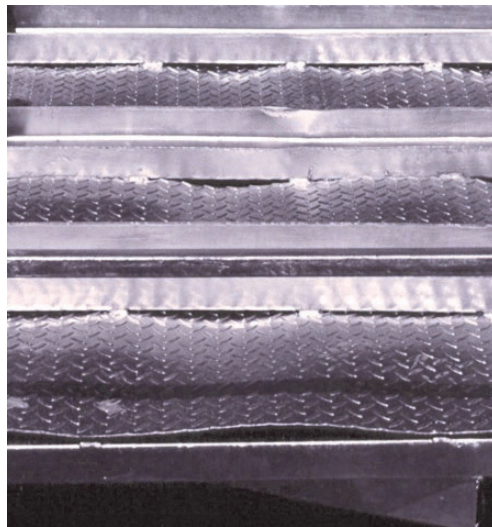
Only hot-dip galvanizing gives a coating that can reach the 50 year life required of structural building products.

THICKNESS COUNTS

Compared to other zinc-rich coatings, hot-dipped galvanizing is:-

- THICKER
- HARDER
- FULLER

HOT-DIP GALVANIZED
PRODUCTS LAST
LONGER...



Distortion of hot dip galvanizing components can be minimised or eliminated by correct design, fabrication and galvanizing

When steel sections or fabrications are immersed in molten zinc, their temperature is raised to that of the molten zinc which is typically 455°C. The rate at which the steel will reach this temperature across its entire surface will depend on:

- the thickness of the sections used in fabricating the item
- the rate at which the item can be immersed in the molten zinc
- the total mass of the item
- the dimension of the item - large items exceeding bath dimension require double-dipping.

At galvanizing temperatures, there is no change to steel's metallurgical micro-structure and the galvanizing process is not hot enough to have any affect on the mechanical properties of the steel after galvanizing.

However, at galvanizing temperatures, the yield strength of steel is lowered by approximately 50%. If the adjacent steel is not at the same temperature and any stresses exist, the weaker area will be subject to movement by the stronger area. There is a responsibility on the designer, the fabricator and the galvanizer to co-operate in ensuring that distortion risks are minimised or eliminated.

Use design and fabrication techniques to avoid distortion :-

1. Design and fabricate sections of uniform steel thickness.
2. Use symmetrical designs where possible, and avoid asymmetrical designs where cleats or plates are welded to one side only of a beam or RHS section.
3. Avoid designs which require fabrications with a large surface area of thin plate to be double-dip galvanized.
4. During fabrication use balanced or staggered welding techniques to avoid uneven locked-in stresses.
5. If cutting a plate to size, ensure all sides are cut using the same technique. Guillotine is the preferred cutting technique.
6. Ensure that the structural design of the item is sufficient to support its own weight at 50% of the steel specified yield strength. Consider temporary bracing if potential to yield exists.
7. Ensure that venting and draining holes are adequate. This will allow the item to be immersed and withdrawn from the molten zinc as quickly as possible.

How to Minimise Distortion when hot– dip galvanizing

TRIED & PROVEN

Over 40 years of field testing shows that galvanized coatings perform well even in harsh environments.

HOW CAN I MINIMISE DISTORTION?

In most cases, distortion risks can be minimised or designed out of fabrications in consultation with the galvanizer. However, some types of products have a higher risk of losing dimensional stability during the galvanizing process and design becomes critical in those cases.

WHY GALVANIZE WITH INDUSTRIAL GALVANIZERS?

For steel users requiring fast, proven corrosion protection for local or national projects Industrial Galvanizers is the established hot dip galvanizer with nationwide coverage.

8. During fabrication, accurately perform parts to avoid force or restraint during welding.
9. Consider (or consult your galvanizer) the hanging requirements for the hot dip galvanizing process. This will ensure the fabrication is adequately supported throughout the process.

Items that are prone to distortion.

Most steel sections and fabrications that are hot dip galvanized never give rise to distortion problems. However, certain types of products have a high risk of losing dimensional stability during the galvanizing process. Some examples are:

- **Thin (6 mm and under) flat sheet and plate** will almost always ripple or buckle unless it is ribbed or corrugated. Flat steel sheet used for box trailer floors will always buckle when the trailer is galvanized. The ribbed sections of the same thickness (1 mm) used for the side sections will rarely buckle.
- **Long lengths of light wall pipe** (spiral or seam welded) or other long, thin sections can be prone to bending during the galvanizing process. As the yield strength of the steel is halved at galvanizing temperature, long lengths of light section can bend or distort under their own weight. This can be avoided by designing dipping equipment that supports the product or by adequate hanging or support points along the length of the section.

- **Floor plate welded to heavier structural framework** render the fabrication prone to distortion because of differential expansion and contraction of the plate and structural sections. The framework and the plate should be galvanized separately and then mechanically fixed.
- **Welded beams with a flange to web thickness ratio of greater than 2:1**, particularly long beams that need to be double-dipped, may present a risk of distortion. Your galvanizer should be consulted at the design stage to ensure satisfactory processing of these types of products.
- **Fabrications containing large areas of asymmetrical welds** (e.g. crane beams). The welding stresses built into these fabrications will significantly increase the risk of distortion as the temperature of the galvanizing process will stress relieve the fabrication.

In most cases, distortion risks can be minimised or designed out of fabrications in consultation with the galvanizer. Efficient design that allows the fabrication to be quickly immersed in the molten zinc to minimise differential temperature stresses that are the major cause of distortion.

A.C.N. 000 545 415

Registered Office:
11 Talavera Road,
Macquarie Park, NSW 2113

INDUSTRIAL GALVANIZERS (AUSTRALIA)

Townsville | Brisbane | Newcastle | Sydney | Port Kembla | Melbourne | Launceston | Perth

www.ingal.com.au

www.valmont.com

