

THE PRINCIPALS OF AVOIDING DISTORTION

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

- Design and fabricate sections of uniform steel thickness.
- 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.
- Avoid designs which require fabrications with a large surface area of thin plate to be double-dip galvanized.
- During fabrication use balanced or staggered welding techniques to avoid uneven locked-in stresses.
- If cutting a plate to size, ensure all sides are cut using the same technique. Guillotine is the

preferred cutting technique.

- 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.
- 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 This will allow the item to be immersed and withdrawn from the molten zinc as quickly as possible.
- During fabrication, accurately preform parts to avoid force or restraint during welding.
- 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 WHICH 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:

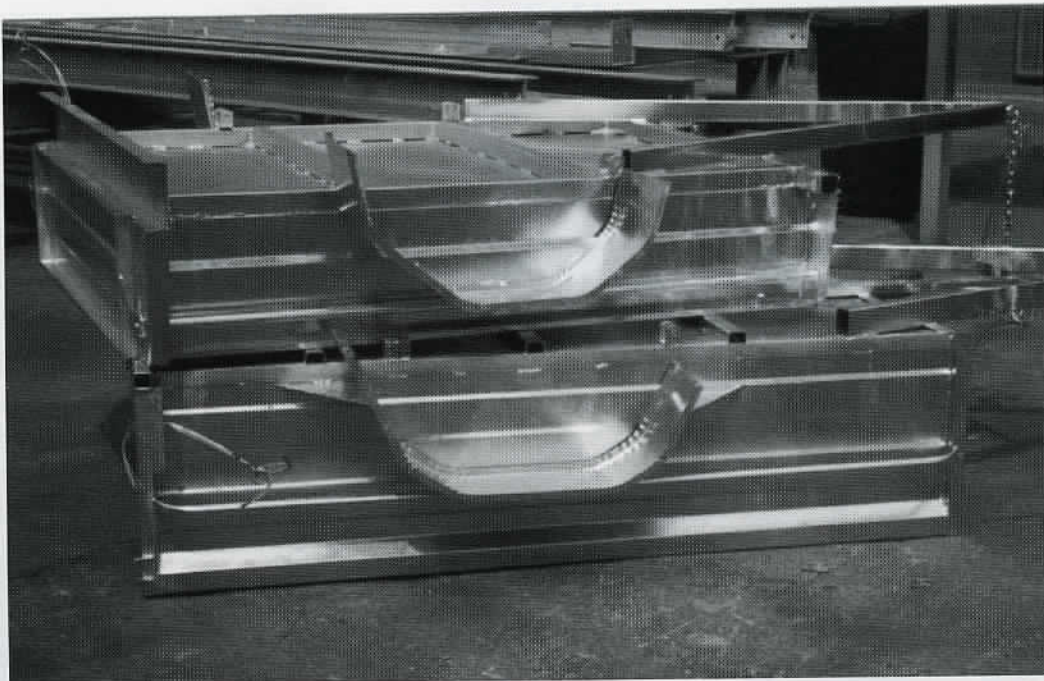
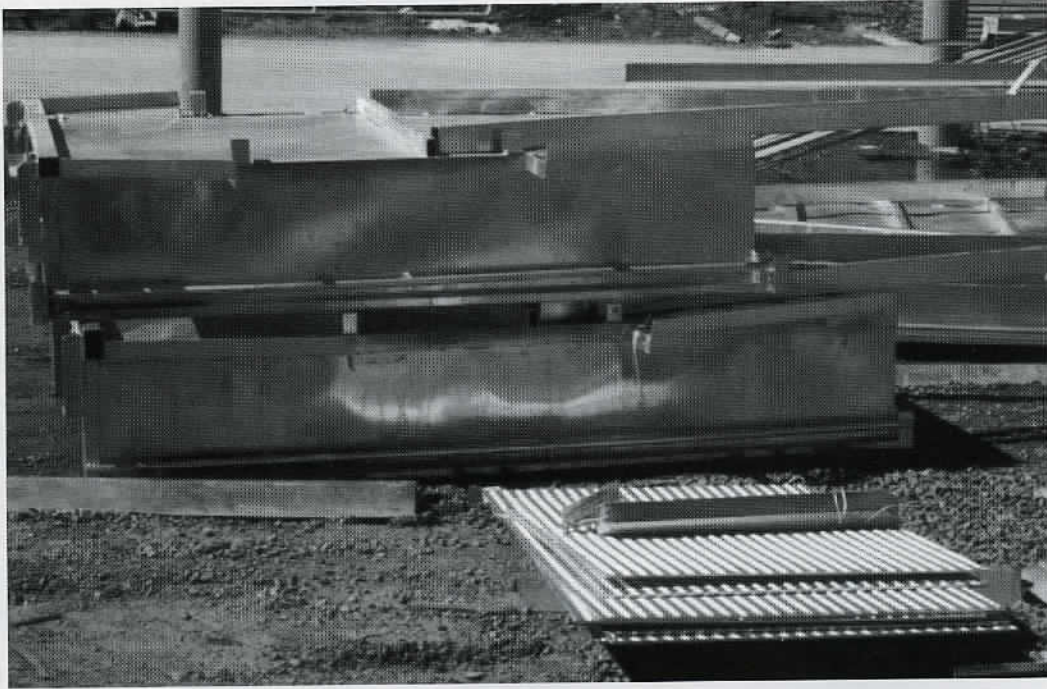
- Thin (6 mm and under) flat sheet and plate will almost always ripple or buckle unless it is ribbed or corrugated. Flat steel sheet used for box trailer floors will always buckle when the trailer is galvanized. The ribbed sections of the same thickness (1 mm) used for the side sections will rarely buckle.
- 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. □



These two box trailer designs illustrate how simple design changes can minimise or eliminate distortion. The 1mm thick side walls on the top trailers show significant buckling. The ribbed sides of the bottom trailers (same thickness) show no sign of buckling distortion.

CORROSION MANAGEMENT

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Editor.

CONTENTS

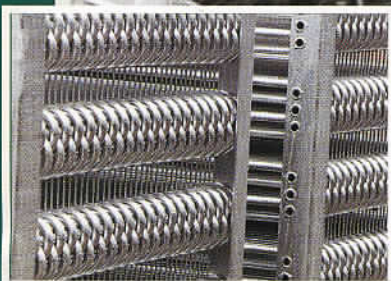
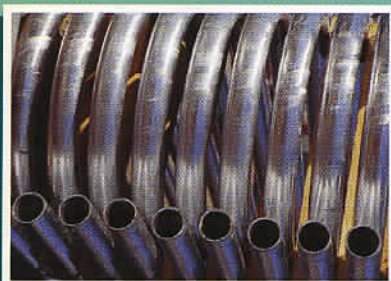
2	...	Editorial
3	...	Galvanized Coating Characteristics
6	...	Repairs To Galvanized Coatings
8	...	White Rust - Prevention And Cure
11	...	Galvanizing Difficult Steels
13	...	Powdercoating Over Galvanizing
15	...	Tolerances On Moving Parts
17	...	The Principals Of Avoiding Distortion
19	...	Venting And Draining - How To Get The Hole Size Right
21	...	Does Galvanizing Affect Steel Strength?
23	...	Preparing Hot Dip Galvanized Coatings For Painting
24	...	Thicker Hot Dip Galvanized Coatings
26	...	Galvanizing A Box Or Boat Trailer
28	...	Industry News - The Scanning Kelvin Probe - CSIRO's New Weapon In The Corrosion Wars
31	...	New Publications From SSPC
32	...	Alsafé Introduces Mini Temp Temperature Reader

***Cover:** Hot dip galvanized coatings provide long-term protection from corrosion for a wide range of manufactured products, including more architectural applications, as designers increasingly use high quality galvanized coatings as a self-finish for its aesthetic appeal.*

CORROSION MANAGEMENT

Volume 9, No 2
Registered by Australia Post PP No. 229640/00002

November 2000



SPECIAL HOT DIP GALVANIZING ISSUE

- Repairs to galvanized coatings
- White Rust - prevention and cure
 - Avoiding distortion
- Powder coating over galvanizing
 - ...and lots more