



Corrosion Protection Methods

3.1 HOT DIP GALVANIZING

Steel components, cleaned of rust, mill scale and other contaminants, are dipped into molten zinc, producing a coating of iron/zinc alloys with pure zinc on the surface. *Chapter 4 refers.*

3.2 ELECTROPLATING

The steel surfaces are degreased and pickled to remove rust and mill scale. The component is then submerged in a zinc salt solution and connected as a cathode to a direct current source. Rods or balls of pure zinc are connected as anodes. The solution (electrolyte) can be acidic, neutral or alkaline, which determines the type of zinc salt. When the current flows, zinc from the electrolyte is deposited on the steel surfaces. At the same time, the anode dissolves and supplies new zinc to the electrolyte.

Items can either be supported in jigs or baskets or they can be placed in drums for movement between the necessary baths.

The deposited layer has a very fine crystalline structure with a distinct boundary between the plated zinc and the metal substrate (*figure 7*). Thicknesses vary from 5 to 25 μm . However, layers thinner than 5 μm can often be found on items such as fittings, small bolts, etc.. Layers thicker than 25 μm can only be obtained on components or structures of simple smooth geometry, e.g. wire.

The surface of the zinc coating is very even, with a silvery, metallic sheen. Through the addition of special additives to the bath, very shiny coatings can be obtained (bright zinc). Electroplated components are usually dipped in chromate to prevent corrosion during storage and transportation. The chromate layer is often colourless but can, in the case of thicker layers, be yellow-brown or green in colour.

Because of the thinness of the zinc layer, electroplated components should be finished with a layer of paint or other organic coating prior to outdoor exposure in order to increase the service life.

See also **SANS 4042/ISO 4042** for fasteners and **SANS 2081/ISO 2081** for other components.

3.3 ZINC METAL SPRAYING

The steel is cleaned by means of abrasive

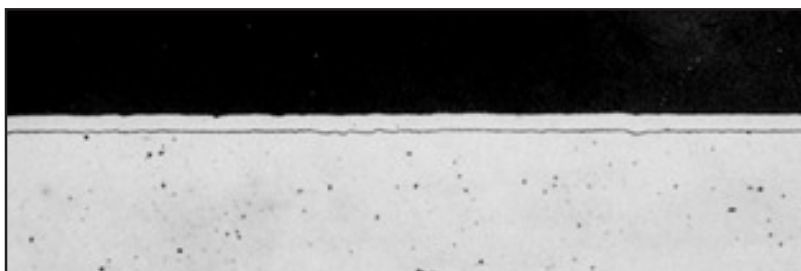


Figure 7. Section through electrolytically applied zinc layer.

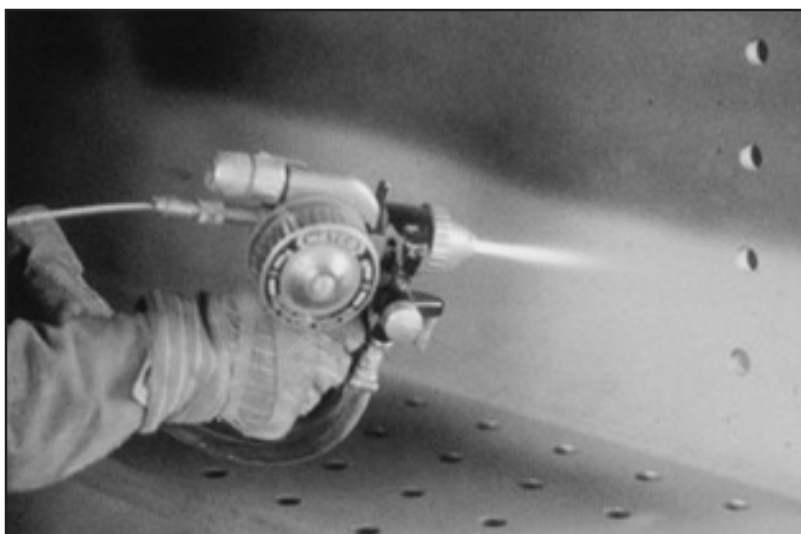


Figure 8. Zinc metal spraying.

blasting - at least to Sa 2 $\frac{1}{2}$, according to **ISO 8501-1**. Zinc is fed into the spray gun in the form of wire or powder and melted by a gas flame or electric arc (*figure 8*). The molten droplets are then sprayed on to the steel surface with the aid of compressed air.

The zinc layer can exhibit porosity and the surface may be coarse (*figure 9*). The thickness of the coating can be varied from about 30 μm to (in practice) about 300 μm . Adhesion to the steel surface is purely mechanical.

The method is suitable for larger objects of relatively simple shape. It is also well suited to the repair of zinc coatings on hot dip galvanized components that have been damaged by mechanical impact or welding.

See also **SANS 2063/ISO 2063**.

3.4 SHERARDIZING

Steel components, cleaned through pickling, are packed together in a drum with

zinc powder and sand. The drum is rotated and heated to just below the melting temperature of the zinc. During a period at this temperature, and with continued rotation, iron and zinc react with each other to form an iron/zinc alloy on the steel surfaces.

Sherardizing gives relatively thin coatings (15-40 μm) with dark grey surfaces. The coatings have good adhesion properties and a very uniform thickness, even on objects of complex shape. The method has about the same range of application as for electroplating.

There are no international standards for coatings applied by sherardizing, but it is widely used in the UK and elsewhere; reference can be made to British Standard **BS 4921**.

3.5 MECHANICAL PLATING

Degreased objects are placed in a drum, together with glass balls. They are first tumbled in an acidic cleaning agent and then in a copper-plating agent. The ob-