Designation: A 321 – 90 (Reapproved 1995)ε1

An American National Standard

Standard Specification for Steel Bars, Carbon, Quenched and Tempered[1]

This standard is issued under the fixed designation A 321; 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.

ε[1] NOTE—Keywords were added editorially in March 1995.

1. Scope

1.1 This specification covers hot-rolled, quenched, and tempered carbon steel bars, of the following sections and size ranges:

1.1.1 *Rounds*, ¼ to 9½ in. (6.35 to 241.3 mm) incl, in diameter.

1.1.2 *Squares*, ¼ to 5½ in. (6.35 to 139.7 mm) incl, between parallel surfaces.

1.1.3 *Hexagons*, ¼ in. (6.35 mm) and over between parallel surfaces.

1.2 The values stated in inch-pound units are to be regarded as the standard. The values given in parentheses are for information only.

2. Referenced Documents

2.1 *ASTM Standards:*

A 29/A29M Specification for Steel Bars, Carbon and Alloy, Hot-Wrought and Cold-Finished, General Requirements for[2]

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products[3]

3. Ordering Information

3.1 Orders for material under this specification should include the following information:

3.1.1 Quantity (weight or number of pieces),

3.1.2 Name of material,

3.1.3 Stress relief anneal (if required),

3.1.4 Finish (specify descaled and oiled if required),

3.1.5 Dimensions (cross sectional shape, size, and length),

3.1.6 Straightness (if other than standard is required),

3.1.7 Leaded steel (if required),

3.1.8 Heat analysis or test report (if required),

3.1.9 ASTM designation and date of issue, and

3.1.10 Additional requirements, if any.

NOTE 1—A typical ordering description is as follows: 10 000 lb, hot-rolled bars quenched and tempered, straightened, stress relieved, descaled, 1.000 in. diameter by 10 ft long, heat analysis required, ASTM A 321, dated____.

4. Manufacture

4.1 *Melting Practice*—The steel shall be made by one or more of the following primary processes: open-hearth, basic-oxygen, or electric-furnace. The primary melting may incorporate separate degassing or refining and may be followed by secondary melting using electroslag remelting or vacuum arc remelting. Where secondary melting is employed, the heat shall be defined as all of the ingots remelted from a single primary heat.

4.2 *Discard*—A sufficient discard shall be made (from each ingot, when ingot cast) to secure freedom from injurious piping and undue segregation.

4.3 *Heat Treatment*:

4.3.1 *Cooling*—Immediately after rolling, the bars shall be allowed to cool to a temperature below the critical range under suitable conditions to prevent injury by too rapid cooling.

4.3.2 *Quenching and Tempering*—The material shall be uniformly heated to the austenitizing temperature, soaked for a sufficient length of time to produce the desired change in structure (a group thus heated being known as a "quenching charge"), and quenched in some medium under substantially uniform conditions for each quenching charge. The material shall then be uniformly reheated to the proper temperature for tempering (a group thus reheated being known as a "tempering charge"), and allowed to cool uniformly. The temperature selected for tempering shall not be less than 800°F (427°C).

4.3.3 *Stress Relieving*—When it is desirable to minimize internal stresses introduced by straightening, the purchaser may specify a stress relief anneal as a final operation.

5. Chemical Composition

5.1 *Chemical Composition*—The steel shall conform to the requirements for chemical composition specified in Table 1.

5.2 *Leaded Steel*—When required, lead may be specified as an added element. A range from 0.15 to 0.35 %, inclusive, is commonly specified. Heat analysis for lead is not determinable since lead is added to the ladle stream while each ingot is poured.

[1] This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel, and Related Alloys, and is the direct responsibility of Subcommittee A01.15 on Bars.

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[2] *Annual Book of ASTM Standards*, Vol 01.05.

[3] *Annual Book of ASTM Standards*, Vol 01.03.