Designation: A 1035/A 1035M – 05

Standard Specification for Deformed and Plain, Low-carbon, Chromium, Steel Bars for Concrete Reinforcement[1]

This standard is issued under the fixed designation A 1035/A 1035M; 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.

1. Scope*

1.1 This specification covers low-carbon, chromium, steel bars, deformed and plain for concrete reinforcement in cut lengths and coils. The standard sizes and dimensions of deformed bars and their number designations are given in Table 1. The text of this specification references notes and footnotes which provide explanatory material. These notes and footnotes (excluding those in tables and figures) shall not be considered as requirements of the specification.

1.2 Bars are of a single minimum yield strength level as defined in 9.2: namely, 100 000 psi [690 MPa].

NOTE 1—**Caution:** Designers need to be aware that typical design standards limit the design strength to 80 000 psi [550 MPa], except for prestressing steel. Members reinforced with bars with yield strengths that are considerably above 80 000 psi [550 MPa] may exhibit behavior that differs from that expected of conventional reinforced concrete members or may require special detailing to ensure adequate performance at service and factored loads.

1.3 Deformed bars shall have a minimum yield strength and other tensile properties in accordance with Table 2. Hot-rolled plain rounds in sizes up to and including 2.25 in. [57.2 mm] in diameter in coils or cut lengths when specified for dowels, spirals, structural ties or bar supports shall be furnished under this specification and shall also meet the tensile properties requirements of Table 2. Ductility properties for plain rounds shall be those of the nearest smaller nominal diameter deformed bar size in Table 2. Requirements covering deformation dimensions and marking are not applicable to plain rounds.

NOTE 2—Welding of the material in this specification should be approached with caution since no specific provisions have been included to enhance its weldability. When this steel is to be welded, a welding procedure suitable for the chemical composition and intended use or service should be used.

1.4 This specification is applicable for orders in either inch-pound units (as Specification A 1035) or in SI units (as Specification A 1035M).

1.5 The values stated in either inch-pound units or SI units are to be regarded as standard. Within the text, the SI 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 the specification.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

A 6/A 6M Specification for General Requirements for Rolled Structural, Steel Bars, Plates, Shapes, and Sheet Piling

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products

A 510/A 510M Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

2.2 *U.S. Military Standards:*

MIL STD-129 Marking for Shipment and Storage[3]

MIL STD-163 Steel Mill Products Preparation for Shipment and Storage[3]

2.3 *U.S. Federal Standard:*

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)[3]

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *deformations*, *n*—protrusions on a deformed bar.

3.1.2 *deformed bar*, *n*—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

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[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.

[3] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098.

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

TABLE 1 Deformed Bar Designation Numbers, Nominal Weights [Masses], Nominal Dimensions, and Deformation Requirements

Bar Designation No.[A]	Nominal Weight, lb/ft [Nominal Mass, kg/m]	Nominal Dimensions[B]			Deformation Requirements, in. [mm]		
		Diameter, in. [mm]	Cross-Sectional Area, in.^{2}[mm^2]	Perimeter in. [mm]	Maximum Average Spacing	Minimum Average Height	Maximum Gap (Chord of 12.5 % of Nominal Perimeter)
3 [10]	0.376 [0.560]	0.375 [9.5]	0.11 [71]	1.178 [29.9]	0.262 [6.7]	0.015 [0.38]	0.143 [3.6]
4 [13]	0.668 [0.994]	0.500 [12.7]	0.20 [129]	1.571 [39.9]	0.350 [8.9]	0.020 [0.51]	0.191 [4.9]
5 [16]	1.043 [1.552]	0.625 [15.9]	0.31 [199]	1.963 [49.9]	0.437 [11.1]	0.028 [0.71]	0.239 [6.1]
6 [19]	1.502 [2.235]	0.750 [19.1]	0.44 [284]	2.356 [59.8]	0.525 [13.3]	0.038 [0.97]	0.286 [7.3]
7 [22]	2.044 [3.042]	0.875 [22.2]	0.60 [387]	2.749 [69.8]	0.612 [15.5]	0.044 [1.12]	0.334 [8.5]
8 [25]	2.670 [3.973]	1.000 [25.4]	0.79 [510]	3.142 [79.8]	0.700 [17.8]	0.050 [1.27]	0.383 [9.7]
9 [29]	3.400 [5.060]	1.128 [28.7]	1.00 [645]	3.544 [90.0]	0.790 [20.1]	0.056 [1.42]	0.431 [10.9]
10 [32]	4.303 [6.404]	1.270 [32.3]	1.27 [819]	3.990 [101.3]	0.889 [22.6]	0.064 [1.63]	0.487 [12.4]
11 [36]	5.313 [7.907]	1.410 [35.8]	1.56 [1006]	4.430 [112.5]	0.987 [25.1]	0.071 [1.80]	0.540 [13.7]
14 [43]	7.65 [11.38]	1.693 [43.0]	2.25 [1452]	5.32 [135.1]	1.185 [30.1]	0.085 [2.16]	0.648 [16.5]
18 [57]	13.60 [20.24]	2.257 [57.3]	4.00 [2581]	7.09 [180.1]	1.58 [40.1]	0.102 [2.59]	0.864 [21.9]

[A] Bar numbers are based on the number of eighths of an inch included in the nominal diameter of the bars [bar numbers approximate the number of millimeters of the nominal diameter of the bar].

[B] The nominal dimensions of a deformed bar are equivalent to those of a plain round bar having the same weight [mass] per foot [meter] as the deformed bar.

TABLE 2 Tensile Properties Requirements

Tensile strength, min, psi [MPa]	150 000 [1030]
Yield strength (0.2 % offset), min, psi [MPa]	100 000 [690]
Stress corresponding to an extension under load of 0.0035 in./in. (0.0035 mm/mm), min, psi [MPa]	80 000 [550]
Elongation in 8 in. [203.2 mm], min. %:	
Bar Designation No.	
3 through 11 [10 through 36]	7
14, 18 [43, 57]	6

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 *lot*, *n*—all the bars of one bar size or pattern of deformation contained in an individual shipping release or shipping order.

3.1.4 *plain bar*, *n*—steel bar without protrusions.

3.1.5 *rib*, *n*—longitudinal protrusion on a deformed bar.

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 shall include but are not limited to the following:

4.1.1 Quantity (weight) [mass],

4.1.2 Name of material: low-carbon, chromium, steel bars for concrete reinforcement,

4.1.3 Size,

4.1.4 Cut lengths or coils,

4.1.5 Deformed or plain,

4.1.6 Packaging (see Section 21),

4.1.7 ASTM designation and year of issue, and

4.1.8 Certified mill test reports.

5. Materials and Manufacture

5.1 The bars shall be rolled from properly identified heats of mold cast or strand cast steel using the basic oxygen, electric-furnace, or open-hearth process.

6. Chemical Composition

6.1 The chemical analysis of each heat shall be determined in accordance with Test Methods A 751. The manufacturer shall make the analysis on test samples taken preferably during the pouring of the heat. The percentages of carbon, manganese, phosphorus, sulfur, silicon, chromium, and nitrogen, shall be determined and reported as required in Section 16.

6.2 The chemical composition as shown by heat analysis shall be limited by the following:

Element	max,[A]
Carbon	0.15 %
Chromium	8.0 to 10.0 %
Manganese	1.5 %
Nitrogen	0.05 %
Phosphorus	0.035 %
Sulfur	0.045 %
Silicon	0.50 %

[A] Maximum unless range is indicated Percentages refer to weight percentages.

7. Requirements for Deformation

7.1 Deformations shall be spaced along the bar at substantially uniform distances. The deformations on opposite sides of the bar shall be similar in size, shape, and pattern.

7.2 The deformations shall be placed with respect to the axis of the bar so that the included angle is not less than 45°. Where the line of deformations forms an included angle with the axis of the bar from 45 to 70° inclusive, the deformations shall alternately reverse in direction on each side, or those on one side shall be reversed in direction from those on the opposite side. Where the line of deformations is over 70°, a reversal in direction shall not be required.

7.3 The average spacing or distance between deformations on each side of the bar shall not exceed seven tenths of the nominal diameter of the bar.

7.4 The overall length of deformations shall be such that the gap (measured as a chord) between the ends of the deformations on opposite sides of the bar shall not exceed 12½ % of the nominal perimeter of the bar. Where the ends terminate in a longitudinal rib, the width of the longitudinal rib shall be considered the gap. Where more than two longitudinal ribs are involved, the total width of all longitudinal ribs shall not exceed 25 % of the nominal perimeter of the bar; furthermore, the summation of gaps shall not exceed 25 % of the nominal perimeter of the bar. The nominal perimeter of the bar shall be 3.1416 times the nominal diameter.

7.5 The spacing, height, and gap of deformations shall conform to the requirements prescribed in Table 1.