

Safety—Note locations of a working shower and fire extinguisher. Use a face shield, hard hat, heavy gloves and three layers of old clothes. Using four 12 gauge (3 ft. long) steel wires, attach separately four angles (2 in. x 2 in. by 1/4 in. thick by 5 in. long). Make a 1 in. loop with wire through one end hole and twist the wire end back onto itself so as to allow the angles to hang freely. Put all four angles into the caustic for three minutes. Rinse and put them into the acid tank to pickle. For HCl it may take 15 to 60 minutes depending on the HCl temperature. For H₂SO₄ it may take 10 to 30 minutes depending on the iron and zinc concentrations, but do not over-pickle (burn) the angles. Rinse the angles and put into the flux tank for 3 minutes. Remove, separate and record the drying time of the flux on the angles.

{I} Twenty-Second Test: Hang one angle 3 feet down from the crane by the wire. Skim the zinc surface below the angle. Using the crane, lower the angle into the zinc at about 10 feet/minute until the twist of the wire is under the zinc. [Video the zinc splashing.] After 20 seconds skim the zinc surface and fully withdraw the angle slowly at 2 to 5 feet/minute. Examine the angle to determine bare spots and photograph. Do not wipe off or knock off the icicle at the bottom of the angle.

{II} Four-Minute/Eight-Minute Test: Hang the second angle from the crane. Skim the zinc surface, and fully immerse the angle (at about 10 ft./min.) up to the wire twist. Hold the angle in the zinc for 4 minutes and skim the zinc. Withdraw the angle half way out of the zinc at 2 to 5 ft./min. Retain the remainder of the angle in the zinc for four **more** minutes. Do not skim. Pull the angle out slowly and fully. Thus the angle will have two galvanized sections that have been in the zinc 4 and 8 minutes after final withdrawal. Do not knock off or wipe off the icicle. Record the zinc thicknesses on the two sections, and photograph both sides of the angle.

{III} Cook-Off Time Test/Ash Formed Test: Hang the third angle onto the crane. Skim the zinc. Immerse fully the angle up to the twist and record the cook-off time of the flux (no more bubbles coming up). During cook-off record if the bubbles coming up are faster or slower than one bubble/second. Without skimming, move the crane sideways about one foot (Photograph the floating ash from a low and high angle.). Record the tare weight without outer plastic handle of the 8 inch diameter stainless steel strainer (Walmart Main Stays stainless 8 in. dia. \$5). Replace the outer plastic handle and bolt on a 3/4 inch diameter metal conduit. Do not submerge the handle into the zinc. Push the strainer under the zinc about one inch down and lift up so as to collect the ash that was formed during cook-off. Record the strainer plus ash weight.

{IV} Pickled Steel Stability One Hour after Fluxing: Hang the fourth angle about 15 feet from the kettle for one hour and then photograph both sides. Then see if it galvanizes in 20 seconds and how much ash is formed.

{I} Twenty-Second Test: Number and size of any black (bare) spots_____.

Zinc coating thickness_____.

Length of bottom icicle_____.

Will a 1/4 in. bolt pass through 3/8 in. bottom hole_____.

Is hanging wire easy or hard to remove_____.

{II} Four-Minute/Eight-Minute Test:

Number and size of any black (bare) spots_____.

Zinc coating thickness 4 minute zone_____.

Zinc coating thickness 8 minute zone_____.

Vertical height of pimple band between 4 and 8 minute zones_____.

Length of bottom icicle_____.

Will a 1/4 in. bolt pass through 3/8 in. bottom hole_____.

Is hanging wire easy or hard to remove_____.

{III} Cook-Off Time/Ash Formed Test

Cook-off time_____.

Bubbles coming up faster or slower than one bubble/second?_____

Tare weight of strainer without handle_____.

Weight of strainer plus ash_____.

Net weight of ash_____.

{IV} Pickled Steel Stability One Hour after Fluxing:

Degree of corrosion on angle one hour after fluxing_____.

Does angle galvanize in 20 seconds_____.

Zinc coating thickness_____.

Is ash more or less than previous tests_____.

Steel Angles: Chemistry---C = 0.16%; Mn = 0.88%; Si = 0.17%; P = 0.014%; Cu = 0.31%; Cr = 0.19%; Ni = 0.10%;

Caustic: Strong Caustics____%; Weak Caustics____%; Density____Be'; Temperature____F
Age____Years; Oil on Caustic____Yes/No; All Steel goes through Caustic____Y/N

Acid: HCl____% Acid; ____% Fe+2; ____% Zn+2; Temperature____F; Pickle Time____
H2SO4____% Acid; ____% Fe+2; ____% Zn+2; Temperature____F;
PickleTime____; Number Rinse Tanks Between Acids and Flux_____.

Flux Solution: Density____Be'; ACN____; Fe+2____%; SO4-2____%; pH____;
NTNV____ppm; Temperature____F; Age____Years; Color of 50 mL
Decanted Flux Solution plus 15 Drops of Bromophenol Blue (0.1% in Water)____
Dimensions of Flux Tank Length____; Width____; Depth_____

Zinc Kettle: Zinc Chemistry: % Al____; % Bi____; % Pb____; % Ni____;
% Cu____; % Sn____; % Other____Specify; Temperature____;
End or Side Fired____; Dimensions of Zinc Kettle L____W____D_____

Production/Residuals: One Day Production____; Same Day Skimmings____
Same Day Zinc Added to Kettle____; % Rejects (Twice through Kettle)____
% MZR Skims Recovery of Zinc____; Average Zinc Thickness on Steel____
Tap Water Softener Y/N____; Reverse Osmosis of Tap Water Yes or No____
Hardness of Tap Water____ppm; Country Mfg. Flux____
Crane Speed Down/Up____ /____; Average Steel Thickness____;
Product Quality (1 low; 10 excellent)____ Yearly U.S. Gallons Spent Acid____
Yearly Production____; Yearly Zinc Used____; Yearly Skims____
Yearly Dross____; Yearly Unworked Skims____
Yearly Ash (out of MZR Machine)____
Types Steel Galvanized_____