

## ADVANCED GALVANISING QUALITY ASSURANCE PROCEDURE

The following procedure is implemented in the factory production line to assure the specified quality is achieved throughout the hot dip galvanising process.

### JIGGING

Jigging is the process of attaching the items with wire to a rigging frame for further hoisting through the dipping process by means of an overhead crane.

At the jigging stations we have three different types of wire (1,6mm / 2,5mm and 3,15mm) that we use depending on the size of these items that need to be jugged.

### DEGREASER

The crane operator collects the rigging frame from the jigging stations to the degreasing bath. Surface dirt, grease and oil are removed with degreasing chemicals, highly alkali solutions containing caustic and non-caustic alkalis. Wetting agents are added and the solution heated to 60°C. At optimum temperature and concentration, an immersion time of five minutes is usually adequate. The importance of good degreasing will ensure that effective wetting of steel surfaces during the subsequent pickling process. Check that cleaning has been satisfactory, is evidenced by no surface water breaks. Regular laboratory testing to ensure optimum concentrations are done on a weekly basis.

### RINSING

The purpose of rinsing after degreasing is to remove degreasing chemicals and to ensure acid is not neutralised by the alkalis when pickling. The operation consists of simply dipping the degreased materials in and out of the water. Alkali and acid is not rinsed in the same bath. The pH of the water must not exceed 10 pH and is tested on a weekly basis. Rinsing is also done by the crane operator.

## ACID PICKLING

The purpose is to remove mill scale, rust and other contaminants from the steel. Acid pickling ensures that molten zinc comes into direct contact with all immersed steel surfaces during galvanising, thus facilitating the formation of the iron / zinc alloys and avoiding the presence of uncoated areas.

Hydrochloric acid is used in our plant at a concentration of about 15% and is also tested on a weekly basis for acid strength and iron chloride content. Pickling time is generally dependent upon the following:

- Temperature, we operate between 15°C and 25°C.
- Acid concentration and iron content
- Surface condition of the article being pickled
- Type and shape of article being pickled

The crane operator pays particular attention to surface conditions and never allow articles to remain in the acid longer than necessary. The pickling operation removes mill scale, annealing / normalising oxides and rust. During the pickling operation the items are raised and lowered at least twice. This is to create agitation in order to avoid areas of low acid concentration and entrapment of air.

Acid must be allowed to drain off items prior to rinsing. After pickling, the operator will check that material has been successfully cleaned and is ready for rinsing, fluxing and galvanising.

## RINSING AFTER PICKLING

The purpose is to remove acid containing iron particles and iron salts from the items before fluxing and galvanising. Contaminated flux will result in the carry-over of iron particles and iron salts into the molten zinc and this in turn will cause excessive dross formation which impacts on aesthetic quality.

## FLUXING

Fluxing is essential to the galvanising operation with a primary purpose to promote the alloying of molten zinc to the steel. Good fluxing practice is important to ensure a high quality coating from the standpoint of appearance, good adhesion and the absence of uncoated areas.

The flux is heated to about 70°C for more efficient fluxing and to effectively dissolve flux crystals in order to maintain the desired concentration. Lowering of the material into the flux and immediately withdrawal after complete immersion is all that is required, however we keep these items immersed for at least one minute in order to provide sufficient time for heat transfer, which in turn facilitates drying prior to galvanising.

Routine checking is done by the production manager of the temperature, flux concentration and pH to ensure an optimum flux solution. All chemical analysis is performed strictly in accordance with SABS standards for in-house laboratory testing.

## DRYING DECK

These items are removed from the flux bath and placed in a drying deck before galvanising. Drying prevents the formation of iron salts and oxides.

## ZINC BATH

When suitably cleaned steel is immersed in molten zinc, a hot dip galvanising coating is formed by metallurgical reaction resulting in the formation of iron / zinc alloys. The coating will not form on contaminated surfaces. The thickness and structure of the coating is determined by the surface roughness of the items, type of steel, zinc temperature, quality of the zinc, withdrawal rate and the angle of withdrawal.

Our zinc bath temperature is maintained at 450°C. Prior to lowering of items, the zinc surface is skimmed to remove oxidised zinc (ash). The galvanising process will result in the accumulation on the molten zinc surface of zinc oxide and other residues. Prior to withdrawal, the zinc surface is skimmed again in order to ensure that surface contaminants are not entrained in the zinc coating. The crane operator withdraws items at a rate slower than 1m per minute at an angle of  $\pm 45$  degrees.



Withdrawal is continuous and uninterrupted at a creep speed equal to the drainage flow of excess zinc on the coated steel surfaces. For this reason, big enough drainage holes in the correct areas are imperative to the quality of the surface of these items.

## PASSIVATION

The quenching operation solidifies the zinc coating while at the same time washing off residues, which may have been deposited on the coating surface during withdrawal from the galvanising bath. Passivation will retard the formation of undesirably brittle coatings and the appearance of dull grey unattractive patches on coating surfaces.

## CLEANING, INSPECTION AND PACKAGING

Upon leaving the passivation bath and cooling down, all wires are removed. During this operation, material is visually inspected and should coating defects be apparent, suspect items are identified and placed in an isolated area for examination by a plant quality inspector.

All solidified teardrops and run-off zinc is removed by means of grinding or grating. Where surface damage appears, the plant inspector is informed and repairs is done in strict accordance with manufacturers specifications.

