Designation: A 635/A 635M – 07

Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for[1]

This standard is issued under the fixed designation A 635/A 635M; 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 the general requirements for hot-rolled, heavy-thickness sheet and strip in coils.

1.2 It applies to Specification A 1018/A 1018M.

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

	Size Limits, Coils Only	
Product	Width, in. [mm]	Thickness, in. [mm]
Strip	over 8 to 12, incl [over 200 through 300]	0.230 to 1.000, incl [from 6.0 through 25]
Sheet	over 12 [over 300]	0.230 to 1.000, incl [from 6.0 through 25]

NOTE 1—The changes in width limits with the publication of A 635/A 635M – 06a result in a change in tensile testing direction for material from 0.180 in. [4.5 mm] to 0.230 in. exclusive [6.0 mm exclusive] over 48 in. [1200 mm] wide as that material is now covered by Specification A 568/A 568M – 06a. The purchaser is advised to discuss this change with the supplier.

1.4 In case of any conflict in requirements, the requirements of the individual material specification shall prevail over those of this general specification.

1.5 Annex A1 lists permissible variations in dimensions and mass (see Note 2) in SI [metric] units. The values listed are not exact conversions of the values listed in the inch-pound tables, but instead are rounded or rationalized values. Conformance to Annex A1 is mandatory when the "M" specification is used.

NOTE 2—The term *weight* is used when inch-pound units are the standard. However, under SI, the preferred term is *mass*.

1.6 The values stated in either inch-pound units or SI units are to be regarded 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 from the two systems may result in nonconformance with this specification.

1.7 This specification and the applicable material specifications are expressed in both inch-pound units and SI units. However, unless the order specifies the applicable "M" specification designation (SI units), the material shall be furnished to inch-pound units.

2. Referenced Documents

2.1 *ASTM Standards:* [2]

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

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Shipment

A 568/A 568M Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for

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

A 941 Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys

A 1018/A 1018M Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Carbon, Commercial, Drawing, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

E 11 Specification for Wire Cloth and Sieves for Testing Purposes

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

E 59 Practice for Sampling Steel and Iron for Determination

[1] 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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[2] 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.

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

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of Chemical Composition[3]

2.2 *Federal Standards:*[4]

Fed. Std. No. 123 Marking for Shipment (Civil Agencies)

Fed. Std. No. 183 Continuous Identification Marking of Iron and Steel Products

2.3 *Military Standards:*[4]

MIL-STD-129 Marking for Shipment and Storage

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *Steel Types*:

3.1.2 *carbon steel*—the designation for steel when no minimum content is specified or required for aluminum, chromium, cobalt, columbium, molybdenum, nickel, titanium, tungsten, vanadium, zirconium, or any element added to obtain a desired alloying effect; when the specified minimum for copper does not exceed 0.40 %; or when the maximum content specified for any of the following elements does not exceed the percentages noted: manganese 1.65, silicon 0.60, or copper 0.60.

3.1.2.1 *Discussion*—In all carbon steels small quantities of certain residual elements unavoidably retained from raw materials are sometimes found which are not specified or required, such as copper, nickel, molybdenum, chromium, etc. These elements are considered as incidental and are not normally determined or reported.

3.1.3 *high-strength, low-alloy steel*—a specific group of steels in which higher strength, and in some cases additional resistance to atmospheric corrosion or improved formability, are obtained by moderate amounts of one or more alloying elements.

3.2 *Product Types*:

3.3 *hot-rolled sheet and strip*—manufactured by hot rolling slabs in a continuous mill to the required thickness; however, the product classification of sheet and strip is based on a combination of thickness and width (see Specification A 1018/A 1018M).

3.4 *steel manufacturer*, *n*—the organization that directly controls, or is responsible for, the melting and refining of steel and the conversion of that steel into semifinished steel products known as slabs either through continuous casting, conventional or compact, or ingot casting and subsequent conversion of the ingots to slabs, and for one or more additional operations such as testing, marking, loading for shipment, and certification.

3.5 *hot roll manufacturer*, *n*—the organization that directly controls, or is responsible for, the conversion of steel slabs, by hot rolling into coils, and for one or more additional operations such as leveling, cutting to length, testing, inspection, blanking, slitting, pickling, cold rolling, heat treating, coating, packaging, marking, loading for shipment, and certification.

3.6 *coil processor*, *n*—the organization that directly controls, or is responsible for, operations involved in processing the coil such as leveling, cutting to length, testing, inspection, blanking, slitting, pickling, cold rolling, heat treating, coating, packaging, marking, loading for shipment, and certification.

3.6.1 *Discussion*—The processing operations need not be controlled by the organization that hot rolls the slab into a coil. If only one organization controls and/or is responsible for the hot rolling and processing operations, that organization is termed the hot roll manufacturer. If more than one organization controls and/or is responsible for hot rolling and processing operations, the organization that controls and is responsible for the hot rolling is termed the manufacturer and the organization or organizations controlling and responsible for the processing operations is/are termed the coil processor or coil processors.

3.7 Refer to Terminology A 941 for additional definitions of terms used in this standard.

4. Index of Tables, Dimensions, and Allowances

4.1 See the following table.

Index of Tables for Dimensions, Tolerances, and Allowances

Dimensions	Table No.	
	Inch-Pound Units	SI Units
Camber		
Sheet	6	A1.5
Strip	11	A1.10
Crown		
Strip	9	A1.8
Thickness		
Sheet	2, 3	A1.1, A1.2
Strip	7, 8	A1.6, A1.7
Width		
Sheet	4, 5	A1.3, A1.4
Strip	10	A1.9

5. Materials and Manufacture

5.1 *Melting Practice*—Hot-rolled heavy thickness sheet and strip coils are normally produced from rimmed, capped, or semi-killed steel. If either coarse or fine-grain practice is specified, special soundness steel will be furnished.

5.2 Steel may be produced as ingot-cast or strand-cast. When different grades of strand-cast steel are sequentially cast, identification and separation of the transition material is required.

5.3 The steel shall be in the hot-rolled condition.

6. Chemical Composition

6.1 *Cast or Heat (Formerly Ladle) Analysis*—An analysis of each heat or cast shall be made by the steel manufacturer to determine the conformance with the appropriate requirement. The analysis shall be from a test sample preferably taken during the pouring of the heat or cast.

6.1.1 Where the material is used for fabrication by welding, care must be exercised in selection of chemical composition or mechanical properties to assure compatibility with the welding process and its effect on altering the properties.

6.2 *Product, Check, or Verification Analysis*:

6.2.1 Non-killed steels such as capped or rimmed steels are not technologically suited to product analysis due to the nonuniform character of their chemical composition, and therefore, the tolerances in Table 1 do not apply. Product analysis is appropriate on these types of steel only when misapplication is apparent, or for copper when copper steel is specified.

6.2.2 For steels other than non-killed (capped or rimmed), product analysis may be made by the purchaser. The chemical

[3] Withdrawn.

[4] Available from Standardization Documents Order Desk, DODSSP, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111-5098, http://www.dodssp.daps.mil.

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TABLE 1 Tolerances for Product Analysis

Element	Limit, or Maximum of Specified Element, %	Tolerance	
		Under Minimum Limit	Over Maximum Limit
Carbon	to 0.15, incl	0.02	0.03
	over 0.15 to 0.25, incl	0.03	0.04
Manganese	to 0.60, incl	0.03	0.03
	over 0.60 to 1.15, incl	0.04	0.04
	over 1.15 to 1.65, incl	0.05	0.05
Phosphorus		. . .	0.01
Sulfur		. . .	0.01
Silicon	to 0.30, incl	0.02	0.03
	over 0.30 to 0.60, incl	0.05	0.05
Copper		0.02	. . .

analysis shall not vary from the limits specified by more than the amounts in Table 1. The several determinations of any element in a cast shall not vary both above and below the specified range.

6.2.3 *Sampling for Product Analysis*:

6.2.3.1 To indicate adequately the representative composition of a cast by product analysis, it is general practice to select samples to represent the steel, as fairly as possible, from a minimum number of pieces as follows: three pieces for lots up to 15 tons included, and six pieces for lots over 15 tons (see Practice E 59).

6.2.3.2 When the steel is subject to tension test requirements, samples for product analysis may be taken either by drilling entirely through the used tension test specimens themselves, or as covered in 6.2.3.3.

6.2.3.3 When the steel is not subject to tension test requirements, the samples for analysis must be taken by milling or drilling entirely through the sheet in a sufficient number of places so that the samples are representative of the entire sheet or strip. The sampling may be facilitated by folding the sheet both ways, so that several samples may be taken at one drilling. Steel subjected to certain heating operations by the purchaser may not give chemical analysis results that properly represent its original composition. Therefore, users must analyze chips taken from the steel in the condition in which it is received from the steel manufacturer.

6.3 *Specimen Preparation*—Drillings or chips must be taken without the application of water, oil, or other lubricant, and must be free of scale, grease, dirt, or other foreign substances. They must not be overheated during cutting to the extent of causing decarburization. Chips must be well mixed and those too coarse to pass a No. 10 sieve or too fine to remain on a No. 30 sieve are not suitable for proper analysis. Sieve size numbers are in accordance with Specification E 11.

6.4 *Test Methods*—In case a referee analysis is required and agreed upon to resolve a dispute concerning the results of a chemical analysis, the procedure for performing the referee analysis must be in accordance with the latest issue of Test Methods, Practices, and Terminology A 751, unless otherwise agreed upon between the manufacturer and the purchaser.

7. Mechanical Properties

7.1 The mechanical property requirements, number of specimens, and test locations and specimen orientation shall be in accordance with the applicable product specification.

7.2 Unless otherwise specified in the applicable product specification, test specimens must be prepared in accordance with Test Methods and Definitions A 370.

7.3 Mechanical tests shall be conducted in accordance with Test Methods and Definitions A 370.

7.4 To determine conformance with the product specification, a calculated value shall be rounded to the nearest 1 ksi tensile strength and yield point or yield strength, 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.

8. Dimensions and Tolerances

8.1 The permissible tolerances for dimensions shall not exceed the applicable limits specified in Tables 2-6 for hot-rolled and hot-rolled, pickled-sheet coils and Tables 7-11 for hot-rolled and hot-rolled, pickled-strip coils (Annex A1, Tables A1.1-A1.10).

TABLE 2 Standard Thickness Tolerances for Heavy-Thickness Hot-Rolled Sheet (Carbon and High-Strength Low-Alloy Steel)—⅜-in. (Cut Edge) and ¾-in. (Mill Edge) Minimum Edge Distance (Coils Only)

NOTE 1—Thickness is measured at any point across the width not less than ⅜ in. from a cut edge and not less than ¾ in. from a mill edge. This table does not apply to the uncropped ends of mill edge coils.

NOTE 2—Micrometers used for measurement of thickness shall be constructed with anvils and spindles having minimum diameters of 0.188 in. [4.80 mm]. The tip of the spindle shall be flat, and the tip of the anvil shall be flat or rounded with a minimum radius of curvature of 0.10 in. [2.55 mm]. Micrometers with pointed tips are not suitable for thickness measurements.

Specified Width, in.	Specified Ordered Thickness, in.[A]				
	0.230 to 0.313, incl	Over 0.313 to 0.375, incl	Over 0.375 to 0.500, incl	Over 0.500 to 0.625, incl	Over 0.625 to 1.000, incl
	Thickness Tolerances Over, in., No Tolerance Under[B]				
Over 12 to 20, incl	0.020	0.024	0.028	0.030	0.032
Over 20 to 40, incl	0.022	0.024	0.028	0.030	0.032
Over 40 to 48, incl	0.024	0.026	0.028	0.030	0.032
Over 48 to 60, incl	0.024	0.028	0.030	0.032	0.034
Over 60 to 72, incl	0.026	0.030	0.032	0.036	0.038
Over 72	0.030	0.032	0.036	0.038	0.040

[A] The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.

[B] The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.

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TABLE 3 Restricted Thickness Tolerances for Heavy-Thickness Hot-Rolled Sheet (Carbon and High-Strength Low-Alloy Steel)—⅝-in. (Cut Edge) and 1-in. (Mill Edge) Minimum Edge Distance (Coils Only)

NOTE 1—Thickness is measured at any point across the width not less than ⅝ in. from a cut edge and not less than 1 in. from a mill edge. This table does not apply to the uncropped ends of mill edge coils.

NOTE 2—Micrometers used for measurement of thickness shall be constructed with anvils and spindles having minimum diameters of 0.188 in. [4.80 mm]. The tip of the spindle shall be flat, and the tip of the anvil shall be flat or rounded with a minimum radius of curvature of 0.10 in. [2.55 mm]. Micrometers with pointed tips are not suitable for thickness measurements.

NOTE 3—This table was constructed by multiplying the values in the standard table by 0.75 and rounding to 3 decimal places using standard ASTM practice.

Specified Width, in.	Specified Ordered Thickness, in.[A]				
	0.230 to 0.313, incl	Over 0.313 to 0.375, incl	Over 0.375 to 0.500, incl	Over 0.500 to 0.625, incl	Over 0.625 to 1.000, incl
	Thickness Tolerances Over, in., No Tolerance Under[B]				
Over 12 to 20, incl	0.015	0.018	0.021	0.022	0.024
Over 20 to 40, incl	0.016	0.018	0.021	0.022	0.024
Over 40 to 48, incl	0.018	0.020	0.021	0.022	0.024
Over 48 to 60, incl	0.018	0.021	0.022	0.024	0.026
Over 60 to 72, incl	0.020	0.022	0.024	0.027	0.028
Over 72	0.022	0.024	0.027	0.028	0.030

[A] The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.

[B] The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.

TABLE 4 Width Tolerances for Heavy-Thickness Mill Edge Sheet (Coils Only)

NOTE 1—This table does not apply to the uncropped end of mill-edge coils.

Specified Width, in.	Tolerance Over Specified Width, in. (No Tolerance Under)
Over 12 to 14, incl	7/16
Over 14 to 17, incl	½
Over 17 to 19, incl	9/16
Over 19 to 21, incl	⅝
Over 21 to 24, incl	11/16
Over 24 to 26, incl	13/16
Over 26 to 28, incl	15/16
Over 28 to 35, incl	1⅛
Over 35 to 50, incl	1¼
Over 50 to 60, incl	1½
Over 60 to 65, incl	1⅝
Over 65 to 70, incl	1¾
Over 70 to 80, incl	1⅞
Over 80	2

TABLE 5 Width Tolerances for Heavy-Thickness Cut-Edge Sheet (Coils Only)

NOTE 1—Heavy-thickness edge cutting results in a bevelled edge. The width shall be measured on the wide surface of the cut-edge coil. Depending upon the angle of the bevelled edge cut, the width of the narrow surface of the cut-edge coil may be less than the minimum ordered width. The manufacturer must be consulted regarding the capability to control bevel angle.

Specified Width, in.	Tolerance Over Specified Width, in. (No Tolerance Under)
Over 12 to 30, incl	⅛
Over 30 to 48, incl	3/16
Over 48 to 60, incl	¼
Over 60 to 80, incl	5/16
Over 80	⅜

TABLE 6 Camber Tolerances for Heavy-Thickness Sheet (Coils Only)

NOTE 1—Camber is the deviation of a side edge from a straight line. Such a deviation is measured by placing a straightedge on the concave side and measuring the greatest distance between the sheet edge and the straightedge.

Camber should not exceed 1 in. in any 20 ft of length.

9. Workmanship, Finish, and Appearance

9.1 The steel shall have a workmanlike appearance and shall not have defects of a nature or degree that will be detrimental to the stamping or fabrication of finished parts.

9.2 Coils are subject to some abnormal imperfections that render a portion of the coil unusable since the inspection of coils does not afford opportunity to remove portions containing imperfections.

9.3 *Surface Finish*:

9.3.1 Unless otherwise specified, the material shall be furnished without removing the hot-rolled oxide or scale.

9.3.2 When required, it is permissible to specify the material to be pickled or blast-cleaned.

9.4 *Oiling*:

9.4.1 Unless otherwise specified, hot-rolled, as-rolled material shall be furnished not oiled, and hot-rolled, pickled, or blast-cleaned material shall be furnished oiled.

9.4.2 When required, it is permissible to specify as-rolled material be furnished oiled, or that pickled or blast-cleaned material be furnished not oiled.

9.5 *Edges*:

9.5.1 As-rolled material has mill edges. Pickled or blast-cleaned material has cut edges; if mill-edge material is required, it must be specified.

9.5.2 When required, it is permissible to specify as-rolled material to have cut edges.

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TABLE 7 Standard Thickness Tolerances for Heavy-Thickness Hot-Rolled Strip (Carbon and High-Strength Low-Alloy Steel)—⅜ in. Minimum Edge Distance (Coils Only)

NOTE 1—Thickness measurements are taken ⅜ in. from edge of strip. These tolerances do not include crown, and, therefore, the tolerances given in Table 9 are in addition to this table.

NOTE 2—Micrometers used for measurement of thickness shall be constructed with anvils and spindles having minimum diameters of 0.188 in. [4.80 mm]. The tip of the spindle shall be flat, and the tip of the anvil shall be flat or rounded with a minimum radius of curvature of 0.10 in. [2.55 mm]. Micrometers with pointed tips are not suitable for thickness measurements.

Specified Width, in.	Specified Ordered Thickness, in.[A]				
	0.230 to 0.313, incl	Over 0.313 to 0.375, incl	Over 0.375 to 0.500, incl	Over 0.500 to 0.625, incl	Over 0.0625 to 1.000, incl
	Thickness Tolerances, in., No Tolerance Under[B]				
Over 8 to 12, incl	0.016	0.018	0.020	0.022	0.024

[A] The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.

[B] The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.

TABLE 8 Restricted Thickness Tolerances for Heavy-Thickness Hot-Rolled Strip (Carbon and High-Strength Low-Alloy Steel)—⅝-in. Minimum Edge Distance (Coils Only)

NOTE 1—Thickness measurements are taken ⅝ in. from edge of strip. These tolerances do not include crown, and, therefore, the tolerances given in Table 9 are in addition to this table.

NOTE 2—Micrometers used for measurement of thickness shall be constructed with anvils and spindles having minimum diameters of 0.188 in. [4.80 mm]. The tip of the spindle shall be flat, and the tip of the anvil shall be flat or rounded with a minimum radius of curvature of 0.10 in. [2.55 mm]. Micrometers with pointed tips are not suitable for thickness measurements.

NOTE 3—This table was constructed by multiplying the values in the standard table by 0.75 and rounding to 3 decimal places using standard ASTM practice.

Specified Width, in.	Specified Minimum Thickness, in.[A]				
	0.230 to 0.313, incl	Over 0.313 to 0.375, incl	Over 0.375 to 0.500, incl	Over 0.500 to 0.625, incl	Over 0.0625 to 1.000, incl
	Thickness Tolerances, in., No Tolerance Under[B]				
Over 8 to 12, incl	0.012	0.014	0.015	0.016	0.018

[A] The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.

[B] The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.

TABLE 9 Crown Tolerances for Heavy-Thickness Strip (Coils Only)

NOTE 1—Strip may be thicker at the center than at a point ⅜ in. from the edge by the amount given in this table.

Specified Width, in.	Crown Tolerances for Specified Thickness and Width Given, in.
	0.2300 to 0.750, incl
Over 8 to 12, incl	0.002

TABLE 10 Width Tolerances for Heavy-Thickness Strip (Coils Only)

Specified Width, in.	Tolerances for Specified Width for Thickness Given, Over and Under, in.	
	Mill Edge and Square Edge All Thicknesses	Slit or Cut Edge
Over 8 to 12	3/16	[A]

[A] The manufacturer must be consulted.

TABLE 11 Camber Tolerances for Heavy-Thickness Strip (Coils Only)

NOTE 1—Camber is the deviation of a side edge from a straight line. Such a deviation is obtained by placing an 8-ft straightedge on the concave side and measuring the greatest distance between the strip edge and the straightedge.

For strip over 8 in. to 12 in., incl	¼ in. in any 8 ft

10. Retests and Disposition of Non-Conforming Material

10.1 *Retests*:

10.1.1 Unless otherwise prohibited by the product specification, retests are permitted under the following circumstances:

10.1.1.1 If any tension test specimen shows defective machining or develops flaws, it must be discarded and another specimen substituted.

10.1.1.2 If the percent elongation of any tension test specimen is less than that specified and any part of the fracture is more than ¾ in. [20 mm] from the center of the gage length of a 2 in. [50 mm] specimen, or is outside the middle half of the gage length of an 8 in. [200 mm] specimen as indicated by scribe scratches marked on the specimen before testing, a retest is allowed.

10.1.1.3 If the test result of any tension test specimen fails to meet the specification requirements and the failure is the result of improper adherence to tension test procedures, a retest is permitted.

10.1.1.4 If the test result of an original tension test specimen fails to meet the specification requirements and the failure is not related to the conditions described in 10.1.1.1-10.1.1.3, but the results are within 2 ksi [14 MPa] of the required yield strength, within 2 ksi [14 MPa] of the required tensile strength, or within 2 percentage points of the required elongation, one retest shall be permitted to replace the failing test.

10.1.2 The retest specimen shall be taken either adjacent to the first failed specimen or selected at random from the material to be certified to the specification.

10.1.3 If the results of a retest satisfy the specified tension test requirements and all other requirements of the applicable specification are satisfied, the material shall be accepted.

10.2 *Disposition of Non-Conforming Material*:

10.2.1 In those cases where the lot is found to be non-conforming, and resampling of non-conforming material is not prohibited by the specification, resampling is permitted under the following circumstances and using the following practices:

10.2.1.1 If the retest results of an original tension test or retest specimen fail to satisfy the specification requirements and the failed test results are not related to the conditions

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described in 10.1, the lot shall be quarantined and resampled for certification of the non-conforming material to the specification requirements.

10.2.1.2 Resampling for certification of the non-conforming material shall include the discarding of out-of-specification material and the resampling of the lot. The resampling shall be appropriate to the specific out-of-specification condition and the processing history of the lot.

10.2.1.3 A maximum of two resampling efforts shall be permitted. If after conducting two resampling efforts, the material does not satisfy the specification requirements, the lot shall be rejected.

11. Inspection

11.1 When the purchaser's order stipulates that inspection and chemical tests (except product analyses) for acceptance of the steel be made prior to shipment from the mill, the manufacturer shall afford the purchaser's inspector all reasonable facilities to determine that the steel is being furnished in accordance with this specification. Steel sheet and strip products subject to the purchaser's inspection and sampling are customarily inspected and sampled in conjunction with the manufacturer's inspection and sampling operations.

12. Rejection and Rehearing

12.1 Material that is reported to be defective subsequent to the acceptance at the purchaser's works shall be set aside, adequately protected, and correctly identified. The manufacturer shall be notified as soon as possible so that an investigation may be initiated.

12.2 Samples that are representative of the rejected material shall be made available to the manufacturer. In the event that the manufacturer is dissatisfied with the rejection, he may request a rehearing.

13. Test Reports and Certification

13.1 When test reports are required by the purchase order or the material specification, the supplier shall report the results of all tests required by the material specification and the order.

13.2 When certification is required by the purchase order, the supplier shall furnish a certification that the material has been manufactured and tested in accordance with the requirements of this material specification.

13.3 A signature is not required on test reports or certifications. However, the document shall clearly identify the organization submitting the document. Notwithstanding the absence of a signature, the organization submitting the document is responsible for the content of the document.

13.4 When test reports are required, copies of the original material manufacturer's test report shall be included with any subsequent test report.

13.5 A Material Test Report, Certificate of Inspection, or similar document printed from or used in electronic form from an electronic data interchange (EDI) transmission shall be regarded as having the same validity as a counterpart printed in the certifier's facility. The content of the EDI transmitted document must meet the requirements of the invoked ASTM standard(s) and conform to any existing EDI agreement between the purchaser and the supplier. Notwithstanding the absence of a signature, the organization submitting the EDI transmission is responsible for the content of the report.

NOTE 3—The industry definition as invoked here is as follows: EDI is the computer to computer exchange of business information in an agreed upon standard format such as ANSI ASC X12.

14. Product Marking

14.1 As a minimum requirement, the material shall be identified by having the manufacturer's name, ASTM designation, grade, weight, purchaser's order number, and material identification legibly marked on a tag attached to each coil or shipping unit.

14.2 When specified in the contract or order, and for direct procurement by or direct shipment to the government, marking for shipment, in addition to requirements specified in the contract or order, shall be in accordance with MIL-STD-129 for military agencies and in accordance with Fed. Std. No. 123 for civil agencies.

14.3 For government procurement by the Defense Supply Agency, strip material shall be continuously marked for identification in accordance with Fed. Std. No. 183.

14.4 Bar coding is acceptable as a supplementary identification method. Bar coding should be consistent with the Automotive Industry Action Group (AIAG) standard prepared by the primary metals subcommittee of the AIAG bar code project team.

15. Packaging and Package Marking

15.1 Unless otherwise specified, the sheet and strip shall be packaged and loaded in accordance with Practices A 700.

15.2 When coils are ordered, it is customary to specify a minimum or range of inside diameter, maximum outside diameter, and a maximum coil weight, if required. The ability of manufacturers to meet the maximum coil weights depends upon individual mill equipment. When required, minimum coil weights are subject to negotiation.

16. Keywords

16.1 carbon; commercial; drawing; heavy thickness coils; high-strength low-alloy; high-strength low-alloy with improved formability; sheet steel; strip steel

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ANNEX

(Mandatory Information)

A1. PERMISSIBLE VARIATIONS IN DIMENSIONS AND MASS IN SI UNITS

A1.1 Listed in Tables A1.1-A1.10 are permissible variations in dimensions and mass expressed in the International System of Units (SI) terminology.

TABLE A1.1 Standard Thickness Tolerances [Metric] for Heavy-Thickness Hot-Rolled Sheet Ordered to Minimum Thickness (Carbon and High-Strength Low-Alloy Steel)—10-mm (Cut Edge) and 20-mm (Mill Edge) Minimum Edge Distance (Coils Only)

NOTE 1—Thickness is measured at any point across the width not less than 10 mm from a cut edge and not less than 20 mm from a mill edge. This table does not apply to the uncropped ends of mill edge coils.

NOTE 2—Micrometers used for measurement of thickness shall be constructed with anvils and spindles having minimum diameters of 0.188 in. [4.80 mm]. The tip of the spindle shall be flat, and the tip of the anvil shall be flat or rounded with a minimum radius of curvature of 0.10 in. [2.55 mm]. Micrometers with pointed tips are not suitable for thickness measurements.

Specified Width, mm	Specified Ordered Thickness, mm[A]				
	6.0 to 8.0, incl	Over 8.0 to 10.0, incl	Over 10.0 to 12.5, incl	Over 12.5 to 16.0, incl	Over 16.0 to 25.0, incl
	Thickness Tolerances, mm, No Tolerance Under[B]				
Over 300 to 600, incl	0.56	0.60	0.64	0.70	0.76
Over 600 to 1200, incl	0.60	0.64	0.70	0.76	0.80
Over 1200 to 1500, incl	0.60	0.70	0.76	0.80	0.84
Over 1500 to 1800, incl	0.64	0.76	0.80	0.90	0.96
Over 1800	0.72	0.80	0.90	0.96	1.00

[A] The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.

[B] The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.

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TABLE A1.2 Restricted Thickness Tolerances [Metric] for Heavy-Thickness Hot-Rolled Sheet Ordered to Minimum Thickness (Carbon and High-Strength Low-Alloy Steel)—15-mm (Cut Edge) and 25-mm (Mill Edge) Minimum Edge Distance (Coils Only)

NOTE 1—Thickness is measured at any point across the width not less than 15 mm from a cut edge and not less than 25 mm from a mill edge. This table does not apply to the uncropped ends of mill edge coils.

NOTE 2—Micrometers used for measurement of thickness shall be constructed with anvils and spindles having minimum diameters of 0.188 in. [4.80 mm]. The tip of the spindle shall be flat, and the tip of the anvil shall be flat or rounded with a minimum radius of curvature of 0.10 in. [2.55 mm]. Micrometers with pointed tips are not suitable for thickness measurements.

NOTE 3—This table was constructed by multiplying the values in the standard table by 0.75 and rounding to 2 decimal places using standard ASTM practice.

Specified Width, mm	Specified Ordered Thickness, mm[A]				
	6.0 to 8.0, incl	Over 8.0 to 10.0, incl	Over 10.0 to 12.5, incl	Over 12.5 to 16.0, incl	Over 16.0 to 25.0, incl
	Thickness Tolerances, mm, No Tolerance Under[B]				
Over 300 to 600, incl	0.42	0.45	0.48	0.52	0.57
Over 600 to 1200, incl	0.45	0.48	0.52	0.57	0.60
Over 1200 to 1500, incl	0.45	0.52	0.57	0.60	0.63
Over 1500 to 1800, incl	0.48	0.57	0.60	0.68	0.72
Over 1800	0.54	0.60	0.68	0.72	0.75

[A] The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.
[B] The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.

TABLE A1.3 Width Tolerances for Heavy-Thickness Mill-Edge Sheet (Coils Only)

NOTE 1—This table does not apply to the uncropped end of mill-edge coils.

Specified Width, mm		Width Tolerance, Plus Only, mm
Over	Through	
300	600	16
600	1200	28
1200	1500	38
1500	1800	45
1800	. . .	50

TABLE A1.4 Width Tolerances for Heavy-Thickness Cut-Edge Sheet Steel (Coils Only)

Specified Width, mm		Width Tolerance, Plus Only, mm
Over	Through	
300	600	3
600	1200	5
1200	1500	6
1500	1800	8
1800	. . .	10

TABLE A1.5 Camber Tolerances for Heavy-Thickness Sheet Steel (Coils Only)

NOTE 1—Camber is the deviation of a side edge from a straight line. Such a deviation is measured by placing a straightedge on the concave side and measuring the greatest distance between the sheet edge and the straightedge.

Camber should not exceed 25 mm in any 6000 mm of length

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TABLE A1.6 Standard Thickness Tolerances [Metric] for Heavy-Thickness Hot-Rolled Strip (Carbon and High-Strength Low-Alloy Steel)—10-mm Minimum Edge Distance (Coils Only)

NOTE 1—Thickness measurements for this table are taken 10 mm from the edge of the strip. These tolerances do not include crown, and, therefore, the tolerances given in Table A1.8 are in addition to those in this table.

NOTE 2—Micrometers used for measurement of thickness shall be constructed with anvils and spindles having minimum diameters of 0.188 in. [4.80 mm]. The tip of the spindle shall be flat, and the tip of the anvil shall be flat or rounded with a minimum radius of curvature of 0.10 in. [2.55 mm]. Micrometers with pointed tips are not suitable for thickness measurements.

Specified Width, mm	Specified Ordered Thickness, mm[A]			
	From 6.0 to 8.0, incl	Over 8.0 to 12.5, incl	Over 12.5 to 16.0, incl	Over 16.0 to 25.0, incl
	Thickness Tolerances, mm, No Tolerance Under[B]			
Over 200 to 300, incl	0.40	0.50	0.55	0.60

[A] The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.

[B] The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.

TABLE A1.7 Restricted Thickness Tolerances [Metric] for Heavy-Thickness Hot-Rolled Strip Ordered to Minimum Thickness (Carbon and High-Strength Low-Alloy Steel)—15-mm Minimum Edge Distance (Coils Only)

NOTE 1—Thickness measurements for this table are taken 15 mm for the edge of the strip. These tolerances do not include crown, and, therefore, the tolerance given in Table A1.8 are in addition to those in this table.

NOTE 2—Micrometers used for measurement of thickness shall be constructed with anvils and spindles having minimum diameters of 0.188 in. [4.80 mm]. The tip of the spindle shall be flat, and the tip of the anvil shall be flat or rounded with a minimum radius of curvature of 0.10 in. [2.55 mm]. Micrometers with pointed tips are not suitable for thickness measurements.

NOTE 3—This table was constructed by multiplying the values in the standard table by 0.75 and rounding to 2 decimal places using standard ASTM practice.

Specified Width, mm	Specified Ordered Thickness, mm[A]			
	From 6.0 to 8.0, incl	Over 8.0 to 12.5, incl	Over 12.5 to 16.0, incl	Over 16.0 to 25.0, incl
	Thickness Tolerances, mm, No Tolerance Under[B]			
Over 200 to 300, incl	0.30	0.38	0.41	0.45

[A] The specified thickness range captions apply independent of whether the ordered thickness is stated as a nominal or minimum.

[B] The tolerances provided in the table are based on minimum thickness (tolerance over, no tolerance under). For nominal thickness, the tolerance is divided equally over and under.

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TABLE A1.8 Crown Tolerances for Heavy-Thickness Strip (Coils Only)

NOTE 1—Strip may be thicker at the center than at a point 10.0 mm from the edge by the amount given in the table.

Specified Width, mm		Crown Tolerances for Specified Thickness and Width Given, mm
Over	Through	Over 6.0 to 19, incl
200	300	0.05

TABLE A1.9 Width Tolerances for Heavy-Thickness Strip (Coils Only)

Specified Width, mm		Tolerances for Specified Width for Thickness Given, Plus and Minus, mm	
Over	Through	Mill Edge and Square Edge, All Thicknesses	Slit or Cut Edge
200	300	5	[A]

[A] The manufacturer must be consulted.

TABLE A1.10 Camber Tolerances for Heavy-Thickness Strip (Coils Only)

NOTE 1—Camber is the deviation of a side edge from a straight line. Such a deviation is obtained by placing a 2000-mm straightedge on the concave side and measuring the greatest distance between the strip edge and the straightedge.

For strip over 200 mm to 300 mm, incl	5 mm in any 2000 mm

SUMMARY OF CHANGES

Committee A01 has identified the location of selected changes to this standard since the last issue (A 635/A 635M – 06a) that may impact the use of this standard. (Approved Sept. 1, 2007.)

(*1*) Steel manufacturer defined.
(*2*) Hot roll manufacturer defined
(*3*) Coil processor defined.
(*4*) Section 6.1 modified to show steel manufacturer is responsible for the analysis of the steel.
(*5*) Reference to A 941 added in Section 3.7.
(*6*) Deleted 15.2 to remove reference to MIL-STD 163.
(*7*) Remove reference to MIL-STD 163 in 2.3.

Committee A01 has identified the location of selected changes to this standard since the last issue (A 635/A 635M – 06) that may impact the use of this standard. (Approved May 1, 2006.)

(*1*) Changed 1.3 to reflect size changes and added note.
(*2*) In Table 2, removed column on 0.180 to 0.230 incl.
(*3*) In Table 3, removed column on 0.180 to 0.230 incl.
(*4*) In Table A1.1, removed column on from 4.5 to 6.0 incl.
(*5*) In Table A1.1, changed column "over 6.0" to "6.0."
(*6*) In Table A1.2, changed column "over 6.0" to "6.0."

Committee A01 has identified the location of selected changes to this standard since the last issue, A 635/A 635M – 05, that may impact the use of this standard. (Approved March 1, 2006.)

(*1*) Changed heading of Tables 2, 3, 7, 8, A1.1, A1.2, A1.6, and A1.7 to Specified Ordered Thickness.
(*2*) Changed heading of Tables 2, 3, 7, 8, A1.1, A1.2, A1.6, and A1.7 to Specified Ordered Thickness.
(*3*) Added new Footnotes A and B to Tables 2, 3, 7, 8, A1.1, A1.2, A1.6, and A1.7.
(*4*) In Tables 2, 3, A1.1, and A1.2, re-lettered old Footnote A to Footnote C.

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