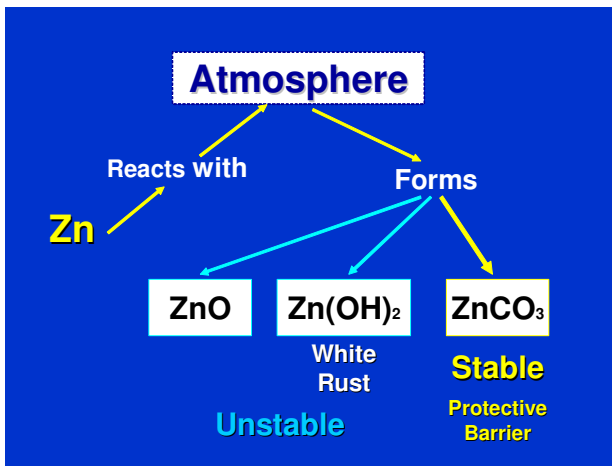


# Hot Dip Galvanized Information Sheet No.2

## White Rust (Also referred to as Wet Storage Stain)

Zinc is a very reactive material and when it is “new”, such as after being applied to steel in a hot dip galvanizing operation, it will react with the atmosphere and form three basic products of corrosion. The following diagram illustrates this reaction with oxygen, hydroxide and finally the carbon dioxide in the atmosphere.



The diagram shows how “clean new” zinc reacts with the atmosphere and forms three products of corrosion.

1. Zinc oxide ZnO
2. Zinc hydroxide Zn(OH)<sub>2</sub> “White Rust”
3. Zinc carbonate ZnCO<sub>3</sub>

ZnO & Zn(OH)<sub>2</sub> are unstable and easily removed leaving a “dull grey” coloured coating of ZnCO<sub>3</sub>, which is the stable “protective barrier” that provides zinc with its corrosion protection property.

These products of corrosion “use” minute quantities of zinc in their reactions and it is of paramount importance that new zinc is allowed to “weather” and form ZnCO<sub>3</sub> in order to establish its protective barrier.

Having described what constitutes white rust and how it is formed, we can now examine the measures used to prevent or control it.

Immediately following the hot dip galvanizing process, the zinc forming the protective coating is so clean that it has the potential to react (corrode) with the atmosphere, particularly in hot, humid environments forming the initial products of corrosion being zinc oxide “ZnO” and zinc hydroxide “Zn(OH)<sub>2</sub>”. For this reason, the final operation within the hot dip galvanizing process is one of “passivation”. The reason for the passivation process is to provide a “temporary barrier protection” for the newly coated hot dip galvanized steel in order to prevent the formation of ZnO & Zn (OH)<sub>2</sub> (white rust) and allow time for the zinc to react with the carbon dioxide and establish the stable corrosion protective barrier known as zinc carbonate “ZnCO<sub>3</sub>”.

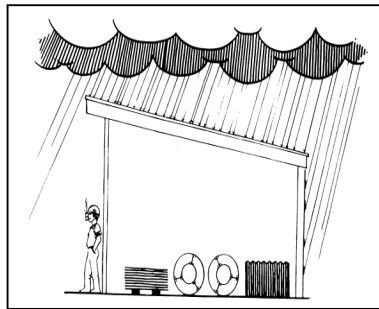
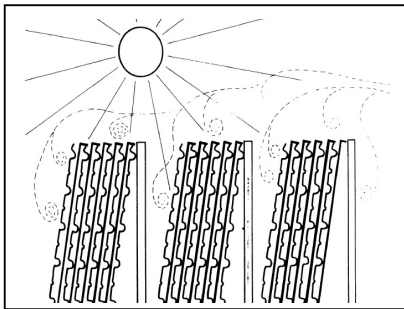
White rust, or “Wet Storage Stain” can also form as a result of the stacking or storage of hot dip galvanized steel with moisture trapped between closely packed product. This form of white rust is the more serious in that the microenvironment so created between the closely packed hot dip galvanized steel is rich in oxygen and hydroxides with the possible exclusion of carbon dioxide. These conditions are ideal for the formation of “Wet Storage Stain”. Corrosion in such conditions will continue as long as the hot dip galvanized sheets are in direct contact with each other and that moisture is trapped between the sheets.

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Once the hot galvanized steel components are separated, or the moisture removed, the white rust will cease. If one should then brush off the white rust, by the use of a stainless steel or nylon brush, a dull grey coloured coating is normally revealed, which indicates that the stable ZnCO<sub>3</sub> protective barrier has been established.

Apart from a few exceptional cases, where necessary precautions have been ignored, white rust merely constitutes an aesthetic problem while to infer that it is a malignant phenomenon which progresses unabated, is a misconception. If the coating thickness at the affected area is equal or greater than the minimum requirements of the specification, it is not cause for rejection, other than perhaps for aesthetic reasons.



The presence of white rust on stabilized galvanized surfaces will disappear naturally in time, but if immediate removal is required, the use of a fairly high pressure water hose is normally effective. Where tenacious adhesion of white rust products is encountered, scrubbing with a bristle brush is recommended. Precautions: Never use a wire brush for cleaning since this may remove some of the protective basic zinc carbonate film that has already formed.

Ensure that all cleaned components are completely dry prior to stacking since moisture present between contact surfaces may result in further white rust formation.