Designation: A 749/A749M – 97 (Reapproved 2002)

An American National Standard

Standard Specification for Steel, Strip, Carbon and High-Strength, Low-Alloy, Hot-Rolled, General Requirements for[1]

This standard is issued under the fixed designation A 749/A749M; 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 steel strip in coils and cut lengths. It applies to carbon steel and high-strength, low-alloy steel furnished as hot-rolled.

1.2 This specification is not applicable to hot-rolled heavy-thickness carbon sheet and strip coils (ASTM Specification A 635/A 635M), cold-rolled carbon steel strip (ASTM Specification A 109 or A 109M), high-strength, low-alloy cold-rolled steel (ASTM Specifications A 606 and A 607) or cold-rolled carbon spring steel (ASTM Specification A 682 or A 682M).

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

1.4 For the purposes of determining conformance with this and the appropriate product specification referenced under 2.1, values shall be rounded to the nearest unit in the right hand place of figures used in expressing the limiting values in accordance with the rounding method of Practice E 29.

1.5 Annex A1 lists permissible variations in dimensions and mass (Note 1) 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 1—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 the 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:*

A 109 Specification for Steel, Strip, Carbon, Cold-Rolled[2]

A 109M Specification for Steel, Strip, Carbon, Cold-Rolled (Metric)[2]

A 370 Test Methods and Definitions for Mechanical Testing of Steel Products[2]

A 606 Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance[2]

A 607 Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled[2]

A 635/A635M Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot-Rolled[2]

A 682 Specification for Steel, Strip, High-Carbon, Cold-Rolled, Spring Quality, General Requirements For [2]

A 682M Specification for Steel, Strip, High-Carbon, Cold-Rolled, Spring Quality, General Requirements For (Metric)[2]

A 700 Practices for Packaging, Marking, and Loading Methods for Steel Products for Domestic Shipment[3]

A 751 Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products[2]

E 11 Specification for Wire-Cloth Sieves for Testing Purposes[4]

E 29 Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications[4]

E 290 Test Method for Semi-Guided Bend Test for Ductility of Metallic Materials[5]

2.2 *Military Standards:*[6]

[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.

Current edition approved November 10, 2002. Published January 2003. Originally approved in 1981. Last previous edition approved in 1997 as A 749 – 97.

[2] *Annual Book of ASTM Standards*, Vol 01.03.

[3] *Annual Book of ASTM Standards*, Vol 01.05.

[4] *Annual Book of ASTM Standards*, Vol 14.02.

[5] *Annual Book of ASTM Standards*, Vol 03.01.

[6] Available from Standardization Documents Order Desk, Bldg. 4 Section D, 700 Robbins Ave., Philadelphia, PA 19111-5094, Attn: NPODS.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

MIL-STD-129 Marking for Shipment and Storage

MIL-STD-163 Steel Mill Products, Preparation for Shipment and Storage

2.3 *Federal Standards:*[6]

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

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

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:* Descriptions 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.

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, are obtained by moderate amounts of one or more alloying elements.

3.1.4 *Product Types*:

3.1.5 *hot-rolled strip*—manufactured by hot rolling billets or slabs to the required thickness. It may be produced single width or by rolling multiple width and slitting to the desired width. It can be supplied in coils or cut lengths as specified.

Width, in.		Thickness, in.	
Over	Through	Over	Through
...	3½	0.044	0.203
3½	6	0.044	0.203
6	12	0.044	0.230 excl
Width, mm		**Thickness, mm**	
Over	Through	Over	Through
...	100	1.2	5.0
100	200	1.2	5.0
200	300	1.2	6.0, excl

Hot-rolled, high-strength, low-alloy strip is commonly available by size as follows:

Width, in.		Thickness, in.		
Over	Through	From	Through	
			Coils & Cut Lengths	Coils Only
...	6	0.054	0.203	0.230 excl
6	12	0.054	0.230	0.230 excl
Width, mm		**Thickness, mm**		
Over	Through	Over	Through	
...	200	1.8	5.0	
200	300	1.8	6.0, excl	

4. Materials and Manufacture

4.1 Unless otherwise specified, hot-rolled material shall be furnished hot-rolled, not annealed or pickled.

5. Chemical Composition

5.1 *Limits*:

5.1.1 The chemical composition shall be in accordance with the applicable product specification. However, if other compositions are required for carbon steel, they shall be prepared in accordance with Appendix X1.

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

5.2 *Cast or Heat (Formerly Ladle) Analysis*:

5.2.1 An analysis of each cast or heat of steel shall be made by the manufacturer to determine the percentage of elements specified or restricted by the applicable specification.

5.2.2 When requested, cast or heat analysis for elements listed or required shall be reported to the purchaser or to his representative.

5.3 *Product, Check, or Verification Analysis*:

5.3.1 Nonkilled steels (such as capped or rimmed) 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.

5.3.2 For steels other than nonkilled (capped or rimmed), product analysis may be made by the purchaser. The chemical 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.

5.4 *Sampling for Product Analysis*:

5.4.1 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: 3 pieces for lots up to 15 tons inclusive, and 6 pieces for lots over 15 tons [15 Mg].

5.4.2 When the steel is subject to tension test requirements, samples for product analysis may be taken either by drilling

TABLE 1 Tolerances for Product Analysis[A]

Element	Limit, or Maximum of Specified Element, %	Tolerances	
		Under Minimum Limit	Over Maximum Limit
Carbon	to 0.15, incl	0.02	0.03
	over 0.15 to 0.40, incl	0.03	0.04
	over 0.40 to 0.80, incl	0.03	0.05
	over 0.80	0.03	0.06
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	. . .

[A] See 6.3.1.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS

Not for Resale

entirely through the used tension test specimens themselves or in accordance with 5.4.3.

5.4.3 When the steel is not subject to tension test requirements, the samples for analysis must be taken by milling or drilling entirely through the strip in a sufficient number of places so that the samples are representative of the entire strip. The sampling may be facilitated by folding the strip 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.

5.5 *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 (2.00-mm) sieve or too fine to remain on a No. 30 (600-µm) sieve are not suitable for proper analysis. Sieve size numbers are in accordance with Specification E 11.

5.6 *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.

6. Mechanical Properties

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

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

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

6.4 Bend tests, where required, shall be conducted in compliance with Test Methods E 290.

6.5 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 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.

6.6 Structural steels are commonly fabricated by cold bending. There are many interrelated factors that 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. Each of the appropriate product specifications lists in the appendix the suggested minimum inside radius for cold bending. These radii should be used as minima for 90° bends. They presuppose “hard way” bending (bend axis parallel to rolling direction) and reasonably good shop forming practices. Where possible, the use of larger radii or “easy way” bends are recommended for improved performance.

7.7 Fabricators should be aware that cracks may initiate upon bending a sheared or burned edge. This is not considered to be a fault of the steel but is rather a function of the induced cold-work or heat-affected zone.

7. Dimensions, Tolerances, and Allowances

7.1 Dimensions, tolerances, and allowances applicable to products covered by this specification are contained in Tables 2-9 [Annex A1, Tables A1.1-A1.7]. The appropriate tolerance tables shall be identified in each individual specification.

8. Workmanship

8.1 Cut lengths shall have a workmanlike appearance and shall not have imperfections of a nature or degree for the product, the grade, and the quality ordered that will be detrimental to the fabrication of the finished part.

8.2 Coils may contain some abnormal imperfections that render a portion of the coil unusable since the inspection of coils does not afford the producer the same opportunity to remove portions containing imperfections as in the case with cut lengths.

9. Finish and Condition

9.1 Hot-rolled strip has a surface with an oxide or scale resulting from the hot-rolling operation. The oxide or scale can be removed by pickling or blast cleaning when required for press-work operations or welding. Hot-rolled and hot-rolled descaled strip are not generally used for exposed parts where surface is of prime importance. However, hot-rolled surface might be of importance, as in the case of weathering steels for exposed parts.

9.1.1 Hot-rolled strip can be supplied with mill edges, square edges, or cut (slit) edges as specified.

9.1.1.1 Mill edges are the natural edges resulting from the hot-rolling operation and are generally round and smooth without any definite contour.

9.1.1.2 Square edges are the edges resulting from rolling through vertical edging rolls during the hot-rolling operations. These edges are square and smooth, with the corners slightly rounded.

9.1.1.3 Cut (slit) edges are the normal edges that result from the shearing, slitting, or trimming of mill edges.

9.1.2 The ends of plain hot-rolled mill-edge coils are irregular in shape and are referred to as uncropped ends. Where such ends are not acceptable, the purchaser’s order should so specify. Processed coils such as pickled or blast cleaned are supplied with square-cut ends.

9.2 *Oiling:*

TABLE 2 Index of Tables for Dimensions, Tolerances, and Allowances

Dimensions	Table No. Inch-Pound Units	SI Units
Camber tolerances	8	A1.6
Crown tolerances	5	A1.3
Flatness tolerances	9	A1.7
Length tolerances	7	A1.5
Thickness tolerances	3, 4	A1.1, A 1.2
Width tolerances	6	A1.4

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

TABLE 3 Thickness Tolerances of Hot-Rolled Strip[A] (Carbon and High-Strength, Low-Alloy Steel) Ordered to Nominal Thickness (Coils and Cut Lengths, Including Pickled)

NOTE 1—Micrometres used for measurement of thickness shall be constructed with either flat anvils having a minimum diameter of 0.188 in. or rounded anvils having a minimum radius of curvature of 0.100 in. Micrometres with pointed anvils are not suitable for thickness measurement.

Specified Width, in.		Thickness Tolerance, Over and Under, in., for Specified Nominal Thickness, in.				
Over	Through	Through 0.057	Over 0.057 to 0.118, incl	Over 0.118 to 0.187, incl	Over 0.187 to 0.203, incl	Over 0.203 to 0.230, excl
. . .	3½	0.003	0.004	0.005	0.006	. . .
3½	6	0.003	0.005	0.005	0.006	. . .
6	12	0.004	0.005	0.005	0.006	0.006

[A] Measurements for the above table are taken ⅜ in. from the edge of a strip on 1 in. or wider; and at any place on the strip when narrower than 1 in. The given tolerances do not include crown and therefore the tolerances for crown as shown in Table 5 are in addition to tolerances in Table 3.

TABLE 4 Thickness Tolerances of Hot-Rolled Strip[A] (Carbon and High-Strength, Low-Alloy Steel) Ordered to Minimum Thickness (Coils and Cut Lengths, Including Pickling)

NOTE 1—Micrometres used for measurement of thickness shall be constructed with either flat anvils having a minimum diameter of 0.188 in. or rounded anvils having a minimum radius of curvature of 0.100 in. Micrometres with pointed anvils are not suitable for thickness measurement.

Specified Width, in.		Thickness Tolerance, Over Only, for Specified Minimum Thickness, in.				
Over	Through	Through 0.057	Over 0.057 to 0.118, incl	Over 0.118 to 0.187, incl	Over 0.187 to 0.203, incl	Over 0.203 to 0.230, excl
. . .	3½	0.006	0.008	0.010	0.012	. . .
3½	6	0.006	0.010	0.010	0.012	. . .
6	12	0.008	0.010	0.010	0.012	0.012

[A] Measurements for the above table are taken ⅜ in. from the edge of a strip on 1 in. or wider; and at any place on the strip when narrower than 1 in. The given tolerances do not include crown and therefore the tolerances for crown as shown in Table 5 are in addition to tolerances in Table 4Table 4.

TABLE 5 Crown Tolerances of Hot-Rolled Strip (Carbon and High-Strength, Low-Alloy Steel) (Coils and Cut Lengths, Including Pickled) Strip may be thicker at the center than at a point ⅜ in. from the edge by the following amounts:

Specified Width, in.		Crown Tolerance, Over Only, for Specified Minimum Thickness, in.		
Over	Through	Through 0.118	Over 0.118 to 0.187, incl	Over 0.187 to 0.230, excl
. . .	3½	0.002	0.002	0.001
3½	6	0.003	0.002	0.002
6	12	0.004	0.003	0.003

TABLE 6 Width Tolerances of Hot-Rolled Strip (Carbon and High-Strength, Low-Alloy Steel) (Coils and Cut Lengths, Including Pickled)

Specified Width, in.		Width Tolerance, Over and Under, in.		
			Cut Edge	
Over	Through	Mill Edge and Square Edge Strip	Through 0.109 in.	Over 0.109 in. Through 0.230 excl
. . .	2	1/32	0.008	0.016
2	5	3/64	0.008	0.016
5	10	1/16	0.010	0.016
10	12	3/32	0.016	0.016

9.2.1 Plain hot-rolled strip is customarily furnished not oiled. Oiling must be specified when required

9.2.2 Hot-rolled pickled or descaled strip is customarily furnished oiled. If the product is not to be oiled, it must be so specified since the cleaned surface is prone to rusting.

10. General Requirements for Delivery

10.1 Products covered by this specification are produced to inch-pound or metric decimal thickness only.

10.2 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.

11. Retests

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

11.2 If the percentage of 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.

11.3 If a bend specimen fails, due to conditions of bending more severe than required by the specification, a retest is permitted either on a duplicate specimen or on a remaining portion of the failed specimen.

12. Inspection

12.1 When the purchaser's order stipulates that inspection and test (except product analyses) for acceptance on the steel be made prior to shipment from the mill, the manufacturer shall afford the purchaser's inspector all reasonable facilities to

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

TABLE 7 Length Tolerances of Hot-Rolled Strip (Carbon and High-Strength Alloy) (Cut Lengths, Including Pickled)

Specified Widths, in.	Length Tolerances over Specified Length, ft for Widths Given, in. No Tolerance Under					
	To 5 ft, incl	Over 5 to 10 ft, incl	Over 10 to 20 ft, incl	Over 20 to 30 ft, incl	Over 30 to 40 ft, incl	Over 40 ft, incl
To 3, incl	¼	⅜	½	¾	1	1½
Over 3 to 6, incl	⅜	½	⅝	¾	1	1½
Over 6 to 12, incl	½	¾	1	1¼	1½	1¾

TABLE 8 Camber Tolerances[A] of Hot-Rolled Strip (Carbon and High-Strength Low-Alloy) (Coils and Cut Lengths, Including Pickled, Applicable to Mill Edge, Square Edge, and Slit or Cut Edge)

NOTE 1— Camber is the deviation of a side edge from a straight line. The standard for measuring this deviation is based on any 8-ft length.[B] It is obtained by placing an 8-ft straightedge on the concave side and measuring the maximum distance between the strip edge and the straightedge.

For strip wider than 1½ in.—¼ in. in any 8 ft.
For strip 1½ in. and narrower—½ in. in any 8 ft.

[A] When the camber tolerances shown in the above table are not suitable for a particular purpose, hot-rolled strip is sometimes machine straightened.

[B] For strip less than 8 ft tolerances are to be established in each instance. A formula for calculating camber is as follows:

$$\frac{L^2 \times C_1}{64} = C_2 \text{ in } L$$

where:
C_1 = Camber in 8 ft and
C_2= Camber in any given length L.

TABLE 9 Flatness Tolerances of Hot-Rolled Strip (Carbon and High-Strength Low-Alloy)

It has not been practicable to formulate flatness tolerances for hot-rolled carbon strip steel because of the wide range of widths and thicknesses, and variety of chemical compositions, mechanical properties and types, produced in coils and cut lengths.

satisfy him that the steel is being produced and furnished in accordance with the specification. Mill inspection by the purchaser shall not interfere unnecessarily with the manufacturer's operation.

13. Rejection and Rehearing

13.1 Unless otherwise specified, any rejection shall be reported to the manufacturer within a reasonable time after receipt of material by the purchaser.

13.2 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.

13.3 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.

14. Test Reports and Certification

14.1 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.

14.2 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 the material specification.

14.3 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.

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

14.5 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 2—The industry definition as invoked here is: EDI is the computer to computer exchange of business information in an agreed upon standard format such as ANSI ASC X12.

15. Marking

15.1 As a minimum requirement, the material shall be identified by having the manufacturer's name, ASTM designation, weight, purchaser's order number, and material identification legibly stenciled on top of each lift or shown on a tag attached to each coil or shipping unit.

15.2 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.

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

15.4 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.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

16. Packaging

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

16.2 When specified in the contract or order, and for direct procurement by or direct shipment to the government, when Level A is specified, preservation, packaging, and packing shall be in accordance with the Level A requirements of MIL-STD-163.

16.3 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.

17. Keywords

17.1 carbon; steel; strip

ANNEX

(Mandatory Information)

A1. PERMISSIBLE VARIATIONS IN DIMENSIONS AND MASS IN SI UNITS

A1.1 Listed in Tables A1.1-A1.7 are permissible variations in dimensions and mass expressed in the International System of Units (SI) terminology.

TABLE A1.1 Thickness Tolerances of Hot-Rolled Strip[A] (Carbon and High-Strength, Low-Alloy Steel) Ordered to Nominal Thickness (Coils and Cut Lengths, Including Pickled)

NOTE 1—Micrometres used for measurement of thickness shall be constructed with either flat anvils having a minimum diameter of 4.80 mm or rounded anvils having a minimum radius of curvature of 2.55 mm. Micrometres with pointed anvils are not suitable for thickness measurement.

Specified Width, mm		Thickness Tolerance, Over and Under, mm, for Specified Nominal Thickness, mm				
Over	Through	Through 1.5	Over 1.5 to 3.0, incl	Over 3.0 to 4.5, incl	Over 4.5 to 5.0, incl	Over 5.0 to 6.0, excl
. . .	100	0.08	0.10	0.13	0.15	. . .
100	200	0.08	0.13	0.13	0.15	. . .
200	300	0.10	0.13	0.13	0.15	0.15

[A] Measurements for the above table are taken 10 mm from the edge of a strip on 25 mm or wider; and at any place on the strip when narrower than 25 mm. The given tolerances do not include crown and therefore the tolerances for crown as shown in Table A1.3 are in addition to tolerances in Table A1.1.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

TABLE A1.2 Thickness Tolerances of Hot-Rolled Strip[A] (Carbon and High-Strength, Low-Alloy Steel) Ordered to Minimum Thickness (Coils and Cut Lengths, Including Pickling)

NOTE 1—Micrometres used for measurement of thickness shall be constructed with either flat anvils having a minimum diameter of 4.80 mm or rounded anvils having a minimum radius of curvature of 2.55 mm. Micrometres with pointed anvils are not suitable for thickness measurement.

Specified Width, mm		Thickness Tolerance, Over Only, for Specified Minimum Thickness, mm				
Over	Through	Through 1.5	Over 1.5 to 3.0, incl	Over 3.0 to 4.5, incl	Over 4.5 to 5.0, incl	Over 5.0 to 6.0, excl
. . .	100	0.15	0.20	0.25	0.30	. . .
100	200	0.15	0.25	0.25	0.30	. . .
200	300	0.20	0.25	0.25	0.30	0.30

[A] Measurements for the above table are taken 10 mm from the edge of a strip on 25 mm or wider; and at any place on the strip when narrower than 25 mm. The given tolerances do not include crown and therefore the tolerances for crown as shown in Table A 1.3 are in addition to tolerances in Table A 1.2.

TABLE A1.3 Crown Tolerances of Hot-Rolled Strip (Carbon and High-Strength, Low-Alloy Steel) (Coils and Cut Lengths, Including Pickled)

Specified Width, mm		Crown Tolerance, Over Only, for Specified Minimum Thickness, mm			
Over	Through	Through 3.0	Over 3.0 to 4.5, incl	Over 4.5 to 6.0, incl	Over 6.0 to 9.5, incl
. . .	100	0.05	0.05	0.03	. . .
100	200	0.10	0.08	0.05	. . .
200	300	0.10	0.08	0.08	0.05

TABLE A1.4 Width Tolerances of Hot-Rolled Strip (Carbon and High-Strength, Low-Alloy Steel) (Coils and Cut Lengths, Including Pickled)

Specified Width, mm		Width Tolerance, Over and Under, mm		
Over	Through	Mill Edge and Square Edge Strip	Cut Edge	
			Through 2.5 mm	Over 2.5 mm
. . .	50	0.8	0.2	0.4
50	100	1.2	0.2	0.4
100	200	1.6	0.3	0.4
200	300	2.4	0.4	0.4

TABLE A1.5 Length Tolerances of Hot-Rolled Strip (Carbon and High-Strength, Low-Alloy Steel) (Cut Lengths, Including Pickled)

Specified Widths, mm		Length Tolerances Over Specified Length, for Widths Given, No Tolerance Under, mm					
Over	Through	Through 1500	Over 1500 to 3000, incl	Over 3000 to 6000, incl	Over 6000 to 9000, incl	Over 9000 to 12 000, incl	Over 12 000
. . .	100	10	10	15	20	25	40
100	200	10	15	15	20	25	40
200	300	15	20	25	30	40	45

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

TABLE A1.6 Camber Tolerances[A] of Hot-Rolled Strip (Carbon and High-Strength Low-Alloy) (Coils and Cut Lengths, Including Pickled, Applicable to Mill Edge, Square Edge, and Slit or Cut Edge)

NOTE 1—Camber is the deviation of a side edge from a straight line. The standard for measuring this deviation is based on any 2000-mm length.[B] It is obtained by placing a 2000-mm straightedge on the concave side and measuring the maximum distance between the strip edge and the straightedge.

For strip wider than 50 mm—5.0 mm in any 2000 mm
For strip 50 mm and narrower—10.0 mm in any 2000 mm

[A] When the camber tolerances shown in the above table are not suitable for a particular purpose, hot-rolled strip is sometimes machine straightened.
[B] For strip less than 2000 mm tolerances are to be established in each instance.

TABLE A1.7 Flatness Tolerances of Hot-Rolled Strip (Carbon and High-Strength Low-Alloy)

It has not been practicable to formulate flatness tolerances for hot-rolled strip because of the wide range of widths and thicknesses, and variety of chemical compositions and qualities, produced in coils and cut lengths.

APPENDIX

(Nonmandatory Information)

X1. STANDARD CHEMICAL RANGES AND LIMITS

X1.1 Standard chemical ranges and limits are prescribed for carbon steels in Table X1.1

TABLE X1.1 Standard Chemical Ranges and Limits

NOTE 1—The carbon ranges shown in the column headed "Range" apply when the specified maximum limit for manganese does not exceed 1.00 %. When the maximum manganese limit exceeds 1.00 %, add 0.01 to the carbon ranges shown below.

Element	Carbon Steels Only, Cast or Heat Analysis		
	Minimum of Specified Element, %	Range	Lowest, max
Carbon (see Note)	to 0.15, incl	0.05	0.08
	over 0.15 to 0.30, incl	0.06	
	over 0.30 to 0.40, incl	0.07	
	over 0.40 to 0.60, incl	0.08	
	over 0.60 to 0.80, incl	0.11	
	over 0.80 to 1.35, incl	0.14	
Manganese	to 0.50, incl	0.20	0.40
	over 0.50 to 1.15, incl	0.30	
	over 1.15 to 1.65, incl	0.35	
Phosphorus	to 0.08, incl	0.03	0.030[A]
	over 0.08 to 0.15, incl	0.05	
Sulfur	to 0.08, incl	0.03	0.035[A]
	over 0.08 to 0.15, incl	0.05	
	over 0.15 to 0.23, incl	0.07	
	over 0.23 to 0.33, incl	0.10	
Silicon	to 0.15, incl	0.08	0.10
	over 0.15 to 0.30, incl	0.15	
	over 0.30 to 0.60, incl	0.30	
Copper	When copper is required 0.20 min is commonly specified.		

[A] Certain individual specifications provide for lower standard limits for phosphorus and sulfur.

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale

ASTM International takes no position respecting the validity of any patent rights asserted in connection with any item mentioned in this standard. Users of this standard are expressly advised that determination of the validity of any such patent rights, and the risk of infringement of such rights, are entirely their own responsibility.

This standard is subject to revision at any time by the responsible technical committee and must be reviewed every five years and if not revised, either reapproved or withdrawn. Your comments are invited either for revision of this standard or for additional standards and should be addressed to ASTM International Headquarters. Your comments will receive careful consideration at a meeting of the responsible technical committee, which you may attend. If you feel that your comments have not received a fair hearing you should make your views known to the ASTM Committee on Standards, at the address shown below.

This standard is copyrighted by ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959, United States. Individual reprints (single or multiple copies) of this standard may be obtained by contacting ASTM at the above address or at 610-832-9585 (phone), 610-832-9555 (fax), or service@astm.org (e-mail); or through the ASTM website (www.astm.org).

Copyright ASTM International
Provided by IHS under license with ASTM
No reproduction or networking permitted without license from IHS
Not for Resale