Hot Dip Galvanising (HDG) 1.2.5

Important Considerations before Choosing to Paint HDG Steel

There are a number of factors that need to be carefully considered when considering painting over galvanised steel. The following factors can all individually add to make it a difficult task to obtain a satisfactory result. If a combination of these exist, then it needs to be questioned whether it is a sound decision to proceed.

✶ Environmental Factors (both during application and service life)

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

✶ Design/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 removed by 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** present painting problems in the fact that the inside of the deep "⊏" section is extremely difficult to paint in a controlled, uniform way to produce a smooth, protective coating. This is of particular concern in areas of high humidity or chemical environment, such as indoor swimming pool areas or manufacturing plants, as moisture and other air-borne chemicals can condense on the inside of the purlins. The zinc layer on the inside of the purlins then readily reacts with the moisture to form white rust (shedding any applied finishes in the process). This process continues until all the zinc is consumed and the mild steel substrate is left exposed. Once the steel is exposed, red rusting quickly follows. Purlins also have very sharp edges, creating additional edge corrosion problems (see first point above).
- Possible **air pockets** and blisters in the hot dip galvanising within the angles of the metal section – such defects are almost impossible to detect.

Severe zinc depletion of HDG steel in a new swimming centre. Red rusted areas indicate complete zinc layer depletion and steel corrosion. Extensive rectification work delayed the opening of the pool and blew out project costs.

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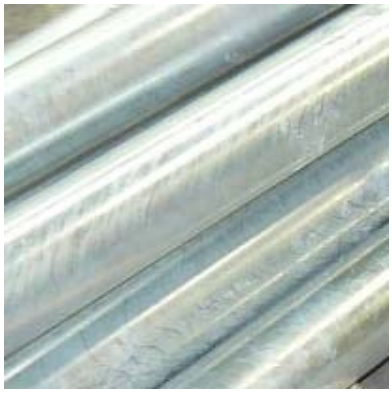
- **Inability to coat the full surface** – sometimes sections are welded together in such a way that brushes, rollers or spray units cannot reach. Fixings can also reduce access of application tools.
- **Fixings** – fixings can present several challenges when painting; if the fixing is of a different metal to that of the section in which it fixed (or even a different grade of the same metal) and the two are in contact, a small current will result and corrosion will occur. A non-conducting isolator must always separate fixings from the surrounding metal. Isolators are usually made of flexible plastic and therefore can present paint adhesion problems. When applying paint, pooling[1] can occur around the base of the fixing, resulting in excessive film builds and possible mudcracking[2].

✶ 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[3]
- 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.

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

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[1] 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.

[2] Mudcracking - the splitting and cracking of the surface of paint when it dries. This usually occurs when the paint film has been applied in excess of its maximum recommended dry film thickness.

[3] 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.