

# Steel Vessel Coating Using PCS-40 Red Iron Oxide Primer and PCS-355 Polyurea

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In the process of manufacturing galvanized roofing nails, a steel vessel is employed in the galvanizing step. This vessel is a six sided “tumbler” six (6) feet in diameter, eight (8) feet in length and weighs about 2 tons. The internal surface is approximately 150 ft<sup>2</sup>, with numerous angles. Fig. 1 shows the tumbler on a trailer with plastic containment area. When in use, the tumbler is loaded with nails, zinc pellets, water, 10% sulfuric acid to adjust the pH to 1.7 and is then rotated. As the tumbler rotates, the zinc pellets dissolve and an oxidation-reduction reaction occurs, coating the nails with zinc, producing galvanized roofing nails. The temperature of the slurry can rise to 150 °F due to the exothermic reaction. A chemically and temperature resistant coating was requested for the interior of the tumbler to extend the service life of the vessel as well as protect the steel from abrasion from the tumbling nails and acid from etching the surface of the steel.



Nail tumblers are used frequently by many galvanizers in the industry. Historically, a rigid urethane coating has been employed, 1” thick. These systems may take 6 weeks to apply and generally last only 1 year in service. The polyurea system, manufactured by Polyurea Coating Systems, Inc. and applied by Kenny Industrial, is a two day process. The tumbler was first sandblasted to a white metal finish. Minor cracks in the welds were left since the polyurea system will bridge these cracks and seal the vessel. This prepared the surface for the application of the primer. PSC-40 Red Iron Oxide primer was chosen for its corrosion resistance characteristics, and the enhanced adhesion qualities with the PCS-355. PCS-40 is a two component, 100% solids, low viscosity epoxy primer. It was applied over the prepared surface with a cup gun at 2-3 mils and allowed to dry overnight. Shorter dry times can be expected depending on temperatures. The PCS-355 polyurea was then applied using a heated proportioner at 3/8” thickness. PCS-355 is a pure polyurea which can be applied in one coat. Dry time is 10-15 seconds. The total application time of the polyurea was 2 hours and consumed 35 gallons of PCS-355. Figs 2 and 3 show the application of the PCS-355 by Kenny Industrial applicators.



The inside of the tumbler was pin-hole free and

provided a monolithic layer with an elongation of 400%. The elastic nature of the coating makes it highly resistant to the continuous tumbling action of the nails in this acidic slurry.

The tumbler was placed back in service one month sooner than the previous system. A nail tumbler coated with PCS-40 and PCS-355 has been in service over one year and no physical defects in the coating have been identified. Using the PCSI polyurea system has significantly reduced down time, provided a tough chemical and abrasion resistant coating, and extended the service time of the vessel.