



Designation: A568/A568M – 19a

Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low- Alloy, Hot-Rolled and Cold-Rolled, General Requirements for¹

This standard is issued under the fixed designation A568/A568M; 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 U.S. Department of Defense.

1. Scope*

1.1 This specification covers the general requirements for steel sheet in coils and cut lengths. It applies to the following specifications that describe carbon steel, structural steel, and high-strength, low-alloy steel (HSLA) furnished as hot-rolled sheet and cold-rolled sheet: Specifications [A414/A414M](#), [A424/A424M](#), [A606/A606M](#), [A659/A659M](#), [A794/A794M](#), [A1008/A1008M](#), [A1011/A1011M](#), and [A1039/A1039M](#).

1.2 This specification is not applicable to hot-rolled heavy-thickness carbon sheet coils (Specification [A635/A635M](#)).

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 in [1.1](#), measured values, calculated values, or observed 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 [E29](#).

1.4.1 Ordered values, identified in tables, specified such as over 30 through 48 or 30 exclusive to 48 inclusive, covers all ordered values specified as 30.1, 30.01, 30.001, etc., up to and including 48.000 etc., but does not cover ordered values specified as 30.000 etc., or less, nor does it cover ordered values specified as 48.1, 48.01, 48.001, etc.

1.5 [Annex A1](#) lists permissible variations in dimensions and mass (see [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 SI units or inch-pound units are to be regarded separately as standard. The values stated in each system may not be exact equivalents; therefore, each system shall be used independently of the other. Combining values from the two systems may result in non-conformance with the standard.

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.

1.8 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 ASTM Standards:²

[A370 Test Methods and Definitions for Mechanical Testing of Steel Products](#)

[A414/A414M Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy for Pressure Vessels](#)

[A424/A424M Specification for Steel, Sheet, for Porcelain Enameling](#)

[A606/A606M Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance](#)

[A635/A635M Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for](#)

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



- A659/A659M** Specification for Commercial Steel (CS), Sheet and Strip, Carbon (0.16 Maximum to 0.25 Maximum Percent), Hot-Rolled
- A700** Guide for Packaging, Marking, and Loading Methods for Steel Products for Shipment
- A751** Test Methods, Practices, and Terminology for Chemical Analysis of Steel Products
- A794/A794M** Specification for Commercial Steel (CS), Sheet, Carbon (0.16 % Maximum to 0.25 % Maximum), Cold-Rolled
- A941** Terminology Relating to Steel, Stainless Steel, Related Alloys, and Ferroalloys
- A1008/A1008M** Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable
- A1011/A1011M** Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength
- A1030/A1030M** Practice for Measuring Flatness Characteristics of Steel Sheet Products
- A1039/A1039M** Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, Produced by Twin-Roll Casting Process
- A1073/A1073M** Practice for Using Hand Micrometers to Measure the Thickness of Uncoated Steel Sheet and Nonmetallic and Metallic-Coated Steel Sheet
- E11** Specification for Woven Wire Test Sieve Cloth and Test Sieves
- E29** Practice for Using Significant Digits in Test Data to Determine Conformance with Specifications
- E59** Practice for Sampling Steel and Iron for Determination of Chemical Composition (Withdrawn 1996)³
- E290** Test Methods for Bend Testing of Material for Ductility
- 2.2 Military Standards:**⁴
- MIL-STD-129** Marking for Shipment and Storage
- 2.3 Federal Standards:**⁴
- Fed. Std. No. 123** Marking for Shipments (Civil Agencies)

3. Terminology

3.1 Definitions of Terms Specific to This Standard:

3.1.1 Steel Types:

3.1.2 *carbon steel, n*—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, and so forth. These elements are considered as incidental and are not normally determined or reported.

3.1.3 *high-strength, low-alloy steel, n*—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.

3.1.4 Product Types:

3.1.5 *hot-rolled sheet, n*—manufactured by hot-rolling slabs in a continuous mill to the required thickness and can be supplied in coils or cut lengths as specified.

(1) Hot-rolled carbon steel sheet is commonly classified by size as follows:

Coils and Cut Lengths	
Width, in. All Widths ⁴	Thickness, in. 0.027 to 0.230, excl

⁴ Hot-rolled sheet in coils and cut lengths less than 12 in. in width must have cut edges. Hot-rolled material with mill edges 12 in. and less in width is considered hot-rolled strip.

Coils and Cut Lengths	
Width, mm All Widths ⁴	Thickness, mm 0.7 to 6.0, excl

⁴ Hot-rolled sheet in coils and cut lengths less than 300 mm. in width must have cut edges. Hot-rolled material with mill edges 300 mm and less in width is considered hot-rolled strip.

(2) Hot-rolled high-strength low-alloy steel sheet is commonly classified by size as follows:

Coils and Cut Lengths	
Width, in. All Widths ⁴	Thickness, in. 0.031 to 0.230, excl

⁴ Hot-rolled sheet in coils and cut lengths less than 12 in. in width must have cut edges. Hot-rolled material with mill edges 12 in. and less in width is considered hot-rolled strip.

Coils and Cut Lengths	
Width, in. All Widths ⁴	Thickness, mm 0.8 to 6.0, excl

⁴ Hot-rolled sheet in coils and cut lengths less than 300 mm in width must have cut edges. Hot-rolled material with mill edges 300 mm and less in width is considered hot-rolled strip.

NOTE 2—The changes in width limits with the publication of A568/A568M – 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. Material formerly tested in the transverse direction will be tested in the longitudinal direction. This is expected to result in some changes in reported properties. The purchaser is advised to discuss this change with the supplier.

3.1.6 *cold-rolled sheet, n*—manufactured from hot-rolled descaled coils by cold reducing to the desired thickness, generally followed by annealing to recrystallize the grain structure. If the sheet is not annealed after cold reduction it is known as full hard with a hardness of 84 HRB minimum and can be used for certain applications where ductility and flatness are not required.

(1) Cold-rolled carbon sheet is commonly classified by size as follows:

³ The last approved version of this historical standard is referenced on www.astm.org.

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

Width, in.
All Widths^{A,B}Thickness, in.
Through 0.142Width, mm
All Widths^{A,B}Thickness, mm
Through 4.0

^A Cold-rolled sheet coils and cut lengths, slit from wider coils with cut edge (only) and in thicknesses through 0.142 in. [4.0 mm] carbon 0.25 % maximum by cast analysis.

^B When no special edge or finish (other than matte, commercial bright, or luster finish) or single strand rolling of widths, or both under 24 in. [600 mm] is not specified or required.

(2) Cold-rolled high-strength low-alloy sheet is commonly classified by size as follows:

Width, in.
Through 12^A
Over 12^BThickness, in.
0.019 through 0.082
0.020 and overWidth, mm
To 300, incl^A
Over 300^BThickness, mm
0.5 to 2.0, incl
0.5 and Over

^A Cold-rolled sheet coils and cut lengths, slit from wider coils with cut edge (only) and in thicknesses 0.019 in. [0.5 mm] through 0.082 in. [2.0 mm] carbon 0.25 % maximum by cast analysis.

^B When no special edge or finish (other than matte, commercial bright, or luster finish) or single strand rolling of widths, or both under 24 in. [600 mm] is not specified or required.

3.1.6.1 *Discussion*—Steel products are available in various thickness, width, and length combinations depending upon equipment and processing capabilities of various manufacturers and processors. Historic limitations of a product based upon dimensions (thickness, width, and length) do not take into account current production and processing capabilities. To qualify any product for a particular product specification requires all appropriate and necessary tests be performed and that the results meet the limits prescribed in that product specification. If the necessary tests required by a product specification cannot be conducted, the product cannot be qualified to that specification. This general requirements specification contains permitted variations for the commonly available sizes. Permitted variations for other sizes are subject to agreement between the customer and the manufacturer or processor, whichever is applicable.

3.1.7 *retests*, *n*—additional test, or tests, made from the original material when the original test did not meet the appropriate acceptance criteria required by a product specification and the failure was mechanical in nature as described in Section 11.

3.1.8 *resample*, *n*—additional test or tests made when the test on the original sample did not meet the appropriate acceptance criteria required by the product specification, but possibly requiring that the material in question have an appropriate amount discarded prior to securing the new sample or samples.

3.1.9 *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 methods, 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.

3.1.10 *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 (cold reduction), heat treating, temper rolling, coating, packaging, marking, loading for shipment, and certification.

3.1.10.1 *Discussion*—The processing operations need not be controlled by the organization that hot rolls the slab into a coil. If only one organization controls or is responsible for (or both) the hot-rolling and processing operations, that organization is termed the manufacturer. If more than one organization controls or is responsible for (or both) hot-rolling and processing operations, the organization that controls and is responsible for the hot-rolling is termed the hot roll manufacturer and the organization or organizations controlling and responsible for the processing operations is/are termed the processor or processors. Likewise, one organization may be the manufacturer of the hot roll coil and another the manufacturer of the cold roll coil. In such case, the organization responsible for the conversion of the hot roll coil to a cold roll coil and other processing operations will also be termed the cold roll manufacturer and organizations performing additional processing operations to the cold roll coil will be termed the coil processor or coil processors.

3.1.11 *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.

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

3.2 Refer to Terminology A941 for additional definitions of terms used in this standard.

4. Materials and Manufacture

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

4.2 Coil breaks, stretcher strains, and fluting can occur during the user's processing of hot-rolled or hot-rolled pickled sheet. When any of these features are detrimental to the application, the manufacturer shall be notified at time of ordering in order to properly process the sheet.

4.3 Cold-rolled carbon steel sheet is available as discussed in 10.2, 10.3, and in Table 1.

4.4 Unless specified as a full-hard product, cold-rolled sheet is annealed after being cold reduced to thickness. The annealed, cold-rolled sheet can be used as annealed last (dead soft) for unexposed end-use applications. When cold-rolled sheet is used for unexposed applications and coil breaks are a hazard in uncoiling, it may be necessary to further process the material. In this case the manufacturer should be consulted.



TABLE 1 Cold-Rolled Sheet Steel Class Comparison

	Exposed	Unexposed
Major imperfections:		
Cut lengths	Mill rejects	Mill rejects
Coils	Purchaser accepts within the manufacturer's published standards (policy)	Purchaser accepts within the manufacturer's published standards (policy)
Minor imperfections:		
Cut lengths	Mill rejections repetitive imperfections. May contain random imperfections which the purchaser accepts within the manufacturer's published standards (policy)	Purchaser accepts all minor imperfections
Coils	Purchaser accepts within the manufacturer's published standards (policy)	Purchaser accepts all minor imperfections
Finish	Matte unless otherwise specified	Purchaser accepts all finishes
Special oils	May be specified	May not be specified
Thickness, width and length tolerance:		
Standard	Will be met	Will be met
Restricted	May be specified	May not be specified
Flatness tolerance:		
Standard	Will be met	Will be met (temper rolled) Not guaranteed—normally within twice standard (annealed last)
Restricted squareness	May be specified	May not be specified
Coil wraps	Purchaser accepts within the manufacturer's published standards (policy)	Purchaser accepts all
Coil welds	Purchaser accepts within the manufacturer's published standards (policy)	Purchaser accepts within the manufacturer's published standards (policy)
Outside inspection	May be specified	May not be specified
Special testing	May be specified	May not be specified

After annealing, cold-rolled sheet is generally given a light skin pass to impart shape or may be given a heavier skin pass or temper pass to prevent the phenomenon known as stretcher straining or fluting, when formed. Temper passing also provides a required surface texture.

4.5 Temper Rolling:

4.5.1 Unless otherwise specified, cold-rolled sheet for exposed applications shall be temper rolled and is usually specified and furnished in the strain free condition as shipped (see [Appendix X1](#)).

4.5.2 Cold-rolled sheet for unexposed applications may be specified and furnished “annealed last” or “temper rolled.” “Annealed last” is normally produced without temper rolling but may be lightly temper rolled during oiling or rewinding. Unexposed temper-rolled material may be specified strain-free or nonfluting. Where specific hardness range or limit or a specified surface texture is required, the application is considered as exposed.

NOTE 3—Skin-passed sheet is subject to an aging phenomenon (see [Appendix X1](#)). Unless special killed (nonaging) steel is specified, it is to the user's interest to fabricate the sheet as soon as possible, for optimum performance.

5. Chemical Composition

5.1 Limits:

5.1.1 The chemical composition shall be in accordance with the applicable product specification. However, if other compo-

sitions are required for carbon steel, they shall be prepared in accordance with [Appendix X2](#).

5.1.2 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.

5.2 Cast or Heat Analysis:

5.2.1 An analysis of each cast or heat of steel shall be made by the steel 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. The steel manufacturer, or the hot roll manufacturer, cold roll manufacturer, or processor, if different from the steel manufacturer, is responsible for providing this information to the purchaser or his representative as requested.

5.3 Product, Check, or Verification Analysis:

5.3.1 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; therefore, the tolerances in [Table 2](#) 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 non-killed (capped or rimmed), product analysis may be made by the purchaser. The chemical analysis shall not vary from the limits specified by more than