Designation: A 850 – 85

Standard Specification for Steel Bars, Carbon-Manganese, Merchant Quality with 50 ksi (345 MPa) Yield Point[1]

This standard is issued under the fixed designation A 850; 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 hot-wrought merchant quality carbon-manganese steel bars and bar size shapes produced to mechanical property requirements and intended for noncritical constructional applications (see 3.2).

1.2 Merchant quality hot-wrought steel bar is available in the following ranges of size and section:

1.2.1 Rounds, squares, and hexagons with diameters or distance across flats under 3 in. (76.2 mm).

1.2.2 Bar size shapes with maximum dimensions under 3 in.

1.2.3 Other bar sections with weight per foot under 40.84 lb/ft (60.78 kg/m).

1.2.4 Flats 6 in. (152 mm) or under in width, over 0.203 in. (5.15 mm) in thickness, and under 40.84 lb/ft (60.78 kg/m) or 12 in.^{2} (77.4 cm^2) in cross-sectional area.

1.2.5 Flats over 6 in. to 8 in. (203 mm), inclusive in width, 0.230 in. (5.84 mm) and over in thickness and under 40.84 lb/ft (60.78 kg/m) or 12 in.^{2} (774 cm^2) in cross-sectional area.

1.2.6 Hot-wrought merchant quality steel bars, subject to mechanical property requirements, are furnished in straight lengths only.

1.3 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

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

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

3. General Requirements

3.1 Material furnished under this specification shall conform to the requirements of the current edition of Specification A 29/A 29M except as stated in 1.2 and 3.2.

3.2 Merchant quality bars shall be free from visible pipe, however, they may contain pronounced chemical segregation. Internal porosity, surface seams, and other surface irregularities may be present in this quality. Deoxidation practice and grain size are at the manufacturers option.

3.3 Unless otherwise specified, the bars shall be furnished as rolled and not pickled, blast cleaned, or oiled.

4. Ordering Information

4.1 Orders under this specification shall include the following requirements:

4.1.1 Quantity (weight or number of pieces),

4.1.2 Dimensions (cross-sectional shape, size, and length),

4.1.3 Name of material (merchant quality carbon steel bars),

4.1.4 ASTM specification designation and year of issue,

4.1.5 Class,

4.1.6 Heat analysis or test report (request, if required),

4.1.7 Application and processing, and

4.1.8 Supplementary requirements (if required)

5. Materials and Manufacture

5.1 The steel shall be made by the open-hearth, basic-oxygen, or electric furnace process.

6. Chemical Composition

6.1 *Heat Analysis*—the steel shall conform to the following requirements as to chemical composition:

Element	Class 1	Class 2
Carbon, max %	0.27	0.27
Manganese, max %	1.45	1.45
Phosphorus, max %	0.04	0.04
Sulfur, max %	0.05	0.05
Copper, when copper steel is specified, min %	0.20	...

6.2 The material furnished shall not exceed a carbon equivalent of 0.48 % on heat analysis as determined by the following formula:

$$CE = C + \frac{Mn}{6} + \frac{(Cr + Mo + V)}{5} + \frac{(Ni + Cu)}{15}$$

7. Tensile Properties

7.1 The material, as represented by the test specimens, shall conform to the tensile properties shown in Table 1.

7.1.2 Test specimens shall be prepared for testing from the material in its as wrought condition. The tension specimen may be aged as described in Methods A 370.

7.1.3 Test specimens shall be taken longitudinally and may be tested in full thickness or section, or they may be

TABLE 1 Tensile Properties

Tensile Strength, ksi (MPa)	70–99 (485–685)
Yield Point, min., ksi	50 (345 MPa)
Elongation in 8.0 in. or 200 mm, min., %	14
Elongation in 2.0 in. or 50 mm, min., % Gage length	18

[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*, Vols 01.01–01.05.

machined to the dimensions shown in Figs. 4 or 5 of Methods A 370. If test specimens are selected conforming to the dimensions of Fig. 5, they shall be machined from a position midway between the center and the surface of the bar.

7.1.4 Test specimens for shapes and flats may be machined to the form and dimensions shown in Fig. 4 of Methods A 370 or with both edges parallel. Test specimens for material over 1½ in. (38 mm) in thickness or diameter may be machined to a thickness or diameter of at least ¾ in. (19 mm) for a length of at least 9 in. (229 mm), or they may conform to the dimensions shown in Fig. 5 of Methods A 370.

7.2 Tensile requirements shall be determined in accordance with Methods A 370.

7.2.1 Shapes less than 1 in.^{2} (6.45 cm^2) in cross section and bars (other than flats) less than ½ in. (13 mm) in thickness or diameter need not be subject to tension by the manufacturer.

7.2.2 For material over ¾ in. (19 mm) in thickness or diameter, a deduction from the percentage of elongation in 8 in. or 200 mm specified in Table 1 of 0.25 % shall be made for each increase of 1/32 in. (0.79 mm) in the specified thickness or diameter above ¾ in.

7.2.3 For material under 5/16 in. (8 mm) in thickness or diameter, a deduction from the percentage of elongation in 8 in. or 200 mm specified in Table 1 of 2.00 % shall be made for each decrease of 1/32 in. (0.79 mm) in the specified thickness or diameter below 5/16 in.

7.2.4 For material over 2 in. (51 mm) in thickness of diameter, a deduction from the percentage of elongation in 2 in. or 50 mm specified in Table 1 of 1.00 % shall be made for each 1 in. (25 mm) of specified thickness or diameter or fraction thereof over 2 in. in thickness or diameter.

7.3 *Number of Tests*—Two tension tests shall be made from each heat, unless the finished material from a heat is less than 50 tons (45 Mg), when one tension test will be sufficient. However, for material 2 in. and under in thickness, when the material from one heat differs ⅜ in. (9.5 mm) or more in thickness, one tension test shall be made from both the thickest and the thinnest material rolled (larger than the sizes enumerated in 7.2.1), regardless of weight represented. For material over 2 in. thick, when the material from one heat differs 1 in. or more in thickness, one tension test shall be made from both the thickest and the thinnest material rolled that is more than 2 in. thick regardless of the weight represented.

7.4 *Test Reports:*

7.4.1 When test reports are required by the purchase order, the report shall show the results of each test required by 7.3, except that only one test need to be reported when the amount of material from a heat in a shipment is less than 10 tons (9 mg) and when the thickness variations described in 7.3 are not exceeded.

7.4.2 The thickness of the product tested may not necessarily be the same as an individual ordered thickness since it is the heat that is tested rather than each ordered item.

7.4.3 When supplementary requirements are specified, the report shall include a statement of compliance with the requirement or the results of tests when the requirement involves measured test values.

SUPPLEMENTARY REQUIREMENTS

One or more of the following supplementary requirements shall apply when specified by the purchaser.

S1. Special Straightness

S1.1 Bars shall be produced to special straightness tolerance in accordance with Specification A 29/A 29M.

S2. Cleaning

S2.1 The purchaser may specify that the surface of the bars shall be descaled by pickling or blast cleaning.

S3. Coating

S3.1 The bars shall be oiled after being descaled.