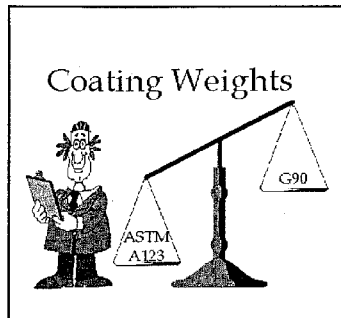


Ask Dr. Galv

Dear Dr. Galv: What is the difference between a G90 galvanized coating and an A123 galvanized coating?



This is a little bit of a trick question. First, G90 isn't a specification. It is a coating designation within ASTM specification A653, Standard Specification for Steel Sheet, Zinc-

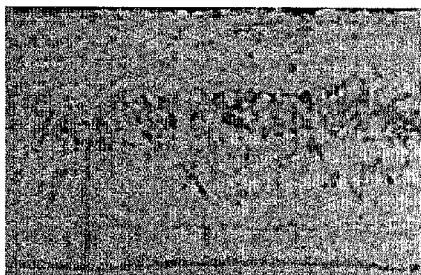
Coating (Galvanized) or Zinc-Iron Alloyed-Coated (Galvannealed) by the Hot-Dip Process. This specification pertains to steel hot dip galvanized in the continuous process and then fabricated.

ASTM A123, Standard Specification of Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products, refers to products that are fabricated and then hot dip galvanized using the batch process.

The two methods of hot dip galvanizing, batch and continuous, produce very different products with different characteristics.

The hot dip galvanized coating consists of a series of layers of zinc-iron alloy with successively higher zinc contents towards the coating surface. This is shown in Figure 1. The coating is unique in that it is metallurgically bonded to the steel substrate, with the coating integral to the steel. The strength of the bond is measured in the range of several thousand psi.

Figure 1



The nature of the hot dip galvanizing process guarantees a coating thickness above minimum coating specification. While a 2 oz/ft² (610 g/m²) or 3.4 mils (86 μm) coating might be considered "standard," thicknesses of 6 to 8 mils (150 - 200 μm) on structural steels are common. For most steels, the coating thickness obtained is relatively insensitive to processing variables. Heavier coating thicknesses can be obtained by abrasive blast cleaning of the steel prior to galvanizing. Coating thickness is proportional to coating weight, with 1 oz/ft² (305 g/m²) of surface equal to 1.7 mils (43 μm) thickness.

The coating produced by continuous galvanizing is uniform, has sufficient ductility to withstand deep drawing or bending without damage to the coating, and consists almost entirely of pure zinc. A photomicrograph of a continuous coating is shown in Figure 2. In the continuous process, the steel in sheet, strip or wire form is passed through the cleaning tanks and zinc kettles at a very rapid speed. The speed determines the coating thickness and can range upwards of 200 feet per minute. This speed, in combination with slight additions of aluminum to the zinc bath, helps suppress the formation of zinc-iron alloy layers. This results in a thin coating of almost pure zinc with very little intermetallic growth.

Figure 2



A variety of coating weights are available, ranging from 0.25 mils (6 μm) to just under 2 mils (50 μm) per side. The standard product is Class G90, which has 0.9 oz/ft² of sheet (total both sides) or about 0.75 mils (18 μm) thickness per side. Batch galvanizing coating specifications are given in weight per surface area. The galvanized sheet coating parameters relate to total for both sides of the sheet. The sheet coating thicknesses must be divided by two for an approximate comparison.

Both coatings provide barrier and cathodic protection, a benefit unique to galvanizing. And both coatings protect steel from rust better than other corrosion protection systems. However, the coating thickness difference is significant. Each type of galvanized product, batch or continuous, has applications where it would be best utilized.