

ASK DR. GALV

Q: My bolt manufacturer requested I galvanize my hardware in accordance with ASTM F 2329, yet my galvanizer uses ASTM A 153 for hardware. What are the differences between these two specifications?

A: ASTM A 153 and ASTM F 2329 are specifications for galvanizing hardware centrifuged after galvanizing. F 2329 is similar to A 153 in many respects, and mentions in several sections the user shall galvanize in accordance with A 153 unless otherwise noted.

Major Differences between the Two Specifications

There are major differences between the two specifications in the categories of coating measurement, overtapping information, hydrogen embrittlement, sampling, and rejection and retesting. A 153 specifies coating weight or thickness shall conform to Table 1, contained in the specification. Table 1 lists required coating weight or thickness according to classes or subclasses of material. Table 2 of F 2329 lists required coating thicknesses according to dimensions of materials. A 153 requires a thicker coating in almost every category of fastener when compared to F 2329, and therefore more corrosion protection.



F 2329 specifies fasteners subject to severe work hardening shall be stress-relieved by the fastener manufacturer prior to galvanizing, and fasteners with a hardness of 33 Rockwell hardness (HRC) or greater are susceptible to hydrogen embrittlement. Fasteners with a hardness of 40 HRC or greater should not be galvanized. F 2329, if requested by the purchaser, also requires the galvanizer to mechanically descale or bake materials to reduce the risk of hydrogen embrittlement. A 153 simply states hardware susceptible to hydrogen embrittlement shall be tested according to A 143.

F 2329 has two sampling plans, one for batch lots and another for production lots. The batch lot sampling plan shall conform to Table 1 of F 2329. The production lot sampling plan shall conform to F 1470. The sampling plan for production lots has two categories, one for the detection process and one for the prevention process, and each of these categories has different sampling requirements. The sampling table in A 153 requires more samples for each numerical category range (i.e., 4 to 500 pieces in the lot or 1201 to 3200 pieces in the lot) than Table 1 in F 2329. The two specifications have different numerical category ranges as well (i.e., 4 to 500 pieces in the lot compared to 5 to 25 pieces in the lot).

However, the samples required for each numerical category range in F 1470 require more samples per range than the sampling table in A 153. F 2329 and A 153 both reference F 1470 for the method of sampling for fasteners required to meet the standards of the Fastener Quality Act. For the detection process of F 2329, sampling for coating thickness and visual appearance shall conform to F 1470 Table 3, sample size A, and to Table 3, sample size C for the adhesion test. For the prevention process of F 2329, sampling for coating thickness and visual appearance shall conform to F 1470 Table 3, sample size B and Table 3, sample size D for the adhesion test.

According to A 153, when materials fail the visual inspection, the galvanizer can sort the lot and resubmit it for inspection. When a set of specimens fails the requirements of A 153, two additional sets shall be tested, and both sets must conform to the requirements of the specification in every respect, or the lot of material represented by the specimens shall be rejected. F 2329 simply references F 1470 for nonconforming lots.



A 153 covers nails and rivets, while F 2329 does not.

Minor Differences between the Two Specifications

One minor difference between the two is F 2329 has extra sections including Ordering Info, Chemical Composition of Zinc, Safeguards Against Alteration of Fasteners Mechanical Properties, and Coating and Dimensional Requirements. The section on the chemical composition of zinc specifies the zinc used in the kettle shall be in accordance with A 153. The two appendixes in F 2329 include Galvanizing Temperature and Variation in Coating. Under the title for the appendixes are the words "Non-mandatory Information." The appendix on galvanizing temperature concerns the high temperature galvanizing process, from 990 to 1040°F, which creates thinner, smoother and duller coatings than normal galvanizing. The appendix that covers variations in coatings explains slight fluctuations in the galvanizing process which can create coatings with slightly different appearances.

Continued next page...

F 2329 does not cover galvanizing nails or rivets, whereas A 153 does. Another minor difference between the two specifications is F 2329 includes detailed ordering information when a purchaser specifies the galvanizing of fasteners. F 2329 also states purchasers are responsible for knowing the possibility of distortion exists at galvanizing temperatures, and the galvanizer is not responsible for unanticipated distortion of parts. Under F 2329, when a purchaser requires a galvanizer to inspect dimensional requirements of parts, they must provide the galvanizer with the necessary tools and inspection gauges.

F 2329 is more detailed and requires more information in terms of documentation required during certification (average galvanizing temperature and average coating thickness of the production lot) and packaging than A 153. Many of the minor differences between the specifications are due to wording.

Although there are some major and minor differences between A 153 and F 2329, hot-dip galvanized fasteners will usually meet the requirements of each of these specifications, and the galvanized coating will provide corrosion protection for many years in field applications.