



Designation: **A920/A920M—07 A920/A920M – 14**

# Standard Specification for Steel Bars, Microalloy, Hot-Wrought, Special Quality, Mechanical Properties<sup>1</sup>

This standard is issued under the fixed designation A920/A920M; 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.

## 1. Scope\*Scope

1.1 This specification covers hot-wrought, special quality microalloyed carbon steel bars intended for use in applications where as-rolled mechanical properties are desired. A typical end use is hydraulic cylinder shafts.

1.2 The bars shall be furnished to chemical composition and mechanical properties as provided herein. Chemical composition is based on standard carbon steel grades modified to include microalloying elements such as columbium (niobium), vanadium, or molybdenum. Three strength classes are available, designated 75 [520], 80 [550], and 100 [690], corresponding to the minimum yield strength in ksi.

1.3 Sections and sizes of bar steels available are covered in Specification **A29/A29M**.

1.4 Supplementary Requirements S1 to S5 are provided for use when additional controls or requirements are desired. These shall apply only when specified on the purchase order.

1.5 The values stated in either ~~inch-pound~~SI units or ~~SI~~inch-pound units are to be regarded separately as standard. Within the text and tables, SI units are shown in brackets. The values stated in each system ~~are~~may not be exact equivalents; therefore, each system ~~must~~shall be used independently of the other. Combining values from the two systems may result in ~~nonconformance~~non-conformance with the ~~specification~~standard.

1.6 Unless the order specifies the applicable “M” specification designation, the material shall be furnished to the inch-pound units.

## 2. Referenced Documents

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

**A29/A29M** Specification for General Requirements for Steel Bars, Carbon and Alloy, Hot-Wrought

**A370** Test Methods and Definitions for Mechanical Testing of Steel Products

**A576** Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality

**E45** Test Methods for Determining the Inclusion Content of Steel

## 3. Terminology

3.1 *Definitions of Terms Specific to This Standard*:

3.1.1 *microalloyed steels, n*—carbon steels to which small quantities of certain elements are added in order to enhance mechanical properties.

<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 A01.15 on Bars.

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<sup>2</sup> 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.

3.1.1.1 *Discussion*—

This enhancement of mechanical properties results from control of the temperature and cooling rate during the hot-rolling process.

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

#### 4. Ordering Information

4.1 Orders for material supplied to this specification should include the following, as required, to describe adequately the desired material:

- 4.1.1 Quantity (weight or number of bars),
- 4.1.2 Name of material (hot-rolled microalloyed steel bars),
- 4.1.3 Dimensions,
- 4.1.4 ASTM specification number and date of issue,
- 4.1.5 Grade designation or chemical composition limits (see Section 87),
- 4.1.6 Class,
- 4.1.7 Type (see 7.1) to designate grain refiner,
- 4.1.7 Additions to the specification and Supplementary Requirements, if required, and,
- 4.1.8 End use.

#### 5. General Requirements

5.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification A29/A29M, unless otherwise provided herein.

#### 6. Materials and Manufacture

6.1 *Melting Practice*—The steel shall be produced in accordance with the applicable methods for primary and secondary melting outlined in Specification A576.

6.2 The steel shall be killed. Supplementary Requirements S1 through S5 may be invoked upon agreement between producer and purchaser.

6.3 The bars shall be special quality.

6.4 The bars shall be hot-wrought, as wrought, unless otherwise specified.

#### 7. Metallurgical Requirements

7.1 *Grain Size*—The steel shall conform to the fine grain size requirement of Specification A29/A29M. The grain refining element may be specified according to one of the following types:

7.1.1 *Type A, Aluminum*—The total aluminum analysis shall be 0.020 % or greater, and shall be reported.

7.1.2 *Type B*—The grain refining element shall be specified in accordance with 5.1.2.3 of Specification A29/A29M.

7.2 *Microstructure*—The microstructure shall consist of a minimum of 90 % ferrite-pearlite or 90 % bainite as agreed upon between the purchaser and producer.

#### 7. Chemical Composition

7.1 Typical examples of chemical compositions are shown in Table 1. Other compositions may be specified using one of the following methods:

7.1.1 Base compositions selected from Table 1 of Specification A576, with the addition of microalloying elements as provided in 8.37.3 to 8.57.5, or

7.1.2 Base compositions using the ranges and limits shown in Table 2 of Specification A576, with the addition of microalloying elements as provided in 8.37.3 to 8.57.5.

NOTE 1—For improved machinability, alternative sulfur ranges may be specified upon agreement between the purchaser and the producer. Additional machinability-enhancing elements such as lead, bismuth, selenium, or tellurium may also be specified by agreement.

7.2 Silicon analysis shall be 0.15/0.35 %. Silicon content up to 0.80 % maximum may be furnished upon agreement between purchaser and producer.

**TABLE 1 Typical Chemical Compositions of Microalloyed Carbon Steels**

NOTE 1—These compositions are identical to those in Specification A576, with the exception of the addition of vanadium.

Base Grade Designation	Chemical Composition Limits, %				
	C	Mn	P	S	V
10V40	0.37–0.44	0.60–0.90	0.040 max	0.050 max	0.02–0.20
10V45	0.43–0.50	0.60–0.90	0.040 max	0.050 max	0.02–0.20
11V37	0.32–0.39	1.35–1.65	0.040 max	0.08–0.13	0.02–0.20
11V41	0.37–0.45	1.35–1.65	0.040 max	0.08–0.13	0.02–0.20
15V24	0.19–0.25	1.35–1.65	0.040 max	0.050 max	0.02–0.20
15V41	0.36–0.44	1.35–1.65	0.040 max	0.050 max	0.02–0.20