
Standard Specification for Uncoated, Corrosion-Resistant, Deformed and Plain Chromium Alloyed, Billet-Steel Bars for Concrete Reinforcement and Dowels

AASHTO Designation: M 334M/M 334-17 (2021)¹

Adopted with Revisions: 2017 Reviewed but Not Updated: 2021

Technical Subcommittee: 4f, Metals



**American Association of State Highway and Transportation Officials
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1. SCOPE

- 1.1. This specification covers uncoated, corrosion-resistant, deformed and plain chromium alloyed, billet-steel concrete reinforcement and dowel bars in cut lengths or coils (Notes 1 and 2). The standard sizes and dimensions of deformed bars and their number designations shall be those listed in Table 2 for millimeter-kilogram bars [Table 3 for inch-pound bars].
- Note 1**—For coils of deformed bars, the capacity of industrial equipment limits the maximum bar size that can be straightened.
- Note 2**—The degree of corrosion resistance specified for both concrete reinforcement and dowel bars is typically dependent on the type of structure, the expected in-service environmental conditions, and the material properties of the concrete in which they are embedded.
- 1.2. Bars are of three minimum yield levels: 420 MPa [60,000 psi], 550 MPa [80,000 psi], and 690 MPa [100,000 psi], designated as Grade 420 [60], Grade 550 [80], and Grade 690 [100], respectively.
- 1.3. Hot-rolled plain rounds, in sizes up to and including 57 mm [2.25 in.] in diameter in coils or cut lengths, when specified for dowels, spirals, and structural ties or supports, shall be furnished under this specification in Grade 420 [60], Grade 550 [80], and Grade 690 [100] (Note 3).
- For ductility properties, test provisions of the nearest nominal diameter deformed bar size shall apply. Those requirements providing for deformations and marking shall not be applicable (Note 3).
- Note 3**—The weight for plain rounds smaller than 10 mm [³/₈ in.] in diameter shall be computed on the basis of the size in [ASTM A510/A510M](#).
- Note 4**—When welding of the material listed in this specification is required, it should be in conformance with AWS D1.4 *Structural Welding Code—Reinforcing Steel* and the applicable sections of AWS D1.6 *Structural Welding Code—Stainless Steels*. If the material is not addressed in these specifications, the manufacturer of the steel should be contacted to obtain a welding procedure for the particular application.
- 1.4. This specification is applicable for orders in either SI units (as M 334M) or in inch-pound units (as M 334). SI units and inch-pound units are not necessarily equivalent. Inch-pound units are shown in brackets in the text for clarity, but they are the applicable values when the material is ordered to M 334.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards:*

- [T 244](#), Mechanical Testing of Steel Products
- [T 285](#), Bend Test for Bars for Concrete Reinforcement
- [T 372M/T 372](#), Sensitivity of Stainless Steel to Intergranular Attack
- [T 373M/T 373](#), Comparative Qualitative Corrosion Characterization of Steel Bars Used for Concrete Reinforcement (Linear Polarization Resistance and Potentiodynamic Polarization Tests)
- [T 374M/T 374](#), Comparative Qualitative Corrosion Characterization of Uncoated Chromium-Alloyed Steel Bars Used in Concrete Reinforcement (Tombstone Test)
- [T 375M/T 375](#), Identification of Iron Based Alloy Steel Bars for Concrete Reinforcement or Dowels by Handheld X Ray Fluorescence (XRF) Spectrometer
- [T 376M/T 376](#), Macrocell Slab Chloride Threshold

2.2. *ASTM Standards:*

- [A276/A276M](#), Standard Specification for Stainless Steel Bars and Shapes
- [A484/A484M](#), Standard Specification for General Requirements for Stainless Steel Bars, Billets, and Forgings
- [A510/A510M](#), Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel, and Alloy Steel
- [A700](#), Standard Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment
- [A751](#), Standard Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- [A955/A955M](#), Standard Specification for Deformed and Plain Stainless Steel Bars for Concrete Reinforcement
- [A1035/A1035M](#), Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement
- [E29](#), Standard Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.3. *Military Standards:*

- MIL-STD-129, Marking for Shipment and Storage
- MIL-STD-163, Steel Mill Products Preparation for Shipment and Storage

2.4. *Federal Standard:*

- Fed. Std. No. 123, Marking for Shipment (Civil Agencies)

2.5. *AWS Standards:*

- AWS D1.4, *Structural Welding Code—Reinforcing Steel*
- AWS D1.6, *Structural Welding Code—Stainless Steels*

3. TERMINOLOGY

3.1. *Description of Terms Specific to This Standard:*

- 3.1.1. *corrosion-resistant*—a relative term indicating resistance to the several forms of corrosion in various environments or corroding media, often compared to the resistance of uncoated plain carbon steels in the same environment or media.
- 3.1.2. *deformed bar*—steel bar with protrusions; a bar that is intended for use as reinforcement in reinforced concrete construction.
- 3.1.2.1. *Discussion*—The surface of the bar is provided with lugs or protrusions that inhibit longitudinal movement of the bar relative to the concrete surrounding the bar in such construction. The lugs or protrusions conform to the provisions of this specification.
- 3.1.3. *deformations*—protrusions on a deformed bar.
- 3.1.4. *plain bar*—steel bar without protrusions.
- 3.1.5. *rib*—longitudinal protrusion on a deformed bar.
- 3.1.6. *lot*—bars of one bar number, heat number, and pattern of deformation contained in an individual shipping release or shipping order.
- 3.1.7. *heat*—a batch of steel produced to meet specified physical and chemical properties. A unique heat number is assigned by the manufacturer to identify each batch of steel.
- 3.1.8. *uncoated corrosion resistant reinforcement (CRR)*—concrete reinforcing bar materials, because of their chemical composition and or microstructure, provide enhanced corrosion resistance properties.

4. ORDERING INFORMATION

- 4.1. *Orders for deformed or plain chromium-alloyed steel billet-steel bars for concrete reinforcement under this specification should include the following information:*
 - 4.1.1. Quantity (mass) [weight];
 - 4.1.2. UNS number of the alloy, Type or Common Name (see Table 1);
 - 4.1.3. Size (diameter) or bar designation number (see Table 2 for mm-kg bars or Table 3 for in-lb bars);
 - 4.1.4. Cut length or coils;
 - 4.1.5. Deformed or plain;
 - 4.1.6. Grade;
 - 4.1.7. Packaging (see Section 22); and
 - 4.1.8. AASHTO designation and year of issue.
- 4.2. Certified mill test reports (required for all orders).

- 4.3. *The purchaser shall have the option to specify additional requirements, including but not limited to, the following:*
- 4.3.1. Comparative corrosion performance data in accordance with Section 11 only when specified in the purchase order;
- 4.3.2. Special bar markings;
- 4.3.3. Other special requirements, if any.

5. MATERIALS AND MANUFACTURE

- 5.1. The steel reinforcement bars for concrete reinforcement and dowels conforming to this standard shall be rolled from individual heats that are properly identified and documented using any commercially accepted steelmaking process.

6. CHEMICAL REQUIREMENTS

- 6.1. The chemical analysis of each heat shall be determined in accordance with [ASTM A751](#). The manufacturer shall make the analysis on test samples taken preferably during the pouring of the heat. The percentages of carbon, sulfur, nitrogen, manganese, phosphorus, silicon, chromium, nickel, copper, molybdenum, and vanadium shall be determined and reported as required in Section 20.
- 6.2. The analysis of the heat shall be made by the manufacturer and shall conform to the analysis tolerances specified in Table 1 of [ASTM A484/A484M](#) when compared to the chemistry reported.
- 6.2.1. A product check made by the purchaser shall conform to the analysis tolerances specified in Table 1 of [ASTM A484/A484M](#) when compared to the chemistry reported.
- 6.3. The chemical composition as shown by heat analysis shall meet the requirements as shown in the following Table 1.