

**Effect of
CADWELD Connections
on Galvanized Pipe**

Test No. 53d

ERICO Products, Inc.

TEST NUMBER 53d

TITLE: Effect of CADWELD Connection on Galvanized Pipe

OBJECT: To determine the effect of a CADWELD Connection on galvanized fence post, both inside and outside surfaces with the outside both unprotected and protected with a zinc rich paint.

SUMMARY: Although the heat from the connection does apparent damage to the galvanizing adjacent to the weld nugget, the healing properties of the zinc offers a great deal of protection. Recoating the area with a zinc rich paint restores the surface to almost the same protection as the original galvanizing. The unprotected inside surface fared almost as well as the protected outside surface.

THEORY: Galvanized steel provides long life to the surface of outdoor structures. The zinc (galvanizing material) becomes an anode to protect the steel by galvanic action. While the zinc surface will tend to heal itself when damaged, any extensive damage must be recoated with a zinc rich paint to restore the original protection.

Although CADWELD Connections to structures can reduce the grounding connection cost by a factor of up to 10, many users hesitate to use CADWELD Connections because of the possible heat damage to the galvanized steel surface by the exothermic reaction.

MATERIAL: A 2-1/2" standard galvanized pipe (2.875" OD x 9.203" wall) was cut longitudinally to equally expose the inside and outside surfaces. Six heavy duty type VS CADWELD Connections using 4/0 cable were made to the pipe, (mold HDVSC-2Q-V2.50 using #200 weld metal). Zinc rich paint was applied to the outside surface of the pipe around the three top connections. Neither the other three connections, nor the inside surfaces of the pipe (behind all six connections) were given any protection.

continued

METHODS: The sample pipe sections were placed in a salt fog chamber and exposed per ASTM B117 (5% salt fog, 100% relative humidity at 95°F) for 9600 hours (13 months) with periodical removal, examination, and photographing.

RESULTS: After 222 hours exposure to the salt fog, no red rust is apparent around either the protected or unprotected welds. The inside of the pipe does show small amounts of red rust directly under each weld.

After 552 hours exposure, very small amount of red rust developed on the outside of the pipe around the unprotected weld. However, no red rust was detected around the protected weld. The amount of rust on the inside varied little from that observed at 222 hours.

After 2184 hours (91 days) exposure, red rust is beginning to show on all portions of the pipe, even those not affected by the weld.

After 9600 hours, severe overall corrosion has taken place. However, close examination revealed the inside surface under the weld was not as deeply pitted and corroded as the outside surfaces. This may have been caused by the positioning of the test sample in the salt fog chamber.

CONCLUSIONS: The visual damage caused by the heat when making a CADWELD Connection to galvanized surfaces can be easily protected with a zinc rich paint. The chain Link Fence Manufacturer's Institute requires the outside surface of galvanized pipe used for post, rails, etc. to withstand 1000 hours of a salt fog test to first sign of red rust, and the inside surface to withstand 350 hours with a maximum of 5% red rust. While a visual test was not made at 1000 hours, the rust visible at 552 and 2184 hours indicates the area around the protected welds rusted very little more than the pipe.

Since the unprotected inside of the pipe had less severe corrosion after 9600 hours than the protected outside, there should be no concern about the inside.

APPENDIX: Attached photos show the set up and the various stages of the test.









