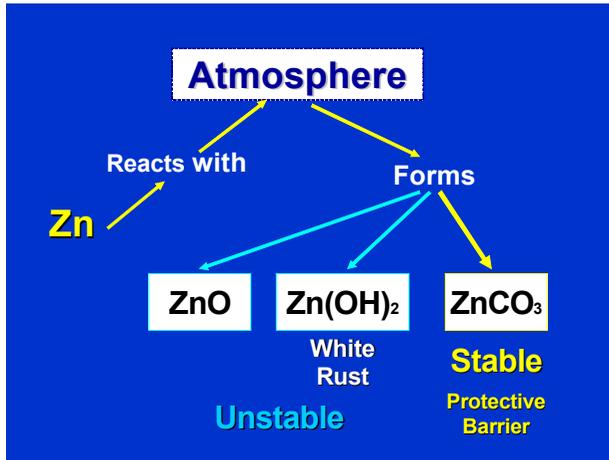


# Hot Dip Galvanized Information Sheet No.2

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

Zinc is a very reactive element. When zinc is “new”, such as immediately after being applied to carbon steel by way of the hot dip galvanizing process, it reacts with the atmosphere forming three basic products of corrosion. The following simplistic diagram illustrates zinc’s reaction with oxygen, hydroxide (moisture content) and carbon dioxide within the atmosphere.



A simplistic diagram showing how the “clean new shiny” zinc reacts with the atmosphere forming three basic products of corrosion

1. Zinc oxide  $ZnO$
2. Zinc hydroxide  $Zn(OH)_2$  “White Rust” or the more serious form of Wet Storage Stain
3. Zinc carbonate  $ZnCO_3$

Unstable  $ZnO$  &  $Zn(OH)_2$  are easily removed . Finally a stable matt grey  $ZnCO_3$  patina forms providing a “barrier protection” for corrosion control.

These products of corrosion consume minute quantities of zinc during this reaction, where  $ZnO$  and  $Zn(OH)_2$  only form on “new” zinc. Once zinc is allowed to “weather” and form its  $ZnCO_3$  patina, a slowly corroding protective barrier is formed and corrosion control is achieved.

White rust comprises  $ZnO$  and mainly quantities of  $Zn(OH)_2$ , being a function of the moisture content in the atmosphere, both of which do not provide any form of corrosion control.

Having described what constitutes white rust and how it is formed, we can now examine the measures used to prevent or more correctly control the formation of  $Zn(OH)_2$ .

Immediately following the hot dip galvanizing process, the zinc coating formed is so clean and “new” that it has a greater potential to react within a given atmosphere; particularly in hot, humid and moist environments. Therefore 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  $ZnO$  &  $Zn(OH)_2$  (white rust) and allow time for the zinc to react with the carbon dioxide in the atmosphere and establish its stable protective barrier patina of a dull grey matt surface finish of  $ZnCO_3$  (Zinc Carbonate).

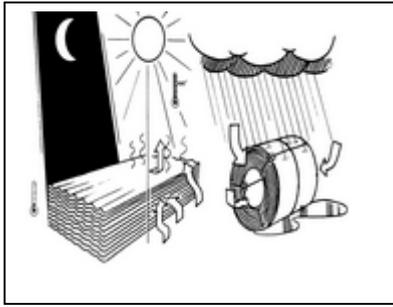
White rust, or the more sinister “Wet Storage Stain” will form as a result of the stacking or storage of hot dip galvanized carbon steel with moisture trapped between closely packed zinc coated components. This form of white rust is far more serious in that the micro-environment so created between the closely packed hot dip galvanized steel is rich in oxygen and hydroxides (moisture) and exclusion of carbon dioxide. Such conditions are ideal for the formation of “Wet Storage Stain” a serious form of white rust.

# Hot Dip Galvanized Information Sheet No.2

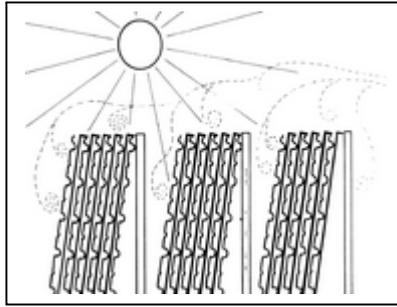
## White Rust (Also referred to as Wet Storage Stain)

White rust in such conditions will continue as long as the hot dip galvanized sheets are in direct contact with each other with moisture trapped between the sheets. Once the hot dip galvanized steel components are separated, or the moisture removed, the white rust will cease. By brush removal of the white rust, using a stainless steel or nylon brush, a dull matt grey surface will be revealed.

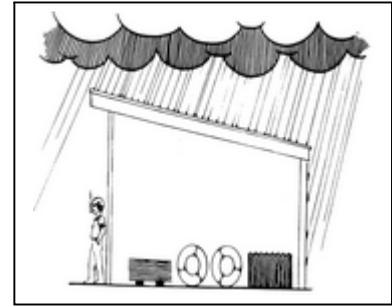
Apart from a few exceptional cases, where necessary precautions have been ignored, white rust merely constitutes an aesthetic problem while to infer that it is a malignant phenomenon which progresses unabated, is a misconception. If the coating thickness at the affected area is equal or greater than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



Incorrect method of  
storage – Wet Storage  
Stain guaranteed



Store so as to maintain  
ventilation between  
galvanized components



Wherever possible store  
under cover and prevent  
the ingress of moisture

The presence of white rust on stabilized galvanized surfaces will disappear naturally in time, but if immediate removal is required, the use of a high pressure water jet is normally effective. Where tenacious adhesion of white rust products is encountered, scrubbing with a bristle brush is recommended.

Recommend that storage of components be in a well ventilated environment or under cover. Prevent the ingress of moisture between contact surfaces of hot dip galvanized components.