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Standard Specification for Uncoated, Stress-Relieved Steel Bars for Prestressed Concrete Railroad Ties[1]

This standard is issued under the fixed designation A911/A911M; 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 uncoated stress-relieved steel bars for use in prestressed concrete railroad ties.

~~1.2Supplement I describes low-relaxation bars and relaxation testing for that product. Low-relaxation bars shall be furnished when specifically ordered, and may be furnished in place of regular bars if mutually agreed to by the purchaser and manufacturer.~~

1.2 A supplementary requirement (S1) is provided for use where low-relaxation bars and relaxation testing for that product is required by the purchaser. The supplementary requirement applies only when specified in the purchase order or contract.

1.3 This specification is applicable for orders in either inch-pounds units (as Specification A911) or in SI units (as Specification A911M).

1.4 The values stated in either inch-pound units or SI units are to be regarded separately as standards. 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]

A370 Test Methods and Definitions for Mechanical Testing of Steel Products

E328 Test Methods for Stress Relaxation for Materials and Structures

2.2 *Federal Standard:*[3]

~~Fed. Std. No. 123Marking for Shipments (Civil Agencies)~~ Fed. Std. No. 123 Marking for Shipments (Civil Agencies)

2.3 *Military Standards:*[3]

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

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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *lot*, *n*—all the coils of bars of the same nominal bar size contained on an individual shipping release or shipping order, from the same ~~east or~~ heat of steel.

4. Ordering Information

4.1 It shall be the responsibility of the purchaser to specify all requirements that are necessary for bars 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 (uncoated, stress-relieved bars for prestressed concrete railroad ties),

~~4.1.3Diameter of bar (inches) [millimetres],~~

~~4.1.4Packaging,~~

~~4.1.5ASTM designation and year of issue, and~~

[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.

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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 ~~19111-5094, Attn: NPODS.~~19111-5098, http://dodssp.daps.dla.mil.

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

~~4.1.6Special requirements, if any.~~

~~NOTE1—A typical ordering description is as follows: 100 tons [90 t] uncoated, stress-relieved steel bars for prestressed concrete railroad ties, 0.394-in. [10-mm] diameter bars in 6.5-ft [2.0-m] diameter coils to ASTM AXXX– [AXXXM–].~~

4.1.3 Nominal diameter of bar (inches) [millimetres],

4.1.4 Inspection (Section 12),

4.1.5 Load-elongation curve (14.2),

4.1.6 Core diameter and length of coils (15.1),

4.1.7 Packaging,

4.1.8 Supplementary Requirement S1 (if desired), and

4.1.9 ASTM designation and year of issue.

5. Manufacture

5.1 The bars shall be made from properly identified heats of steel made by the electric-furnace, the open-hearth, or the basic-oxygen process.

5.2 After hot-rolling, the bars shall be cold-drawn and finally stress-relieved by induction heat treatment to produce the desired mechanical properties and then coiled.

6. Chemical Requirements

6.1 An analysis of each heat of steel shall be made by the manufacturer from test samples taken during the pouring of each heat.

6.2 The analysis of the steel shall conform to the chemical requirements specified in Table 1.

7. ~~Mechanical Requirements~~ Mechanical Property Requirements

7.1 *Test Method*—Tests shall be made in accordance with Test Methods and Definitions A370, including Annex A4, using full-size bar specimens taken from either end of the coil of the finished product.

7.2 *Tensile Strength*—The minimum tensile strength of the finished bar, as represented by test specimens, shall conform to the requirements prescribed in Table 2.

7.3 *Yield Strength*—Yield strength shall be measured at 1 % extension under load. The load at this extension is recorded as yield strength and shall meet the requirements of Table 2.

7.4 *Elongation*—The total elongation after rupture shall not be less than 6.0 % and shall be measured in a gage length of 4 in. [100 mm].

7.5 *Wrapping Test*—Bars shall withstand being wound around a mandrel with a diameter of five times the bar diameter without cracking or other surface defects occurring on the outside of the bent portion. The bar shall be bent around the mandrel 1-½ turns beginning with a 90° bend.

8. Dimensions and Permissible Variations

8.1 The size of the finished bar shall be expressed as the nominal diameter of the bar in decimals of an inch [millimetere]. The required initial diameters before cold-drawing, and the final diameters after cold-drawing shall be as follows:

Initial Diameter	Final Diameter
0.591 in. [15 mm]	0.370 in. [9.4 mm]
0.614 in. [15.6 mm]	0.394 in. [10 mm]
0.654 in. [16.6 mm]	0.413 in. [10.5 mm]

TABLE 1 Chemical Requirements

Element	Composition, %
Carbon	0.70–0.90[A]
Silicon	0.10–0.35
Manganese	0.50–0.90[B]
Chromium, max	0.15
Phosphorus, max	0.030
Sulphur, max	0.035
Copper, max	0.30

[A] Carbon in any one lot shall not vary more than 0.13 %.
[B] Manganese in any one lot shall not vary more than 0.30 %.