



**Designation: A 907/A907M – 96**

## **Standard Specification for Steel, Sheet and Strip, Heavy Thickness Coils, Carbon, Hot- Rolled, Structural Quality<sup>1</sup>**

This standard is issued under the fixed designation A 907/A907M; 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.

*This standard has been approved for use by agencies of the Department of Defense.*

### **1. Scope**

1.1 This specification covers hot-rolled heavy-thickness carbon-steel sheet and strip of structural quality in coils beyond the size limits of Specification A 570/A 570M. This material is intended for structural purposes where mechanical test values are required and is available in the sizes listed below. This material is available only in coils as described below:

#### **Size Limits, Coils Only**

Product	Width, in. (mm)	Thickness, in. (mm)
Strip	over 8 to 12 (200 to 300)	0.230 to 1.000, incl (6.0 to 25)
Sheet	over 12 to 48 (300 to 1200)	0.230 to 1.000, incl (6.0 to 25)
	over 48 (1200)	0.180 to 1.000, incl (4.5 to 25)

#### **1.1.1 The following grades are covered in this specification:**

##### **Mechanical Properties**

Grade	Yield Point min, ksi (MPa)	Tensile Strength min, ksi (MPa)
30	30 (205)	49 (340)
33	33 (230)	52 (360)
36	36 (250)	53 (365)
40	40 (275)	55 (380)

1.2 The values stated in either inch-pound units or SI (metric) units are to be regarded separately 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 of the two systems may result in nonconformance with this specification.

1.3 Sheet and strip in coils of the sizes noted in 1.1 can be included in this specification only with the following provisions:

1.3.1 The material is not to be converted into steel plates for structural or pressure vessel use unless tested in complete

accordance with the appropriate sections of Specifications A 6/A 6M (plates provided from coils) or A 20/A 20M (plates produced from coils),

1.3.2 This specification is not applicable to the steels covered by Specification A 635/A 635M,

1.3.3 The dimensional tolerances from Specification A 635/A 635M are applicable to material produced in accordance with this specification,

1.3.4 The material is to be fed directly from coils into a blanking press, drawing or forming operation, tube mill, rolling mill, or sheared or slit into blanks for subsequent drawing or forming, and

1.3.5 Not all strength levels are available in all thicknesses. The user should consult the producer for appropriate size limitations.

### **2. Referenced Documents**

#### **2.1 ASTM Standards:**

A 6/A6M Specification for General Requirements for Rolled Structural Steel Bars, Plates, Shapes, and Sheet Piling<sup>2</sup>

A 20/A20M Specification for General Requirements for Steel Plates for Pressure Vessels<sup>2</sup>

A 570/A570M Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality<sup>3</sup>

A 635/A635M Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled<sup>3</sup>

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications<sup>4</sup>

### **3. Ordering Information**

3.1 Orders for material in accordance with this specification shall include the following information, as required, to describe the desired material adequately:

3.1.1 ASTM designation number and year date of issue and grade.

3.1.2 Name of material (hot-rolled sheet coils or hot-rolled strip coils).

<sup>1</sup> 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 A01.19 on Steel Sheet and Strip.

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<sup>2</sup> Annual Book of ASTM Standards, Vol 01.04.

<sup>3</sup> Annual Book of ASTM Standards, Vol 01.03.

<sup>4</sup> Annual Book of ASTM Standards, Vol 14.02.

3.1.3 Copper-bearing (if required).

3.1.4 *Condition*—Material in accordance with this specification is furnished in the hot-rolled condition. Pickled (or blast-cleaned) must be specified if required. Material ordered as pickled (or blast-cleaned) will be oiled unless ordered dry.

3.1.5 Type of edge (must be specified for hot-rolled sheet coils and strip coils, either mill edge or cut edge (sheet), mill edge or slit edge (strip)).

3.1.6 Dimensions (decimal thickness and width of material).

3.1.6.1 As agreed upon between the purchaser and the producer, material ordered to this specification will be supplied to meet the appropriate standard or restricted thickness tolerance table shown in Specification A 635/A 635M.

NOTE 1—Not all producers are capable of meeting all of the limitations of the thickness tolerance tables in Specification A 635/A 635M. The purchaser should contact the producer regarding possible limitations prior to placing an order.

3.1.7 Coil size and weight requirements (must include inside diameter (ID) and outside diameter (OD) and maximum weight).

3.1.8 Quantity (weight).

3.1.9 Application (part identification and description).

3.1.10 Special requirements (if required).

3.1.11 Cast or heat analysis (if required).

3.1.12 Test reports.

NOTE 2—A typical ordering description is as follows: (Inch-pound) Specification A NNN-XX—Grade 33, hot-rolled sheet coils pickled and oiled, mill edge, 0.500 by 40 in. by coil; ID 24 in., OD 72 in., maximum; coil weight 40 000 lb maximum; 200 000 lb for roll-forming shapes; (Metric) Specification A NNN-XX—Grade 230, hot rolled sheet coils pickled and oiled, mill edge, 10 by 900 mm by coil; ID 600 mm, OD 1800 mm, maximum; coil weight 18 000 kg maximum; 90 000 kg for roll-forming shapes.

## 4. Chemical Composition

4.1 The cast or heat analysis and product analysis of the steel shall conform to the requirements prescribed in Table 1.

4.1.1 Unspecified elements may be present. Limits on elements shall be as stated in Table 2.

4.1.1.1 Each of the elements listed in Table 2 shall be included in the report of the heat analysis. When the amount of copper, nickel, chromium, or molybdenum is less than 0.02 %, these elements may be reported as <0.02 %. Other elements listed in Table 2 shall be reported in conformance with the maximum limits specified.

4.1.2 The addition of microalloying elements, including columbium, vanadium, and titanium, as well as nitrogen, as strength enhancers is prohibited under this specification.

## 5. Mechanical Properties

5.1 *Tensile Properties*—The material as represented by the

**TABLE 1 Chemical Requirements**

Element	Composition, %
Carbon, max	0.25
Manganese, max	1.50
Phosphorus, max	0.035
Sulfur, max	0.04
Copper, min (when copper is specified)	0.20

**TABLE 2 Limits on Additional Elements (See 4.1.1 and 4.1.2)**

Copper, max, % <sup>A</sup>	heat analysis	0.20
	product analysis	0.23
Nickel, max, % <sup>A</sup>	heat analysis	0.20
	product analysis	0.23
Chromium, max, % <sup>AB</sup>	heat analysis	0.15
	product analysis	0.19
Molybdenum, max, % <sup>AB</sup>	heat analysis	0.06
	product analysis	0.07
Columbium, max, %	heat analysis	0.008
	product analysis	0.018
Vanadium, max, %	heat analysis	0.008
	product analysis	0.018
Titanium, max, %	heat analysis	0.005
	product analysis	0.005
Nitrogen, max, %	heat analysis	0.012
	product analysis	0.012

<sup>A</sup>The sum of copper, nickel, chromium, and molybdenum shall not exceed 0.50 % upon heat analysis. When one or more of these elements are specified, the sum does not apply; in which case, only the individual limits on the remaining unspecified elements will apply.

<sup>B</sup>The sum of chromium and molybdenum shall not exceed 0.16 % upon heat analysis. When one or more of these elements are specified, the sum does not apply; in which case, only the individual limits on the remaining unspecified elements will apply.

test specimens shall conform to the tensile properties requirements prescribed in Table 3.

5.2 *Tension Test Specimen Location and Orientation*—Tension test specimens shall be taken sufficiently far from the as hot-rolled coil ends so that the sample is representative of material which received the designed processing. The test shall be taken approximately midway between the center and edge of the material as rolled. For coils wider than 24 in. (600 mm), tension test specimens shall be taken such that the longitudinal axis of the specimen is perpendicular to the direction of rolling (transverse test). For coils through 24 in. (600 mm) in width, tension test specimens shall be taken such that longitudinal axis of the specimen is parallel to the direction of rolling (longitudinal test).

5.3 *Tension Tests*—Two tension tests shall be conducted from each heat or from each lot of 50 tons (45 Mg). When the amount of finished material from a heat or lot is less than 50 tons, only one tension test shall be conducted. When material rolled from one heat differs 0.050 in. (1.3 mm) or more in thickness, one tension test shall be conducted from both the thickest and the thinnest material rolled regardless of the weight represented.

**TABLE 3 Tensile Requirements<sup>A</sup>**

	Grade 30	Grade 33	Grade 36	Grade 40
Tensile strength, min, ksi (MPa)	49 (340)	52 (360)	53 (365)	55 (380)
Yield point min, ksi (MPa)	30 (205)	33 (230)	36 (250)	40 (275)
Elongation in 2 in. (50 mm), min, %, for thicknesses to 0.750 in. (19 mm) inclusive	22.0	22.0	21.0	19.0
Elongation in 8 in. (200 mm), min, %, for thicknesses 0.180 in. (4.5 mm) to 0.750 in. (19 mm) inclusive	17.0	16.0	15.0	14.0

<sup>A</sup>For coil products, testing by the producer is limited to the end of the coil. Results of such tests must comply with the specified values. Tensile properties throughout the balance of the coil must not be less than 90 % of the minimum values specified.

5.4 To determine conformance with the product specification, a calculated value should be rounded to the nearest 1 ksi (7 MPa) tensile strength and yield point, and to the nearest unit in the right-hand place of figures used in expressing the limiting value for other values in accordance with the rounding off method given in Practice E 29.

5.5 Structural sheet steels are commonly fabricated by cold bending. There are many interrelated factors which affect the ability of a given steel to cold form over a given radius under shop conditions. These factors include thickness, strength level, degree of restraint, relationship to rolling direction, chemistry, and microstructure. The producer should be consulted concerning the recommended minimum inside radii and bending direction. Where possible, larger radii or “easy way” bending (with the bend axis perpendicular to rolling direction), or both, are recommended for improved performance.

5.6 Fabricators should be aware that cracks may initiate upon bending a sheared or burned edge. This is not considered

a fault of the steel, but is rather a function of the induced cold-work or heat-affected zone.

## **6. General Requirements for Delivery**

6.1 Material furnished in accordance with this specification shall conform to the applicable requirements of the current edition of Specification A 635/A 635M, unless otherwise provided herein.

## **7. Certification**

7.1 Material ordered to this specification is structural material and, as such, must be tested, and such test results must be certified by the producer to the purchaser.

## **8. Keywords**

8.1 carbon; carbon steel sheet; carbon steel strip; heavy thickness coils; hot-rolled; hot rolled steel sheet; hot rolled steel strip; sheet; steel; steel sheet; steel strip; strip; structural applications; structural quality

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