TECH NOTE 1.2.4

HDG – PAINTING ISSUES

WHY PAINT HDG STEEL?

Hot Dip Galvanised (HDG) steel surfaces are often painted for one or more of the following reasons:

- Improved aesthetics/appearance – hot dip galvanising can have an uneven, patchy appearance, from very bright silver to dull grey to white. Paint provides a uniform finish in either solid colours or metallic finishes.
- Improvement in protection to the mild steel substrate – protective coatings provide a barrier between the sacrificial zinc layer and the environment. In severe coastal environments the zinc layer will sacrifice itself rapidly, thus reducing its life considerably.

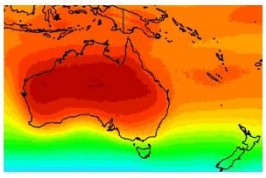
ISSUES WITH PAINTING HDG STEEL

- The hot dip process requires strict control over surface preparation and application processes much the same way as required for the application of an applied coating and it is just as vulnerable to variations in quality of the finished product. These variations are outside the control of a supplier of subsequent paint products and therefore painting over galvanising must be treated with the same caution as painting over another company's primer.
- Due to the multi-step process of hot dip galvanising, large variations in the condition of the surface can occur. This can affect the performance and appearance of any applied coating system.
- In immersed or high humidity conditions, moisture vapour will eventually penetrate the coating and take with it soluble salts. These soluble salts will initiate corrosion at the zinc/coating interface to produce soluble corrosion products, commonly known as "white rust". White rust takes up more volume than the original zinc metal, forcing the paint to delaminate from the surface. Once the paint begins to shed from the surface, ever more moisture comes in contact with the newly exposed zinc surface, rapidly accelerating the corrosion process.
- The quality of surface preparation, and the presence of corrosion products or soluble contaminants are more difficult to assess visually on the lighter HDG steel surface than a mild steel surface.
- Care needs to be taken to ensure a suitable coating is used to prime a HDG steel surface. Zinc-rich coatings, including hot dip galvanising, are alkaline in nature. When oil based (alkyd) coatings are applied directly onto alkaline surfaces a reaction occurs with the alkyd resin, which will cause delamination of the coating - this is known as saponification[i]. Typical coatings for HDG steel include water-based acrylics, vinyl butyrate etch primers, solution vinyls and epoxies. The choice of product type is determined by environment and performance requirements.
- Corrosion products or soluble salts left on the surface prior to painting can draw moisture through the paint film, accelerating corrosion and leading to blistering (commonly known as "osmotic blistering").
- The surface of HDG steel is usually very smooth. Good coating practice requires the removal of contaminants that may interfere with adhesion and mechanical abrasion (using non-metallic abrasive) to maximise mechanical and chemical adhesion. Please refer to Dulux Protective Coatings Tech Note 1.2.2 'Surface Preparation Issues' and Dulux Protective Coatings Tech Note 1.2.3 'Preferred Surface Preparation Methods'.

HDG process can produce wide variations in product quality

Osmotic blistering is identified by broad areas of blistering. Often the blisters contain water.

Poor surface preparation and primer choice were factors in system failure



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DO THESE ISSUES EXIST WITH ZINC-RICH PRIMERS?

Zinc rich primers contain very high levels of zinc metal. The difference between the zinc levels of HDG (100% zinc) and zinc rich primers (~80% zinc) is only around 20% and therefore they both offer similar galvanic corrosion protection.

Organic zinc rich primers offer a flat, uniform surface for the subsequent coating to adhere to. Furthermore, if applied during the primer's recoat window, the intermediate coat forms an extremely tight chemical bond with the zinc rich primer, and offers outstanding barrier protection.

As both surface preparation and priming of the steel are generally done in shop, corrosion products and soluble salts, the causes of osmotic blistering, are unlikely to be trapped between the primer and subsequent coatings.

On the other hand, newly HDG steel is extremely smooth and provides neither a mechanical bond nor a chemical bond with the applied coating. The smooth surface cannot be painted without degreasing and a whip blast first.

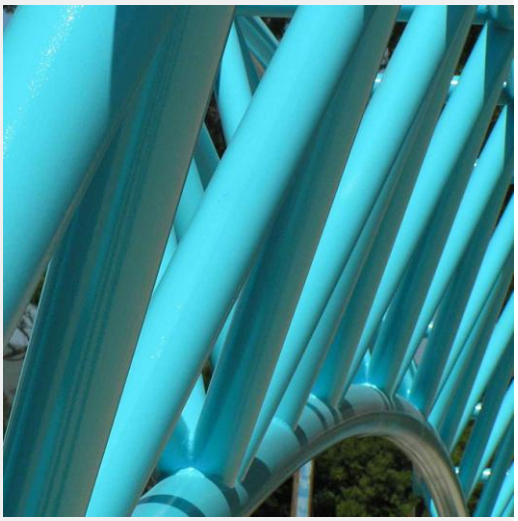
If the HDG steel is allowed to "weather" and allow its shiny layer to oxidise and become chalky, the oxidation products present more problems for the painter. All chalkiness and salt deposits must be removed prior to painting or the applied coating will eventually blister and peel off.

Manufacturers ensure that their zinc-rich primer has tenacious adhesion to both the properly prepared mild steel surface and their own intermediate and topcoats. These coating systems are generally designed to prevent the ingress of salts, moisture and oxygen, virtually eliminating such problems as the formation of white rust. The zinc metal is present as finely divided pigment in the primer, spaced out by resin. The "spacing out" of the zinc metal accommodates any zinc corrosion products (should they occur), without loss of coating adhesion.

When painting over HDG steel, the applicator is applying one supplier's product over another supplier's product, which voids any implied warranties and increases risk to the asset owner.

For more information on the advantages of inorganic zinc silicate coatings, please refer to Dulux Protective Coatings Tech Note 3.8.1, and for those of zinc-rich epoxy primers please refer to Dulux Protective Coatings Tech Note 3.8.2.

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



Barrier protection and galvanic protection (with products from a single supplier) work hand in hand to offer total corrosion protection and peace of mind.

"Duplex systems" (HDG and paint) in coastal environments often fail within a few years.

[i] 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.