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ABSTRACT:

The zinc coating selection and thickness for metal studs requires knowledge of the corrosiveness of the environment in which the product will be used and the code requirements for the proper coating type and weight.

FILING:

UniFormat®
B2010 Exterior Walls
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KEYWORDS:

Stud, Coating, Continuous Sheet Galvanizing, Hot-Dip, Zinc, Galvanized

REFERENCES:

AISI S100 - North American Specification for the Design of Cold-Formed Steel Structural Members
AISI S220 - North American Standard for Cold-Formed Steel Nonstructural Framing
AISI S240 - North American Standard for Cold-Formed Steel Structural Framing
ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
IBC 2202.1 - Identification of Steel for Structural Purposes, General

Zinc Coatings and Metal Studs

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Introduction

There are many different types of zinc coatings available. The major galvanized types are batch hot-dip galvanizing, continuous sheet galvanizing, zinc plating, electrogalvanizing, mechanical plating, zinc spraying, and zinc painting.

This article will discuss continuous sheet galvanizing which is the predominant method used on sheet steel for structural and nonstructural steel studs.

The hot-dip process for continuous sheet galvanizing produces four different types of coated products, including (G)-zinc, (A)-zinc-iron alloy, (AZ)-55% aluminum-zinc alloy, and (GF)-zinc-5% aluminum alloy.

In North America there were approximately 89 hot-dip lines in 2022. Each could apply at least one of the coatings listed above.

Continuous Sheet Galvanizing Process

The molten coating is applied onto the steel surface by passing a continuous ribbon of steel through a bath of molten zinc at speeds up to 600 feet per minute. Sheet size can range from 0.010 to 1.70 inches thick, and up to 72 inches wide.

The coating process begins by cleaning the steel with alkaline liquid combined with brushing and followed by rinsing, and drying of the steel.

The steel passes into the heating or annealing furnace to soften the steel and impart the desired strength and formability.

In the furnace, the steel is maintained under a reducing gas atmosphere to remove any oxide that may be on the steel surface.

The steel then passes through a vacuum chamber to the molten zinc coating bath to prevent any air from re-oxidizing the heated steel. The steel sheet is sent around a submerged roller, which reacts with the molten metal to create the bonded coating.

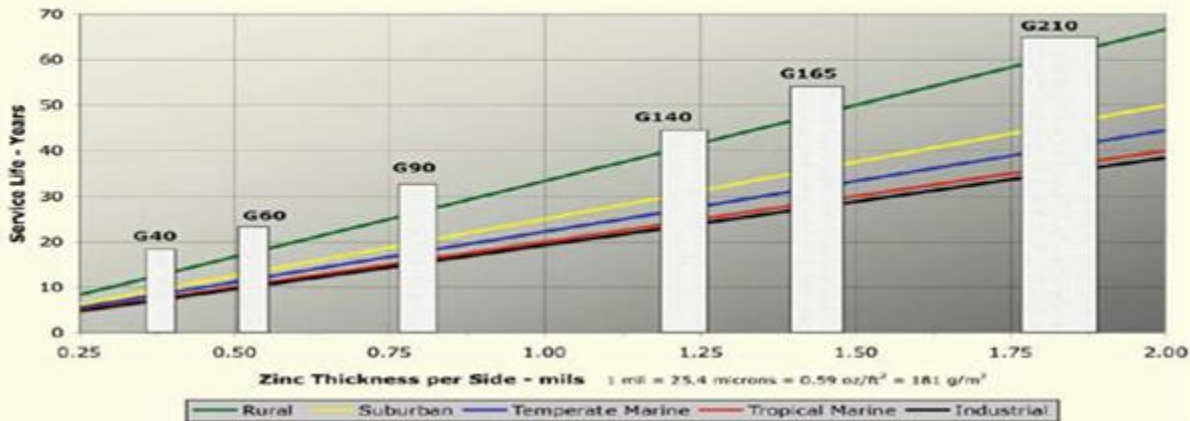
The steel is then removed in a vertical direction and high pressure air is used to remove any excess molten zinc to create a controlled coating thickness. The steel is then cooled to allow the zinc to solidify onto the steel surface before the steel contacts another roller to avoid transferring or damaging the coating.

Selecting the Correct Coating Thickness

Although hot-dipped galvanizing is available in a variety of coating weights ranging from G01 to G360, the steel stud industry typically offers three standard zinc coatings G40, G60, and G90 with 0.40, 0.60, and 0.90 total ounces of zinc per square foot, respectively, applied to both sides of the sheet metal. The standard coatings requirements for structural products are listed in AISI S240 and nonstructural products are found in AISI S220.

The metallic coating requirements for structural studs can be found within AISI S240 Table A4-1. The table lists three coating designators CP 60, CP 90, and PM that permit coatings using any one of the four types: zinc coated, zinc iron, 55% Al-zinc, and zinc-5%.

Figure 1 Service Life for Hot-Dip Galvanized Sheet



AISI S240 states that structural studs must have a minimum protective coating CP 60. The CP 60 designator requires G60 as the minimum zinc coating or A60, AZ50 or GF30, the equivalent of the other permitted coatings.

For AISI S220 nonstructural studs, a minimum G40 zinc coating conforming to ASTM A653 is required. The standard also allows other protective coatings with an equivalent corrosion resistance.

When extreme humidity, salt spray or corrosive environments are anticipated, a G90 coating weight is recommended, which most manufacturers offer as a special purchase item. It is important to remember that for all continuously galvanized sheet materials, the coating weight is given as the total zinc weight for both sides of the sheet. This coating weight is not necessarily evenly divided between both sides of the sheet.

Figure 1 shows the estimated service life for the various coating thicknesses, assuming full exposure during the life cycle. (Illustration used with permission from www.galvinfo.com.)

Identifying Studs in the Field

Most Architects don't carry micrometers to the field to check metal thicknesses.

The IBC 2202.1 requires that each cold-formed steel members be identified in accordance to AISI S100 and cold-formed steel light-frame construction in accordance to AISI S220 or S240 as applicable. Products are labeled at a maximum 96 inches on center. The marking must show the roll-former identification, minimum uncoated metal thickness, minimum yield strength (ksi) and coating type and weight.

Therefore, if the product is not marked, it is not code compliant material and should not even be allowed on the jobsite.

Conclusion

Understanding what galvanized coatings are available is the first step in selecting what coating is right for your product and project. We suggest the following as the minimum coatings based on use: Exterior Walls: G90; Interior Wet Areas: G60; and Interior Dry Areas: G40 or equivalent, the default by AISI S220 and AISI S240. Be sure to take advantage of your product reps to assist in selecting the correct coating thickness for your metal studs, especially for unusual conditions. For additional information to help select coating thicknesses, refer to the [GalvInfo Notes](#) series of Documents.

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