

# Ask Dr. Galv

**Q:** A customer called and said his newly galvanized steel was rusting, and wanted to know why I didn't galvanize the whole part. I did galvanize the whole part, so what should I tell him?

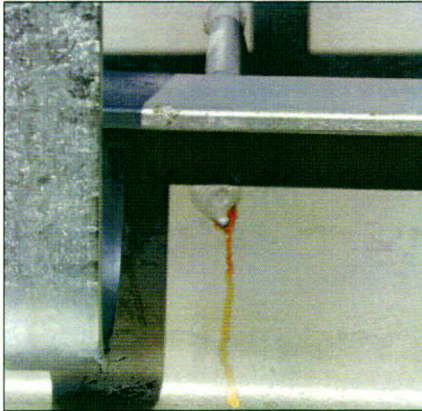


Image 1

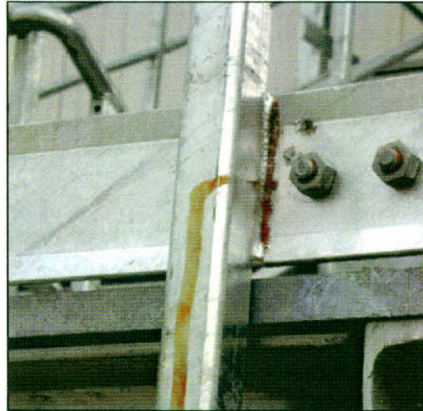


Image 2

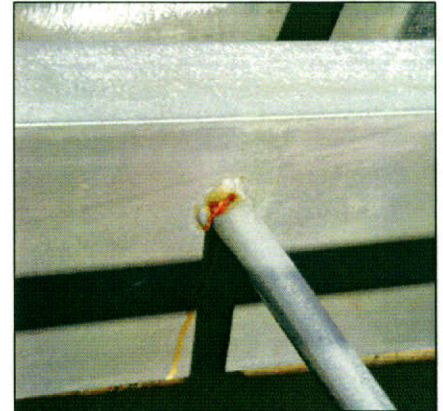


Image 3

**A:** Looking at the above pictures the customer sent, it is clear where the rust originated. This condition, called rust bleeding, is the unsightly dripping of rust (iron oxide) from small gaps created by overlapping or contacting surfaces on galvanized structures. Cleaning and flux solutions can penetrate gaps less than 3/32", but zinc cannot due to its higher viscosity. Because zinc cannot enter, the surfaces inside the gaps remain ungalvanized. The cleaning and flux solutions that remain inside the gaps are vaporized as the steel approaches the galvanizing temperature of approximately 850°F.

When these solutions are vaporized, anhydrous crystals are left inside the gaps. After the steel has been galvanized, atmospheric moisture can penetrate the gaps and mix with the anhydrous crystals to form an acidic and highly corrosive solution. When the solution corrodes the ungalvanized portions inside the gaps, corrosion products accumulate and leak or bleed from the gaps, leaving a trail of rust down the side of the part.

Now that we can see what it looks like, what is the solution? Proper design of materials to be galvanized is the best method to prevent rust bleeding. ASTM A385 recommends seal welding all overlapping or contacting surfaces that have gaps less than 3/32".

Seal welding prevents cleaning and flux solutions from entering the gap. When these solutions are prevented from entering the gap, rust bleeding will not occur. It is important

to ensure seal welds are complete and without imperfections or pinholes. Imperfections or pinholes in the seal weld can allow moisture to penetrate the gap and become trapped inside the sealed area. This creates a safety hazard to galvanizing personnel due to explosive forces that can develop in the sealed area as the steel reaches the galvanizing temperature. When the enclosed area is greater than 16 square inches, it is recommended to vent the structure per ASTM A385.

*"...assure your customer the entire structure was galvanized, and explain rust bleeding from overlapping or contacting surfaces is easily remedied."*

The designer and fabricator are responsible for notifying the galvanizer when they plan to galvanize pieces with overlapping or contacting surfaces. The galvanizer is not responsible for ensuring small gaps have been seal welded or for repairing damage due to rust bleeding.

You can assure your customer the entire structure was galvanized, and explain rust bleeding from overlapping or contacting surfaces is easily remedied. The stains can be removed from galvanized steel by rinsing with water and scrubbing with a nylon brush.

Rust bleeding can be stopped at the source by sealing the overlapping or contacting surfaces. When the electrolyte (in this case, the solution created by cleaning or flux solutions mixing with water) is prevented from entering the area, the corrosion halts. Sealing can be accomplished with materials such as caulking or epoxy coatings. This prevents water from penetrating the gaps and mixing with the anhydrous cleaning or flux crystals. These coatings also prevent rust from exiting the gaps.