



Designation: A 1031 – 04

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

This standard is issued under the fixed designation A 1031; 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 reappraisal. A superscript epsilon ( $\epsilon$ ) indicates an editorial change since the last revision or reappraisal.

### 1. Scope

1.1 This specification covers hot-rolled, heavy thickness coils beyond the size limits of Specifications A 506 and A 507.

1.2 The product is available in three designations: Alloy, Drawing Steel, and Structural Steel.

1.3 Alloy steel is furnished to chemical composition requirements and is intended primarily for general or miscellaneous use where bending and moderate forming is a requirement.

1.4 Drawing steel is produced principally for applications involving severe cold plastic deformation such as deep drawn or severely formed parts.

1.4.1 Drawing steel may be furnished in several conditions, heat treatments, surface finishes, and edges, as specified herein.

1.5 Structural steel is furnished to chemical composition requirements and to specific mechanical property requirements which may include tension tests, hardness tests, or other commonly accepted mechanical tests.

1.5.1 The formability of structural steel decreases with increasing yield strength or hardness. Therefore, product design in relation to the mechanical properties of the grade used must be considered.

1.6 This material is available only in coils described as follows:

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

1.7 Sheet and strip in coils of sizes noted in 1.6 are covered by this specification only with the following provisions:

1.7.1 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). A plate produced in this manner is no

longer governed by this sheet steel specification and since this material is now plate, the appropriate plate standard must now apply.

1.7.2 The dimensional tolerances of Specification A 635/A 635M are applicable to material produced to this specification.

1.7.3 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.

1.8 The values stated in either inch-pound units and SI units (metric) 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 each other.

### 2. Referenced Documents

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

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

A 20/A 20M Specification for General Requirements for Steel Plates for Pressure Vessels

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

A 505 Specification for Steel, Sheet and Strip, Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

A 506 Specification for Alloy and Structural Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled

A 507 Specification for Drawing Alloy Steel, Sheet and Strip, Hot-Rolled and Cold-Rolled

A 635/A 635M Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Commercial Steel, Drawing Steel, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, Hot-Rolled, General Requirements for

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products

<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 A01.19 on Steel Sheet and Strip.

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<sup>2</sup> For referenced ASTM standards, visit the ASTM website, [www.astm.org](http://www.astm.org), or contact ASTM Customer Service at [service@astm.org](mailto:service@astm.org). For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

**TABLE 1 Standard Steels Commonly Produced for Alloy Steel Sheet and Strip**

UNS Design.	SAE No.	Chemical Composition Ranges and Limits, % (Heat Analysis) <sup>A</sup>							
		C	Mn	P	S	Si <sup>B</sup>	Ni	Cr	Mo
G41180	4118	0.18-0.23	0.70-0.90	0.035	0.035	0.15-0.30	.....	0.40-0.60	0.08-0.15
G41300	4130	0.28-0.33	0.40-0.60	0.035	0.035	0.15-0.30	.....	0.80-1.10	0.15-0.25
G41400	4140	0.38-0.43	0.75-1.00	0.035	0.035	0.15-0.30	.....	0.80-1.10	0.15-0.25
G43400	4340	0.38-0.43	0.60-0.80	0.035	0.035	0.15-0.30	1.65-2.00	0.70-0.90	0.20-0.30
G51200	5120	0.17-0.22	0.70-0.90	0.035	0.035	0.15-0.30	.....	0.70-0.90	.....
G51400	5140	0.38-0.43	0.70-0.90	0.035	0.035	0.15-0.30	.....	0.70-0.90	.....
G51500	5150	0.48-0.53	0.70-0.90	0.035	0.035	0.15-0.30	.....	0.70-0.90	.....
G51600	5160	0.55-0.65	0.75-1.00	0.035	0.035	0.15-0.30	.....	0.70-0.90	.....
G86150	8615	0.13-0.18	0.70-0.90	0.035	0.035	0.15-0.30	0.40-0.70	0.40-0.60	0.15-0.25
G86200	8620	0.18-0.23	0.70-0.90	0.035	0.035	0.15-0.30	0.40-0.70	0.40-0.60	0.15-0.25

<sup>A</sup> The chemical ranges and limits shown are subject to product analysis tolerances. See Specification A 505.

<sup>B</sup> Other silicon ranges are available. Consult the producer.

## E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications

### 3. General Requirements for Delivery

3.1 Material furnished under this specification shall conform to the applicable requirements of Specification A 505, current edition, unless otherwise provided herein.

### 4. Ordering Information

4.1 Orders for material under this specification shall include the following information, as required, to adequately describe the desired material.

4.1.1 ASTM specification number and year of issue,

4.1.2 Classification of the material (hot-rolled sheet or hot-rolled strip),

4.1.3 Chemical Composition (grade),

4.1.4 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,

4.1.5 Heat treatment required, if any,

4.1.6 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),

4.1.7 Dimensions (decimal thickness and width of material),

4.1.7.1 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 tolerances shown in Specification A 635/A 635M,

NOTE 1—Not all producers are capable of meeting all 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.

4.1.8 Coil size and weight requirements (must include inside diameter, ID; outside diameter, OD), and maximum weight,

4.1.9 Quantity (weight),

4.1.10 Application (part identification and description),

4.1.11 Special requirements (if required),

4.1.12 Test reports (if required), and

4.1.13 Cast or heat analysis (if required).

NOTE 2—A typical ordering description is as follows: (inch pound units) ASTM A XXXX/XXXXM: Alloy, hot rolled sheet coils, grade SAE 4118, pickled and oiled, cut 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; (SI units) ASTM A XXXX/XXXXM: Alloy, hot rolled sheet coils, grade SAE 4118, pickled and oiled, cut edge, 10 mm 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.

### 5. Manufacture

5.1 *Heat Treatment:*

5.1.1 As-rolled,

5.1.2 Annealed,

5.1.2.1 Spheroidized Annealed,

(1) *Drawing Steel*—Unless otherwise specified on the order, drawing steel will be furnished with a spheroidized annealed heat treatment.

(2) If the material is to be heat treated by other than the producer, the order shall so state. The material may be ordered in the as-rolled condition, in such cases.

5.1.2.2 Normalized, or

5.1.2.3 Normalized-and-tempered.

### 6. Chemical Requirements

6.1 The heat analysis of the steel shall conform to the requirements for the grade specified on the order.

6.2 *Standard Alloy Steel* grades listed in Table 1 are those commonly produced for alloy steel sheet and strip. Other standard steel grades are listed in Annex A1.

6.3 *Nonstandard Alloy Steel* grades may be specified using the ranges and limits shown in Table 2.

6.4 *Structural Alloy Steel*—The grade shall be specified as outlined in 6.2 or 6.3. However, since different mechanical properties may be expected for each of the many chemical compositions and conditions (heat treatment) that may be specified, consideration must be given to these factors in selecting the chemical composition to be specified.

### 7. Metallurgical Structure

7.1 *Microstructure:*

7.1.1 *Drawing Steel*—A minimum of 75 % of the carbide microstructure shall be of the globular type for material with an ordered thickness of less than or equal to 0.400 in. (10 mm). For material with an ordered thickness greater than 0.400 in. (10 mm), the percent minimum globular carbide microstructure guarantee shall be by agreement between the purchaser and the producer.