Designation: A123/A123M – 24

Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products[1]

This standard is issued under the fixed designation A123/A123M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

This standard has been approved for use by agencies of the U.S. Department of Defense.

1. Scope*

1.1 This specification covers the requirements for zinc coating (galvanizing) by the hot-dip process on iron and steel products made from rolled pressed and forged shapes, castings, plates, bars, and strips.

1.2 This specification covers both unfabricated products and fabricated products, for example, assembled steel products, structural steel fabrications, large tubes already bent or welded before galvanizing, and wire work fabricated from uncoated steel wire. This specification also covers steel forgings and iron castings incorporated into pieces fabricated before galvanizing or which are too large to be centrifuged (or otherwise handled to remove excess galvanizing bath metal).

NOTE 1—This specification covers those products previously addressed in Specifications A123–78 and A386–78.

1.3 This specification does not apply to wire, pipe, tube, or steel sheet which is galvanized on specialized or continuous lines, or to steel less than 22 gauge (0.0299 in.) [0.76 mm] thick.

1.4 The galvanizing of hardware items that are to be centrifuged or otherwise handled to remove excess zinc (such as bolts and similar threaded fasteners, castings and rolled, pressed and forged items) shall be in accordance with Specification A153/A153M.

1.5 Fabricated reinforcing steel bar assemblies are covered by the present specification. The batch galvanizing of separate reinforcing steel bars shall be in accordance with Specification A767/A767M and the continuous galvanizing of reinforcing bars shall be in accordance with Specification A1094/A1094M.

1.6 This specification is applicable to orders in either inch-pound units (as A123) or SI units (as A123M). Inch-pound units and SI units are not necessarily exact equivalents. Within the text of this specification and where appropriate, SI units are shown in parentheses. Each system shall be used independently of the other without combining values in any way. In the case of orders in SI units, all testing and inspection shall be done using the metric equivalent of the test or inspection method as appropriate. In the case of orders in SI units, such shall be stated to the galvanizer when the order is placed.

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A47/A47M Specification for Ferritic Malleable Iron Castings

A90/A90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings

A143/A143M Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement

A1094/A1094M Specification for Continuous Hot-Dip Galvanized Steel Bars for Concrete Reinforcement

A153/A153M Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware

A384/A384M Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanizing of Steel Assemblies

A385/A385M Practice for Providing High-Quality Zinc Coatings (Hot-Dip)

A767/A767M Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement

A780/A780M Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

[1] This specification is under the jurisdiction of ASTM Committee A05 on Metallic-Coated Iron and Steel Products and is the direct responsibility of Subcommittee A05.13 on Structural Shapes and Hardware Specifications.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at www.astm.org/contact. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

***A Summary of Changes section appears at the end of this standard**

A902 Terminology Relating to Metallic Coated Steel Products
B6 Specification for Zinc
B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section
B602 Guide for Attribute Sampling of Metallic and Inorganic Coatings
B960 Specification for Prime Western Grade-Recycled (PWG-R) Zinc
D6386 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting
D7803 Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Powder Coating
E376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy Current (Electromagnetic) Testing Methods

3. Terminology (See Fig. 1)

3.1 *Definitions:*

3.1.1 The following terms and definitions are specific to this specification. Terminology A902 contains other terms and definitions relating to metallic-coated steel products.

3.2 *Definitions of Terms Specific to This Standard:*

3.2.1 *average coating thickness, n*—the average of three specimen coating thicknesses.

3.2.2 *black, adj*—denotes the condition of not galvanized or otherwise coated. For purposes of this specification the word "black" does not refer to the color or condition of surface, or to a surface deposit or contamination.

3.2.3 *coating thickness grade, n*—the numerical value from Table 1 at the intersection of a material category and a thickness range.

3.2.4 *gross dross inclusions, n*—the iron/zinc intermetallics present in a galvanized coating in a form other than finely dispersed pimples.

3.2.4.1 *Discussion*—These inclusions would create an exposed steel spot if they were removed from the coating. These inclusions are raised surfaces and are easily knocked off through contact with lifting straps or chains, tools, fixtures, or other galvanized parts.

3.2.5 *intended use, n*—the objective or function a product is designed to be used for which is not primarily aesthetic in nature. This includes functional features of the product, required fit-up to other parts, or ability to be painted or powder coated.

3.2.6 *masking, n*—the practice of treating a portion of the steel surface with a material not removable by chemical cleaning during the galvanizing process to achieve purposely ungalvanized areas.

3.2.7 *material category, n*—the general class or type of material or process of manufacture, or both, that nominally describes a unit of product, or from which a unit of product is made. For example, bar grating belongs to the category "strip," handrail belongs to the category "pipe," etc. Refer to Appendix X1 for additional examples.

3.2.8 *multi-specimen article, n*—a unit of product whose surface area is greater than 160 in.^{2} [100 000 mm^2]. For thickness testing purposes, articles whose surface area is greater than 160 in.^{2} are subdivided into three continuous local sections, nominally equal in surface area, each of which constitutes a specimen. In the case of any such local section containing more than one material category or steel thickness range as delineated in Table 1, that section will contain more than one specimen (see Fig. 1).

3.2.9 *sample, n*—a collection of individual units of product from a single lot selected in accordance with Section 7, and intended to represent that lot for acceptance. If a sample is taken as representing the lot for acceptance, the sample shall be taken at random from the lot without regard to the perceived quality or appearance of any individual unit in the lot being sampled. The sample consists of one or more test articles.

3.2.10 *single-specimen article, n*—a unit of product whose surface area is equal to or less than 160 in.^{2} [100 000 mm^2] or that is centrifuged or otherwise similarly handled in the galvanizing process to remove excess galvanizing bath metal (free zinc). For thickness testing purposes, the entire surface area of each unit of product constitutes a specimen. In the case of any such article containing more than one material category or steel thickness range as delineated in Table 1, that article will contain more than one specimen (see Fig. 1).

3.2.11 *specimen, n*—the surface of an individual test article or a portion of a test article, upon which thickness measurements are to be performed, which is a member of a lot, or a member of a sample representing that lot. For magnetic thickness measurements, specimen excludes any area of the surface which is subject to processes (such as flame cutting,

TABLE 1 Minimum Average Coating Thickness Grade by Material Category

Material Category	All Specimens Tested Steel Thickness Range (Measured), in. [mm]					
	<1/16 [<1.6]	≥1/16 to <1/8 [≥1.6 to <3.2]	≥1/8 to <3/16 [≥3.2 to 4.8]	≥3/16 to <1/4 [≥4.8 to <6.4]	≥1/4 to <5/8 [≥6.4 to <16.0]	≥5/8 [≥16.0]
Structural Shapes	45	65	75	75	100	100
Strip and Bar	45	65	75	75	75	100
Plate	45	65	75	75	75	100
Pipe and Tubing	45	45	75	75	75	75
Wire	35	50	60	65	80	80
Reinforcing Bar	...	...	...	...	100	100
Forgings and Castings	...	...	...	100	100	100

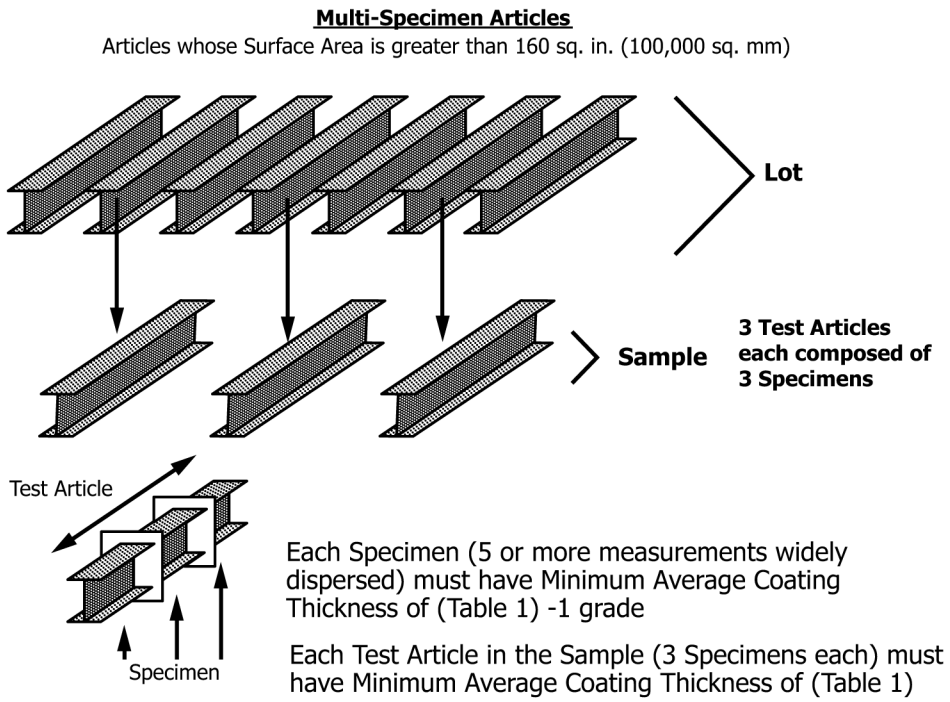

FIG. 1 Single- and Multi-Specimen Articles

machining, threading, etc.) that can be expected to result in surface conditions not representative of the general surface condition of the test article, or is disqualified by the measurement method. The minimum average coating thickness grade for any specimen shall be one coating grade below that required for the appropriate material category and thickness in Table 1, which is based on the order of thickness grade values in Table 2. For a unit of product whose surface area is equal to or less than 160 in.^{2} [100 000 mm^2], the entire surface area of each test article constitutes a specimen. In the case of an article containing more than one material category or steel thickness range as delineated in Table 1, that article will contain more than one specimen, as appropriate (see Fig. 1).

3.2.12 *specimen coating thickness, n*—the average thickness from no less than five test measurements on a specimen, when each measurement location is selected to provide the widest dispersion (in all applicable directions) of locations for the steel category of the test article within the confines of the specimen volume.