



Designation: ~~A 767/A 767M-05~~ Designation: A767/A767M – 09

## Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement<sup>1</sup>

This standard is issued under the fixed designation A767/A767M; 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 ( $\epsilon$ ) indicates an editorial change since the last revision or reapproval.

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

### 1. Scope\*

1.1 This specification covers steel reinforcing bars with protective zinc coatings applied by dipping the properly prepared reinforcing bars into a molten bath of zinc.

1.2 This specification is applicable for orders in either inch-pound units (as Specification A767) or SI units (as Specification A767M).

1.3 The values stated in either SI or inch-pound units are to be regarded as standard. Within the text, the inch-pound units are shown in brackets. The values stated in each system are not exact equivalents. Therefore, each system must be used independently of the other. Combining values from the two systems may result in nonconformance with this specification.

### 2. Referenced Documents

#### 2.1 ASTM Standards:<sup>2</sup>

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

A615/A615M Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement ~~A706/A 706M~~

~~A706/A706M~~ Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement

A780/A780M Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings ~~A 996/A 996M~~

~~A996/A996M~~ Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement

B6 Specification for Zinc

B487 Test Method for Measurement of Metal and Oxide Coating Thickness by Microscopical Examination of Cross Section

ASTM A767/A767M-09

<https://standards.iteh.ai/catalog/standards/sist/289ab625-1d1f-4d75-9f86-c121636b0937/astm-a767-a767m-09>

<sup>1</sup> 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.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). 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.

E376 Practice for Measuring Coating Thickness by Magnetic-Field or Eddy-Current (Electromagnetic) Examination Testing Methods

2.2 ~~American Concrete Institute Specification~~: ACI Specification:<sup>3</sup>  
ACI 301 Specifications for Structural Concrete

**3. Ordering Information**

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

- 3.1.1 Quantity of bars,
- 3.1.2 Size of bars,
- 3.1.3 Reinforcing bar specification (ASTM designation and year of issue) and grade,
- 3.1.4 Class of coating,
- 3.1.5 Galvanization before or after fabrication, and

NOTE 1—A typical ordering description is as follows: Deformed Grade 420 bars to ASTM A615M-\_\_\_\_; 1600 m, No. 19, 8 m long in secured lifts; zinc-coated (galvanized) to ASTM A767M-\_\_\_\_; including Class 1 coating, and galvanization after fabrication.

[Deformed Grade 60 bars to ASTM A615-\_\_\_\_; 4000 linear ft, No. 6, 20 ft, 0 in. long in secured lifts; zinc-coated (galvanized) to ASTM A767-\_\_\_\_, including Class 1 coating, and galvanization after fabrication.]

**4. Galvanizing**

4.1 *Handling*:

4.1.1 The galvanizer shall be permitted to subject the newly coated steel reinforcing bars to air or steam wiping to remove excess zinc from the bars. After the wiping, the coated steel reinforcing bars shall meet the minimum coating mass [weight].

NOTE 2—During the wiping process, care should be taken to maintain a uniformly thick coating around the perimeter of the bar.

4.1.2 It shall be the responsibility of the galvanizer to maintain identity of the reinforcing bars throughout the galvanizing process and to the point of shipment.

4.2 *Mass [Weight] of Coating and Test*:

4.2.1 This specification includes two classes of coating mass [weight]. The mass [weight] of zinc coating based on actual area of the bar, bar shall conform to the requirements shown in Table 1.

NOTE 3—The nominal diameter of a deformed bar is equivalent to that of a plain round bar having the same mass per metre [weight per foot] as the deformed bar. Coating mass [weight] shown in Table 1 is based on an assumed area ratio of 1.2:1 (actual to nominal surface area of the steel reinforcing bar).

4.2.2 *Magnetic Thickness Measurements*—The mass [weight] of the coating shall be determined by magnetic thickness gage measurements in accordance with Practice E-376E376. The thickness measurement is used to calculate the mass [weight] by multiplying it by the surface area of coated bar and by the zinc density. One or more of the following methods shall be permitted to be used to referee the results obtained by magnetic thickness measurements.

4.2.2.1 *Stripping Method*—The mass [weight] shall be determined by stripping the coating from the steel reinforcing bar section in accordance with Test Method A-90/A-90MA90/A90M.

NOTE 4—This is a destructive test appropriate for small samples of a minimum of 2000 mm<sup>2</sup> [3 in.<sup>2</sup>] of surface area. It does not include the mass [weight] of iron reacted with the zinc coating and may overestimate coating mass [weight] by up to 10 %.

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

<sup>3</sup> Available from American Concrete Institute, 38800 Country Club Dr., Farmington Hills, MI 48331.

<sup>3</sup> Available from American Concrete Institute (ACI), P.O. Box 9094, Farmington Hills, MI 48333-9094, <http://www.concrete.org>.

**TABLE 1 Mass [Weight] of Zinc Coating**

Coating Class	Mass [Weight] of Zinc Coating, min, g/m <sup>2</sup> [oz/ft <sup>2</sup> ] of Surface
<b>Class I</b>	
Bar Designation Size No. 10 [3]	915 [3.00]
Bar Designation Size No. 13 [4] and Larger	1070 [3.50]
<b>Class II</b>	
Bar Designation Size No. 10 [3] and Larger	610 [2.00]

4.2.2.3 *Microscopy*—The mass [weight] 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 mass [weight] shall be determined by multiplying coating thickness by the surface area of the coated sample and by the density of zinc.

4.2.3 *Number of Tests*—For determination of the coating mass [weight], three random samples shall be tested from each lot. For each magnetic thickness measurement sample, five or more measurements shall be made at various points throughout 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 5—A lot shall be as follows: All bars of one size furnished to the same steel reinforcing bar specification that have been galvanized within a single production shift.

4.2.4 *Retests*—If the average zinc coating mass [weight] fails to meet the requirements of Table 1, six additional random samples from the lot shall be permitted to be tested. If the average zinc coating mass [weight] of the six samples conforms to the requirements of Table 1, the lot shall be accepted.

4.3 *Chromating*—The galvanized coating shall be chromate treated. This is to preclude a reaction between the bars and fresh portland cement paste. Proprietary chromating solutions of equivalent strength are permitted in place of the generic chemical treatment specified.

4.3.1 *4.3.1* If the chromate treatment is performed immediately after galvanizing, it may be accomplished by quenching the steel reinforcing bars in a solution containing at least 0.2 mass [weight] % of sodium dichromate in water (such as 2kg/m<sup>3</sup> [3 oz of each 10 gal] of quench water) or by quench chromating in a minimum of 0.2 % chromic acid solution. The solution shall be at least 32°C [90°F]. The galvanized reinforcing bars shall be immersed in the solution for at least 20 s.

4.3.2 If the galvanized reinforcing bars are at ambient temperature, the chromate treatment shall be the same as specified in 4.3.1 except that 0.5 to 1.0 % concentration of sulfuric acid shall be added as an activator of the chromate solution. In this case, there is no temperature requirement for the activated chromate solution.

## 5. General Requirements

5.1 The steel reinforcing bars shall conform to one of the following specifications: A 615MA 615/A 615M, A 706MA 706/A 706M, or A 996A 996/A 996MM [A 615, A 706, or A 996].

5.2 The zinc used for coating shall be any grade that conforms to Specification B 6B 6

5.1 The steel reinforcing bars shall conform to one of the following specifications: A615M, A706M, or A996M [A615, A706, or A996].

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

## 6. Finish and Adherence of Coating

6.1 The zinc coating shall have no bare spots. The coating shall be free of blisters, flux spots or inclusions, dross, and acid or black spots. Bars that stick together after galvanizing shall be rejected. In addition, the presence of tears or sharp spikes which make the bar hazardous to handle shall be cause for rejection. A matte gray finish appearance shall not be itself a cause for rejection.

NOTE 6—Specific concentrations of elements such as silicon, carbon, and phosphorus in steel tend to accelerate the growth of the zinc-iron alloy layer so that the galvanized coating may have a matte finish with little or no free zinc outer layer. The mass, shape, and amount of cold working of the bar being galvanized may also affect this condition.

6.2 The coating shall be adherent so it cannot be removed by any reasonable process of handling or erection.