AN EVALUATION OF THE PERFORMANCE OF ZRC COLD GALVANIZING COMPOUND AS WELDING REPAIR PER ASTM A 780 ON G90 HOT-DIP GALVANIZED STEEL IN 5% SALT SPRAY

Date: July 22, 2009

EXECUTIVE SUMMARY

ZRC Cold Galvanizing Compound has been tested in salt spray for its ability to protect welded areas of G90 hot-dip galvanized steel surfaces from corrosion, after application according to ASTM A-780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

The results of this evaluation illustrate that ZRC Cold Galvanizing Compound affords outstanding protection against corrosion to welded and/or damaged areas of G90 hot-dip galvanized steel. Figure 2 shows the condition of the ZRC Cold Galvanizing Compound coated test piece after 4000 hours of ASTM B117 Salt Fog Testing. Figure 1 shows the galvanized control test piece without ZRC applied.

Figure 1

Showing the control test piece after 4000 hours ASTM B 117 Salt Fog Testing.

Figure 2

Showing test piece with ZRC applied after 4000 hours ASTM B 117 Salt Fog Testing.

OBJECT OF STUDY:

To evaluate the use of ZRC Cold Galvanizing Compound as a repair compound for welded areas on G90 specified hot-dip galvanized steel in 5% salt spray as defined in ASTM B 117.

PROCEDURES:

In this experiment, 11 gauge panels of G90 specified hot-dip galvanized steel (ASTM A 526) were obtained from Ledford Steel Company, Winchester, KY and employed as the substrate. Two panels of the substrate were MIG-welded together to create the test area. Figure 3 shows the test piece after welding. The welded area was then Power Tool Cleaned (SSPC-SP 11). The surrounding area was Hand Tool Cleaned (SSPC-SP 2). The surface of the whole test piece was then Solvent Cleaned (SSPC-SP 1) using MEK. Figure 4 illustrates the test piece after cleaning.

Figure 3
Showing a representative test piece after MIG welding.

Figure 4
Showing ZRC test piece after surface preparation.

Two coats of ZRC were applied from a randomly chosen can (after stirring) by brush to a total dry film thickness of 4.3 mils (recorded with a Positector 6000 series magnetic film thickness gauge, per SSPC-PA 2), allowing a 24-hour dry time at 25°C between coats. ZRC was overlapped 1.5 inches over the galvanized surface on either side of the weld. Figure 5 shows the panel after ZRC application.

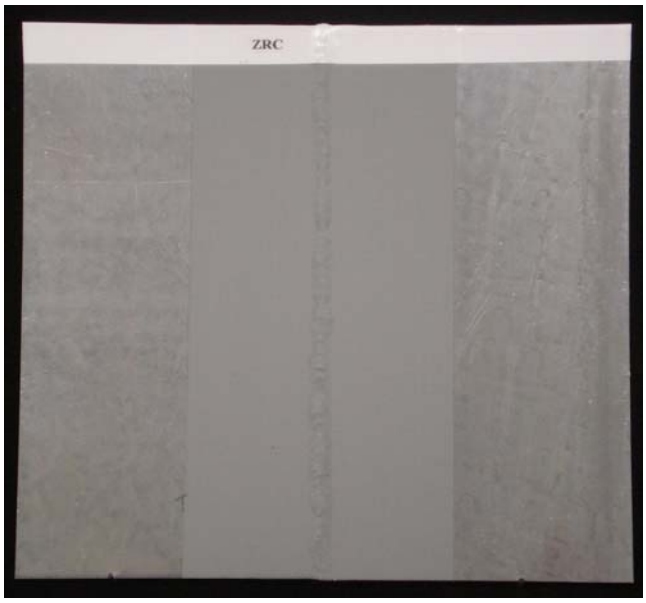

Figure 5
Showing test piece after application of ZRC.

The above substrate preparation and coating application was done according to the requirements of ASTM A 780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.

The test piece was allowed two weeks to dry under laboratory conditions (25°C, 50% relative humidity), before being exposed to 5% salt spray as per ASTM B 117 for 4000 hours, after which time the test was terminated, the test piece visually inspected and corrosion and blistering resistance evaluated using ASTM D 610 and ASTM D 714, respectively.

DATA:

Figure 1 shows the condition of our control test piece, which received no surface preparation before testing. Over the course of 4000 hours salt fog testing, it has formed copious amounts of zinc salt on its surface as a result of the galvanic reaction caused when zinc sacrifices itself to protect the underlying substrate. However, it now exhibits a very significant amount of red rust across its surface, ASTM D 610 Rust Grade 0. The weld itself is totally corroded.

Figure 2 shows the condition of the ZRC Cold Galvanizing Compound coated test piece. On the uncoated area of the hot-dip galvanizing, similar to the control test piece, this panel has also formed copious amounts of zinc salt, followed by very significant amounts of red rust, ASTM D 610 Rust Grade 0.

However, where ZRC has been applied to the weld and surrounding area, there is light formation of zinc hydroxycarbonate salt, typical of bonafide zinc rich coatings, and a few very small rust spots just beginning to show on the right edge of the weld. No blistering was observed on the weld. Medium blistering was observed across the ZRC coated surface (ASTM D 714 6-MD) with slightly larger blisters at the interface between ZRC and the uncoated hot-dip galvanizing, ASTM D 714 4-MD, seemingly caused by the formation of the copious amounts of zinc salt on the uncoated area bleeding over.

Figure 1

Showing the control test piece after 4000 hours ASTM B 117 Salt Fog Testing.

Figure 2

Showing test piece with ZRC applied after 4000 hours ASTM B 117 Salt Fog Testing.

CONCLUSION:

The results of this evaluation illustrate that ZRC Cold Galvanizing Compound, when applied according to ASTM A 780, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings, affords outstanding protection against corrosion to welded and/or damaged areas of G90 hot-dip galvanized steel.

Prepared and Respectfully Submitted,

Steven P. Collins
Vice-president

General panel evaluations are expressed on a scale of 0-10 as per ASTM D 610. The rating scale advances numerically with decreasing corrosion. Rust distribution is expressed with the following designations: P – Pinpoint, G – General, S – Spot. For the evaluation of size and distribution, the Standard includes photographic reference standards.

Blistering evaluations are made according to ASTM D 714. Evaluations are made for both the Size and the Frequency of blister. Blistering size is expressed on a scale of 0-10, advancing numerically with decreasing blister size. A reading of 8 indicates the smallest blister size easily seen by the unaided eye. Frequency is expressed with the following designations: D – Dense, MD – Medium Dense, M – Medium and F – Few. For both evaluations of size and frequency, the Standard includes photographic reference standards.