



Designation: A1060/A1060M – 14

Standard Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete¹

This standard is issued under the fixed designation A1060/A1060M; 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 reappraisal. A superscript epsilon (ϵ) indicates an editorial change since the last revision or reappraisal.

1. Scope*

1.1 This specification covers zinc-coated steel welded wire reinforcement, plain and deformed, or a combination of deformed and plain wires, for reinforcement of concrete, in sizes not less than 0.080 in. [2.03 mm] and over nominal diameter for plain wire and 0.113 in. [2.87 mm] and over for deformed wire.

1.2 This specification is intended to be applicable to cold-worked wire, drawn or rolled, plain or deformed, coated in a continuous process.

1.3 An alternative to a continuous coating process of wire before fabrication is a hot-dip process, where the welded wire reinforcement is immersed in a bath of molten zinc.

NOTE 1—Data on the corrosion resistance of galvanized steels in concrete are limited. The user is cautioned that the laboratory testing performed on this material has been insufficient and may not accurately reflect the performance of the material when embedded in concrete as reinforcement.

1.4 The values stated in either SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 ASTM Standards:²

¹ This specification is under the jurisdiction of ASTM Committee A01 on Steel, Stainless Steel and Related Alloys and is the direct responsibility of Subcommittee A01.05 on Steel Reinforcement.

Current edition approved May 1, 2014. Published May 2014. Originally approved in 2010. Last previous edition approved in 2011 as A1060/A1060M – 11^{e1}. DOI:10.1520/A1060_A1060M-14.

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

- A90/A90M Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings
- A700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment (Withdrawn 2014)³
- A780 Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
- A1064/A1064M Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete
- B6 Specification for Zinc
- B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section
- E376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Testing Methods
- 2.2 Military Standard:⁴
 - MIL-STD-129 Marking for Shipment and Storage
- 2.3 Federal Standard:⁴
 - Fed. Std. No. 123 Marking for Shipments (Civil Agencies)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 *continuous coating, n*—of metallic coated steel products, the process of uninterrupted passage of long lengths of steel products, usually steel sheet, tube, pipe, or wire, through the various processing steps such as cleaning and coating.

4. Ordering Information

4.1 It shall be the responsibility of the purchaser to specify all requirements that are necessary for material ordered to this specification. Such requirements may include but are not limited to the following:

- 4.1.1 Quantity (weight [mass] or square area),
- 4.1.2 Name of material (galvanized welded wire reinforcement),

³ The last approved version of this historical standard is referenced on www.astm.org.

⁴ Available from U.S. Government Printing Office Superintendent of Documents, 732 N. Capitol St., NW, Mail Stop: SDE, Washington, DC 20401, http://www.access.gpo.gov.

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

- 4.1.3 Wire spacing and sizes,
- 4.1.4 Conforms to Specification **A1064/A1064M**.
- 4.1.5 ASTM designation and year of issue,
- 4.1.6 Minimum yield strength if Supplement S1 of Specification **A1064/A1064M** applies,
- 4.1.7 Length and width of sheets or rolls,
- 4.1.8 Required zinc coating weight [mass] (coated before fabrication) or zinc coating thickness (coated after fabrication), and
- 4.1.9 Packaging (see Section **13**).

5. General Requirements

5.1 The wire used in the manufacture of welded wire reinforcement shall conform to Specification **A1064/A1064M** with optional Supplement S1. After galvanizing, the welded wire shall meet the required mechanical properties of Specification **A1064/A1064M** except for the bend test requirements as prescribed in **Table 1** of this specification.

5.2 Welded wire reinforcement shall be furnished either in flat sheets, or in rolls, as specified by the purchaser.

5.3 The zinc used for coating shall be any grade that conforms to Specification **B6**.

6. Galvanizing

6.1 Mass [Weight] Thickness of Coating and Test:

6.1.1 This specification includes six classes of coating weight [mass] when the welded wire reinforcement is coated before fabrication and four coating thickness grades when the welded wire reinforcement is coated after fabrication. The weight [mass] of zinc coating is based on the measured diameter of the wire when the stripping method is performed and the nominal diameter for all other methods, and shall conform to the requirements shown in **Table 2** or **Table 3**. Individual results not more than 10 % below the minimum values specified in **Table 2** or **Table 3** are allowed if the average of at least two samples from the same coil are equal to or greater than the minimum, individual results shall be not less than 1.08 oz/ft² [330 g/m²].

6.1.1.1 When the product is coated before fabrication in a continuous coating process, coating weights are given in **Table 2** for various zinc coating classes.

NOTE 2—Zinc coated wire produced as “regular coating” shall have the full surface covered with zinc, but there is no specified minimum weight of coating.

TABLE 1 Mandrel Diameters for Test for Adherence of Zinc Coating Inch-Pound Units [SI Units]

Wire Diameter	Mandrel Diameters of Coating Classes and Grades		
	Regular and Class 1	Class 3 or A, 4, B, 5, and C	Grade 50, 60, 65, and 80
Under 0.148 [3.70]	1D ^A	3D	3D
0.148 [3.70] to 0.500 [12.7]	2D	4D	4D
over 0.500 [12.7]	3D	5D	5D

^A D = nominal wire diameter being tested.

6.1.1.2 When the product is coated after fabrication in a hot-dip process, coating thickness are given in **Table 3** for various zinc coating grades.

NOTE 3—At the purchaser’s request the galvanized coating may be chromate treated. This is to minimize a reaction between the reinforcing steel and fresh portland cement paste. Proprietary chromating solutions of equivalent strength are permitted in place of the generic chemical treatment specified.

6.1.2 *Magnetic Thickness Measurements*—The weight [mass] of the coating may be determined by magnetic thickness gage measurements in accordance with Practice **E376**. The thickness measurement is used to calculate the weight [mass] by multiplying it by the surface area of coated wire and by the zinc density. Because this form of testing can yield inconsistent and potentially unreliable results on smaller sizes of wire, one or more of the following methods shall be permitted to be used to referee and take precedence over the results obtained by magnetic thickness measurements.

6.1.2.1 *Stripping Method*—The weight [mass] shall be determined by stripping the coating from the steel wire specimen in accordance with Section **8** and Test Method **A90/A90M**.

6.1.2.2 *Weighing Before and After Galvanizing*—The weight [mass] shall be determined by weighing the sample before and after galvanizing. The difference between the two measurements divided by the surface area of the sample provides the weight [mass]. The original weighing shall occur after pickling and drying. The second weighing shall occur after cooling to ambient temperature.

6.1.2.3 *Microscopy*—The weight [mass] shall be determined by cross-sectional and optical measurement in accordance with Test Method **B487**. A cross-section sample of the steel shall be polished and examined with an optical microscope to determine the coating thickness. The coating weight [mass] shall be determined by multiplying coating thickness by the surface area of the coated sample and by the density of zinc.

6.1.3 *Number of Tests*—For determination of the coating weight [mass], three random samples shall be tested from each lot. For each magnetic thickness measurement sample, five or more measurements shall be made along the length and width of the sample so as to represent the entire surface of the sample. A total of at least fifteen measurements shall be averaged to obtain the coating thickness. For the microscopy method, five samples shall be tested per lot. Each sample shall be measured on four sides and the total of twenty measurements shall be averaged to obtain the coating thickness. For the stripping method and the weighing method, three samples per lot shall be measured.

NOTE 4—A lot shall be as follows: all wire of the same size furnished to the same steel reinforcing specification that has been galvanized within a single production shift.

6.2 Handling:

6.2.1 The identification of all reinforcing steel shall be maintained throughout the coating and fabrication process to the point of shipment.

7. Finish and Adherence of Coating

7.1 The zinc coating shall have no bare spots. The coating shall be free of blisters, flux spots or inclusions, dross, and acid