WJE

# PRIMER

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## Galvanized Nails

### Not All Are Created Equal

**Galvanizing refers to a coating of zinc applied to the surface of ferrous metal to impart corrosion resistance. Why is it called galvanizing? Believe it or not, the electrochemical reaction between metals was inadvertently discovered by Italian physician Luigi Galvani in 1772 during an experiment which ultimately showed that the muscles of frogs' legs twitched when exposed to electricity.**

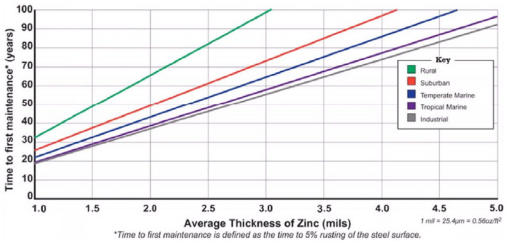
**A close look at two common methods used to impart corrosion resistance in today's galvanized roofing nails.**

Today, numerous methods exist for coating iron and steel with zinc, including electroplating, hot dipping, mechanical plating, and metallizing (hot zinc spray). Galvanized roofing nails are typically produced by electroplating or hot dipping, so for the purposes of this newsletter, we will focus on these two methods.

Electroplating (also called electrogalvanizing and often indicated by "EG" on packaging) involves submerging steel nails in a solution containing zinc ions. An electrical current deposits a coating of zinc onto the surface of the nails.

Hot-dipped galvanizing is exactly what it sounds like. Steel nails are dipped into a bath of molten zinc. An alloy forms between the iron in the steel and the inner surface of the zinc coating, creating a very strong bond. Double hot-dipped galvanized nails, as you might expect, are dipped in the zinc bath twice. This does not translate to doubling the thickness of the zinc coating, however. Rather, the second dipping "improve[s] the overall quality of the outer zinc layer..."[1] by smoothing out any imperfections and adds a marginal amount to the thickness of the coating.

So, what's the practical difference from a roofing standpoint? The biggest difference is




the thickness of the zinc coating. According to the American Galvanizers Association (AGA), the zinc coating achieved by electroplating can range in thickness from 0.14 to 0.28 mils versus 1.4 to 3.9 mils achieved by hot dipping.[2] A thicker zinc coating generally equates to longer lasting corrosion resistance. The AGA reports that, in a suburban environment, electroplated nails may be expected to exhibit five percent corrosion of the steel surface in ten years or less, whereas hot-dipped galvanized nails in the same conditions may exhibit five percent corrosion of the steel surface in thirty to eighty-five years, depending on the thickness of the zinc coating (see chart[3]).

Some nails advertised as hot-dipped galvanized are manufactured from wire that has already been hot-dipped galvanized. The cutting and forming of the nail head can damage and stretch the zinc coating, thereby reducing the nail's corrosion resistance. Look

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## Galvanized Nails (CONTINUED)

for nails that comply with ASTM A153, Standard Specification for Zinc Coating (HotDip) on Iron and Steel Hardware, which applies only to preformed fasteners; malleable castings; and rolled, pressed, or forged iron and steel items. Even so, given today's marketing practices, it is probably best to confirm with the manufacturer that hot-dip galvanizing is performed after the nails are formed.

Although electroplated nails are acceptable to most asphalt shingle manufacturers, you really want the nails to last at least as long as the shingles. Most dimensional asphalt shingles today are available with forty- to fifty-year warranties. Given the relatively brief anticipated service life of electroplated nails, we recommend specifying double hot-dipped galvanized nails for securing dimensional asphalt shingles. Double hot-dipped galvanized nails complying with ASTM A153 are manufactured by Maze Nails, a division of the W.H. Maze Company in Peru, Illinois.

Not sure what you're looking at on a job site? Take a close look. Electroplated and hot-dipped galvanized nails are very different in appearance (photo to right). Electroplated nails are shiny and relatively smooth, whereas hot-dipped galvanized nails are dull gray and have a slightly rough surface texture.

*The nail on the left is double hot-dipped galvanized. The nail on the right is electroplated.*

[1] Hardison, Shalea. "Life Expectancy of Galvanized Fasteners." *The Journal of Light Construction*, Feb. 1998.

[2] "Zinc Coatings," American Galvanizers Association, http://www.galvanizeit.org/corrosion-protection/zinc-coatings, 2015.

[3] "Time to First Maintenance," American Galvanizers Association, http://www.galvanizeit.org/corrosion-protection/zinc-coatings, nd.

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