

# HDG – PAINTING CONSIDERATIONS

## BEFORE YOU PAINT HDG STEEL

There are several factors to be carefully considered before deciding to paint hot dip galvanised (HDG) steel. The following factors can all individually cause an unsatisfactory result. A combination of factors raises the question whether painting should proceed at all.

### ENVIRONMENTAL FACTORS

The following factors greatly shorten service life of HDG steel:

- Marine Exposure (salt, moisture)
- Chemical Exposure (acid, alkali, etc)
- Tropical Climate Exposure (Moisture)
- Indoor Swimming Pool Exposure (chlorine, moisture)

### DESIGN AND STRUCTURAL FACTORS

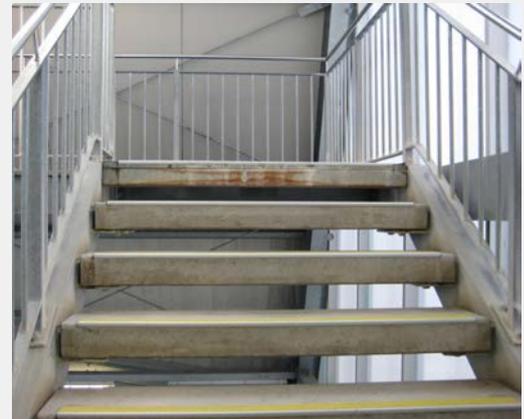
- **Sharp edges** – a coating applied to a sharp edge will always pull back from the edge, leaving the edge with a very low film build. This edge is therefore highly prone to edge corrosion. To ensure consistent and adequate coating thickness, the sharp edge must be rounding off to a minimum radius of 2 millimetres. Sharp steel edges that have been hot dip galvanised present the same problem when applying a coating – inadequate edge coverage along the sharp edge. When grinding off the sharp edge of a galvanised steel section, the exposed steel on the rounded edge must be stripe coated with “cold galv” primer to reinstate the zinc. This represents considerable time and expense, and offers a substandard solution to the problem.
- **HDG steel purlins** – the inside of the deep “C” section of a purlin is difficult to paint to achieve a smooth, uniform protective coating. This is of particular concern in humid or chemical environments, such as indoor aquatic centres or manufacturing plants, where moisture condenses within the purlins. The zinc readily reacts with the moisture to form white rust (and sheds any applied finishes). This process continues until all the zinc is consumed and the exposed mild steel begins to corrode. Purlins also have **sharp edges**, creating edge corrosion problems (see above).
- **Defects** such as air pockets and blisters in the HDG within the angles of the metal section are extremely difficult to detect if present.
- **Inaccessible sections** – sometimes sections are welded together in such a way that prevents access by brushes, rollers or spray units. Fixings can also reduce access of application tools.
- **Fixings** – if the fixing is of a different metal to the HDG steel and the two are in contact, then a resultant current will cause corrosion. A plastic isolator must always separate dissimilar metals. Some plastics can present paint adhesion problems. During application, paint can pool<sup>1</sup> around the base of the fixing and may cause excessive film builds and mudcracking<sup>2</sup>.

<sup>1</sup> Pooling - the behaviour of paint when flowing down a vertical surface onto a horizontal surface or away from a sharp edge. The surface tension of the paint prevents the paint from spreading out, so it remains in a small pool.

<sup>2</sup> Mudcracking - the cracking of the surface of paint when it dries when the paint has been applied in excess of its maximum recommended film thickness.



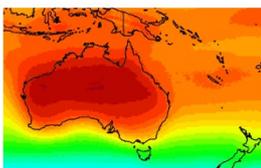
*Sacrificial corrosion protection at Docklands Landing after 6 years exposure is clearly inadequate.*



*Aquatic centres are extremely corrosive environments. This swimming pool steelwork was around 5 years old*



*Same aquatic centre; dissimilar metals must not be in contact with each other!*



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## SURFACE PREPARATION FACTORS

- Insufficient abrasion – surface profile is not high enough for the coating system to key into, resulting in loss of adhesion.
- Dags/lumps of galvanising not removed – apart from the disappointing appearance of the painted steel, dags are often poorly bonded to the steel, and can simply drop off, particularly in response to steel expansion and contraction when subject to hot/cold temperature cycling.
- Acid wash – the traditional acid etching method of HDG steel would often result in traces of acid residues being entrapped under the coating system, causing deterioration of the galvanising layer and subsequent coating failure. Hence acid etch is no longer considered a viable method of surface preparation.

## APPLICATION FACTORS

- Insufficient film build - the wet film thickness of a coating is quite easy to measure using a wet film build gauge, but hot dip galvanising thickness is much more difficult to measure and rectify.
- Incorrect coating - eg alkyd enamels saponify on contact with zinc<sup>3</sup>
- Surface is not fully encapsulated - misses, difficult to reach areas.
- Handling and erection damage not repaired - similar effect as misses.
- On site storage prior to application - potential surface contamination.

## MAINTENANCE FACTORS

If ongoing maintenance is your responsibility, keep in mind that:

- A coating supplier can't offer a warranty for their coating's long term performance over HDG steel as the behaviour of the HDG steel itself is an unknown factor. The coating supplier can offer a warranty, however, for products applied to mild steel prepared and painted according to the supplier's specifications
- You can't re-hot dip steel without great difficulty

## CONCLUSION

If you are in a position to choose whether to hot dip galvanise your steel, then paint it, or to abrasive blast clean and paint your steel with a protective coating system, consider the sacrificial nature of HDG steel, particularly in humid and chemical environments and the short and long term difficulties associated with painting and maintaining HDG steelwork.

*For more information, please contact the Dulux Protective Coatings Technical Consultant in your state.*

<sup>3</sup> Saponification - Breakdown of a paint film resulting from the reaction of alkali (galvanised surface) on the binder medium (resin) in paint. This reaction forms a soap film that will cause softness and loss of adhesion of the coating.



*This deep "U" section shows bubbles and brittleness of the HDG. Surface preparation and painting will be extremely difficult if the applicator accepts the work. Long term durability is very doubtful.*



*The smooth surface should have been abrasive whip blasted prior to painting. Lake Pertobe playground Warrnambool Victoria*



*Bentleigh Primary School Queensland enjoys bayside sea breezes, but the chloride-laden air accelerated the sacrificial corrosion mechanism of the five year old painted HDG steelwork*