

Technical Bulletin – White Rust Prevention and Treatment

INTRODUCTION

One of the commonly encountered problems with galvanized steel building products is the presence of wet storage stain – also known as white rust. This condition causes a significant, powdery deposit on the galvanized material's surface which can result in damage to the coating and is detrimental to the product's appearance.

Galvanizing is a metallic layer of zinc which is specified in the weight of zinc per square foot. Galvanized metal deck typically comes in G60 or G90 which represents 0.60 oz/SF or 0.90 oz/SF respectively. Zinc is durable and provides an excellent anti-corrosion performance for steel. Without free airflow and carbon dioxide, the stable zinc oxide that gives galvanized coatings its extended corrosion protection are not allowed to form. White rust is simply the chemical compound zinc hydroxide which forms when zinc is in contact with moisture and is not converted to a zinc carbonate passive film because the material is not freely exposed to carbon dioxide containing air. Zinc hydroxide (white rust) will continue to form as long as the surfaces are wet and starved of carbon dioxide. Once the wet material has been separated and allowed to dry the staining will remain, however, no further staining will occur.

The purpose of this technical bulletin is to address some of the causes of white rust, how to avoid it, and provide recommendations based on industry standard treatment.

CAUSES

White rust on metal decking is the result of wet storage stain. This is caused when closely packed bundles of galvanized metal deck are stored under damp and poorly ventilated conditions. The most common condition in which white rust occurs is with galvanized products that are nested together, tightly packed, and where moisture can penetrate and remain for extended periods.

There are several ways to avoid white rust on galvanized metal deck:

- **STORE BUNDLES IN A WELL-VENTILATED, DRY LOCATION**
- **DO NOT ALLOW MOISTURE TO REMAIN BETWEEN SHEETS**
- **Cut metal shipping bands**
- **Use wood blocking to elevate panels at least 1 ft off the ground**
- **Elevate one end higher to allow drainage**
- **Cover bundles with a ventilated waterproof covering**
- **Leave the bottom of cover loose to allow air circulation**
- **Never cover with plastic which causes sweating or condensation**

TREATMENT

White rust can often appear heavy, but the amount of zinc corroded is small. Although wet storage stain can affect the appearance of the galvanized material, it is generally not harmful in terms of the long-term corrosion performance. The Engineer of Record on the project will have to determine the severity of the damage and the proper treatment.

The following are industry standard recommendations for treatment of white rust on galvanized products:

Light white rusting

This is characterized by the formation of a light film of white powdery residue. If left alone it may wash off in service with normal weathering. If it is deemed necessary to remove the white rust it can usually be done with a stiff bristle brush (nylon). If brushing alone is insufficient, rub or brush the surface with a mixture of mineral oil and sawdust. The mild abrasive action may remove the stain, although this treatment is not of much help for advanced wet storage stain.

Moderate white rusting

If the stain is not too severe, it may be removed by washing with a 10% (by volume) acetic acid solution, followed immediately by a thorough rinsing with water to neutralize the surface. The removal can be assisted by the use of a stiff bristle brush (nylon). The sheets must be dry before restacking. This treatment may remove some of the metallic lustre, even in non-stained areas.

Severe white rusting

The zinc hydroxide corrosion product will dissolve readily in weak acidic solutions. Ordinary household white vinegar has been found very effective and environmentally benign. Commercial products like CLR™, widely advertised for scale and stain removal, can also be effective. Alternatively, a solution of 5% (by volume) of phosphoric acid in water, with a wetting agent added, can be brushed onto the sheets. In all cases proper safety precautions are necessary as well as approved disposal of cleaning liquids. After cleaning, the sheets must be immediately well-rinsed to neutralize the surface and then thoroughly dried. This treatment will remove some of the metallic luster, even in non-stained areas.

A coating thickness check will determine the extent to which the galvanized coating has been damaged. Remedial treatments to reinstate the coatings may include:

- a.) Wire brush or buff the affected area to remove all zinc hydroxide build up
- b.) Apply one or two coats of epoxy zinc-rich paint. Must verify the compatibility with the owner's end use, finish coat, or fire-proofing prior to field applying paint.



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