

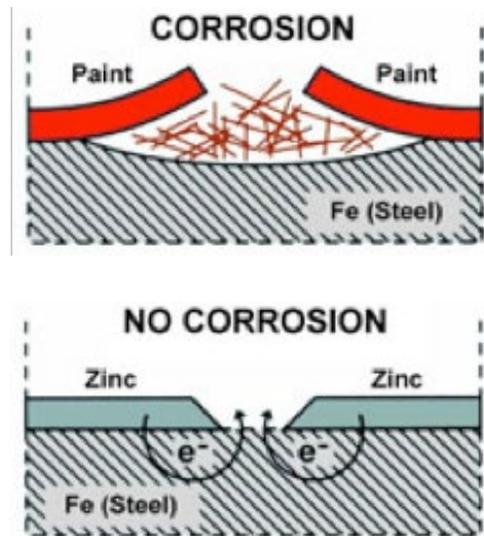
# Planning Advisory Notice

## Tower Maintenance and Corrosion Prevention

**In this Planning Advisory Notice (PAN) we will analyze effective methods for combating corrosion in the field.** Corrosion creates an unaesthetic appearance and, more importantly, a safety hazard. New towers are traditionally treated with hot-dip galvanization; however, once the hot-dip galvanization depletes itself, and it is not feasible to dismantle a tower in order to reload the hot dip, what can be done to protect a tower from corrosion?

An onsite galvanization product can be used in the field, but when choosing a product, it is important for the corrosion solution to provide true, long lasting, and provide cathodic protection while being cost effective and user friendly.

Paint can provide barrier protection but does not offer active, cathodic protection. Even zinc-rich paints may only provide barrier protection. With paint, the slightest scratch can lead to rust that spreads underneath the paint layer. Regardless of coating thickness, once the coating is breached, corrosion commences. To achieve active protection, a product must be able to withstand a degree of scratching without allowing for rust formation. The barrier protection that paint does provide, changes in time and by exposure to corrosive forces. For instance, UV radiation is responsible for micro-cracks in the paint layer. Paint dissociates slowly and turns porous over time. Cracks and blisters ultimately will lead to the coat flaking off.



The members of the **PAN Advisory Group** who are involved in writing and researching each PAN topic include **Scott Kisting** (Vice President, MUTI-Sabre Industries Telecom Services), **John Erichsen** (Principal EET PE, Chairman TIA Committee TR 14), **Craig Snyder** (President, Sioux Falls Tower & Communications) and **Stephanie Brewer** (Compliance Coordinator, MUTI-Sabre Industries Telecom Services).

## Metal is flexible. It expands and shrinks under the influence of temperature variations.

An anti-rust-coating must therefore “live” exactly in the same way as the metal substrate. In contrast to a paint layer, a galvanization layer is itself a metal product. It is therefore just as flexible as metal. Movement will not jar the galvanization layer loose, make it chip off, or cause scratches where insidious rust can form underneath.

### Application of a film galvanization product.

#### BEFORE



#### AFTER



### Rust and cracking occurs when the eta (top layer pure zinc) of hot-dipped galvanizing depletes



A galvanization product must also provide true cathodic protection, sacrificing zinc rather than the base metal it is designed to protect. The ASTM A780 advises that zinc coatings must contain greater than 92% metallic zinc in dry film to provide cathodic protection, but it is also important to consider the purity of the zinc. The purity of zinc dictates the performance level of cathodic protection. Therefore, the higher the purity, the better cathodic protection is achieved. The highest cathodic protection will be provided by products that have at least a 99.99% purity level.

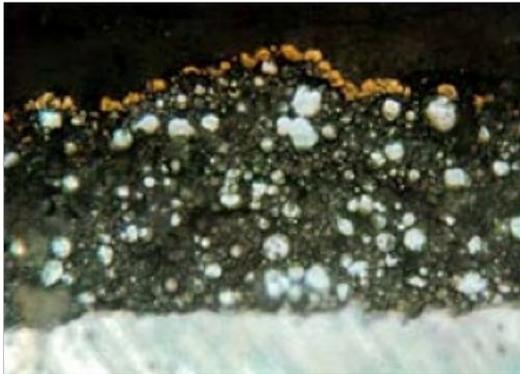
Another important factor to consider when choosing a product is the ability of the product's binder to conduct electricity. A product with a conductive binder allows the zinc to flow freely without a barrier inhibiting contact between the zinc and the metal. Independent third party testing shows that not all galvanizing products contain a conductive binder. Products with non-conductive binders create a barrier between the metal and the zinc. Incidental contact may occur between the zinc and the metal, but the majority of the zinc is being blocked by the binder and does not have direct contact with the metal. Incidental contact between the zinc and the metal will only result in low levels of cathodic protection. To achieve true cathodic protection, the binder must be conductive allowing the zinc to contact the metal. As the galvanizing product does its job, the zinc will be depleted instead of the base metal.

SAMPLE	Glass Substrate 3 mils	Glass Substrate 6 mils	Mylar Substrate 3 mils	Mylar Substrate 6 mils
A	0.13 V	0.28 V	0.11 V	0.58 V
B	No Measurable Voltage	No Measurable Voltage	No Measurable Voltage	No Measurable Voltage

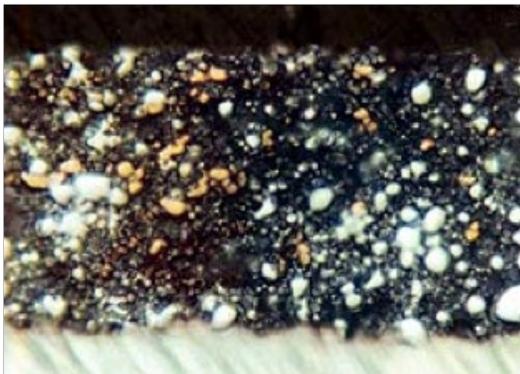
*\*Complete report available upon request.*

The photos on the next page illustrate the importance of selecting a product that can re-liquidize and reach the metal when a new coat is applied, forming a single homogenous layer. This ensures a massive cost savings in on-going maintenance, because the old layer does not have to be removed before re-coating with a new layer. This also means that once the initial abrasive blasting has been completed, the steel's surface will never have to be blasted again. The product used for the test on the next page has the ability to recharge itself and to recharge old hot-dip galvanization.

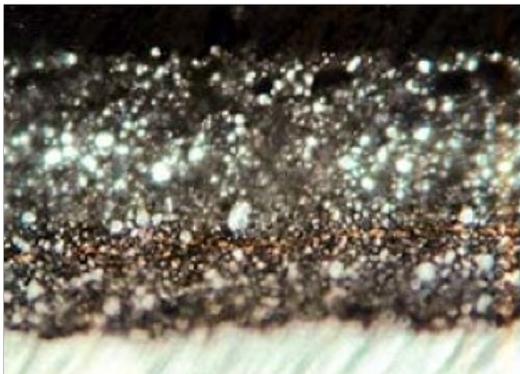
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**Photo 1** - Gold flake was applied on top of one coat of a film galvanizing product.



**Photo 2** - Subsequent microscopic analysis shows the gold flake integrated through the full coating. This is an effective coating because the zinc particles are active and allow the gold flake to move within the coating. As the coating re-liquidizes and merges with itself, it forms one solid coating where the zinc particles can float freely within the binder in order to form a base and produce enough conductivity to protect metal surfaces.



**Photo 3** – Gold particles in between two layers of a typical "zinc-rich" paint. The microscopic analysis in this photo shows that the gold flakes are trapped

between the old and new layers. The new layer cannot travel to the metal nor merge with itself to provide cathodic protection. Therefore, it is just providing barrier protection.

A few additional factors to consider when selecting a galvanizing product to use in the field include:

**Dry Time** – The quicker the product dries and cures, the sooner a second coat can be applied, saving on labor costs.

**Coverage** – Some products will cover a larger surface area thereby greatly reducing the cost of application or total job cost!

**Ease of Use** – Single component products that can be rolled on, brushed on, or sprayed on allow for various applications in a timely manner.

**Weather Conditions** – If the product can be applied in frigid, hot, or humid conditions, this may result in a cost savings since there are few weather or temperature restrictions that would halt the application.

**Pot Life and Shelf Life** – Products that have unlimited pot life and shelf life can result in increased overall job savings with minimal waste.

#### **Overall Recommendation**

Products that meet the above specifications and are recommended for use during tower maintenance and corrosion prevention. ■