

CASE STUDY

GALVANIZING FRIENDLY marker evaluation

by Chantell Aucamp

Background

Specially formulated markers are imported into South Africa by The Hot Dip Galvanizers Association of Southern Africa (HDGASA). This marker is specifically designed for use in the hot dip galvanizing process, as this marking pen stays on during fabrication but is removed completely in the galvanizing process.

Marker features

- Permanent marks during fabrication
- Ergonomic non-slip rubber grip
- Formulated for industrial use
- Marks on wet & oily surfaces
- Durable clip cap
- Fast drying
- Weather resistant marks
- Crisp lines or bold lines
- Suitable for all metal surfaces
- Design for Fabricators & Galvanizers
- Multi-lingual packaging
- Multiple colours (creamsicle, white & yellow)

Case study

Tests were conducted to verify the performance of the markers in different environments and galvanizing conditions.

Steel preparation

A 6m length angle iron was cut into 9 x 300mm lengths, in order to test all three colours supplied at three different galvanizers. A 6mm Ø hole was drilled into each piece in order to assist with the jiggling process. The following references were written on the nine pieces of steel as per (Figure 1) and left outside in the sun to weather for approximately 3 to 4 weeks as per (Figures 2, 3 & 4).

As per the above figures, it is noticeable that the writing has faded, and the steel corroded during the weathering process as anticipated.

We conducted tests on the nine pieces of marked steel, by putting them through the hot dip galvanizing process at three different galvanizers, to verify if the marking pen will be completely removed during the galvanizing process.

Hot dip galvanizing process

Hot dip galvanizing is a process used to apply a protective coating of zinc to steel or iron surfaces. It involves immersing the cleaned and prepped steel or iron articles into a bath of molten zinc at a temperature of approximately 450°C to 460°C. The process of hot dip galvanizing consists of three key steps: surface preparation, galvanizing and inspection.

Step 1: Surface preparation

Degreasing – organic pollutants such as dirt, paint marks, grease, and oil are removed from the metal surface using a hot alkali solution.



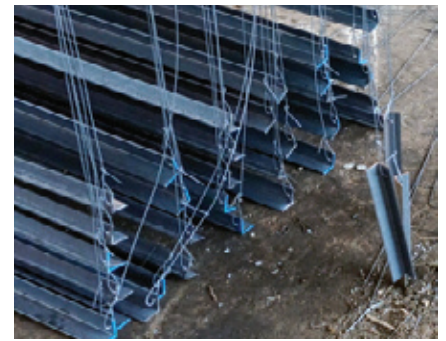
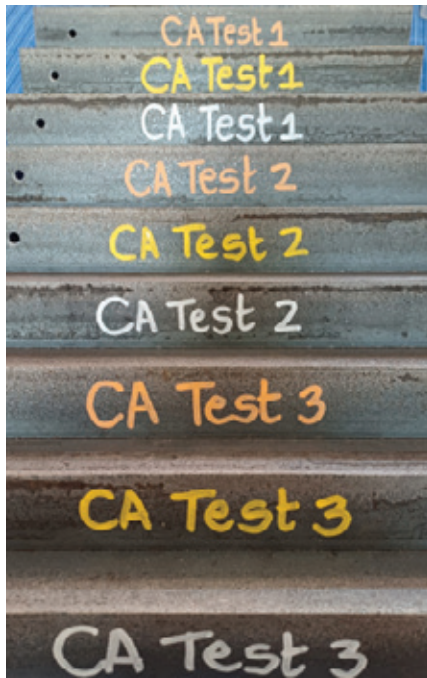
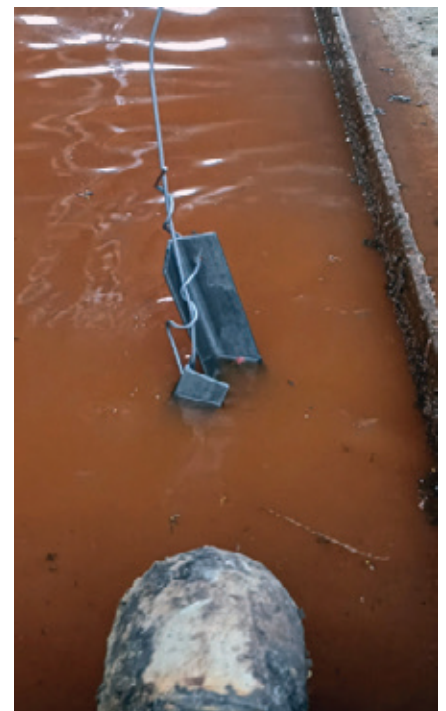
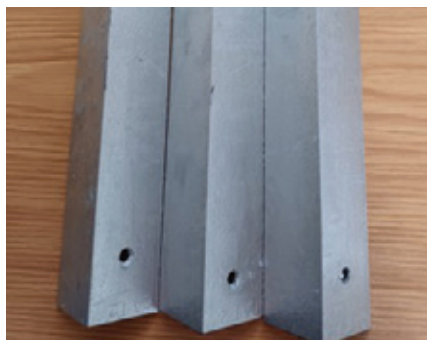


Figure 1: References written on the 9 pieces of steel.

Figures 2, 3 and 4: The steel was left outside in the sun to weather for approximately 3 to 4 weeks.

Figures 5, 6, 7 and 8: The markings were completely removed during the galvanizing process (see comparison between Figure 1 and Figure 8).



Pickling – mill scale, and iron oxides are removed from the steel surface using a diluted solution of ambient hydrochloric acid.

Fluxing – the cleaned articles are dipped into a flux solution. The flux prevents the formation of oxides from the surface and provides a protective layer on the steel, promoting the formation of a uniform zinc coating.



Step 2: Galvanizing

The steel is entirely immersed in a bath (kettle) of molten zinc, the galvanizing step of the process happens. The bath chemistry must be at least 98% pure zinc and kept at a temperature of around 450°C, according to the specifications. The crane lowers the steel at an angle. This allows air to escape from tubular shapes or pockets in the design of a fabricated component, as well as molten zinc to displace the air. The zinc reacts with the iron in the steel in the kettle to generate a sequence of zinc-iron intermetallic alloy layers. The coating growth is complete after the fabrication item reaches bath temperature, and the products are slowly removed from the galvanizing bath. Draining, vibrating, and/or centrifuging are used to remove excess zinc. As long as the pieces remains around bath temperature after being removed from the bath, the metallurgical reaction will continue. Articles are cooled either by immersing them in a passivation solution or by leaving them out in the open air.

Step 3: Inspection and Finishing

The final stage of the procedure, inspection, is straightforward and rapid. Coating thickness and coating appearance are the two aspects of the hot dip galvanized coating that are thoroughly examined. Products are galvanized in accordance with the SANS121:2024 standard that have been long established, accepted, and approved.

Conclusion

As per the tests conducted at the three different galvanizers during their galvanizing process in accordance with SANS121:2024, it was concluded that the galvanizing friendly marker upheld the function it was designed for. The markings remained during the fabrication but was completely removed during the galvanizing process as per (Figures 5, 6, 7 & 8).