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AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for Steel Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled, and Steel Sheet, Cold-Rolled, High-Strength, Low-Alloy, with Improved Formability[1]

This standard is issued under the fixed designation A 715; 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 high-strength, low-alloy, hot-rolled steel sheet and strip and cold-rolled sheet having improved formability when compared with steels covered by Specifications A 606 and A 607. The product is furnished as either cut lengths or coils and is available in four-strength levels, Grades 50, 60, 70, and 80 (corresponding to minimum yield strength (see Table 1)). The steel is killed, made to a fine grain practice, and includes microalloying elements such as columbium, titanium, vanadium, zirconium, etc. The steel may be treated to achieve inclusion control. The product is intended for structural and miscellaneous applications where higher strength, savings in weight, improved formability, and weldability are important.

1.2 The values stated in inch-pound units are to be regarded as the standard.

2. Referenced Documents

2.1 *ASTM Standards:*

A 568/A568M Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for[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 749/A749M Specification for Steel, Strip, Carbon and High-Strength, Low-Alloy, Hot-Rolled, General Requirements for[2]

3. Ordering Information

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

3.1.1 ASTM designation number and year of issue,

3.1.2 Grade (see Table 2),

3.1.3 Name of material (hot-rolled high-strength low-alloy steel sheet or strip, or cold-rolled sheet),

3.1.4 Condition (material to this specification is furnished in the hot-rolled condition. Pickled, or blast cleaned, must be specified if required. Material so ordered will be oiled unless ordered "not oiled" (see 8.1 and 8.2)). For cold-rolled, indicate exposed (*E*) or unexposed (*U*). Matte dull finish will be supplied unless otherwise specified,

3.1.5 Edges (see 8.3), and

3.1.6 Dimensions (thickness, width, and length for cut lengths, or thickness and width for coils).

3.1.6.1 As agreed upon between the purchaser and the producer, material ordered to this specification will be supplied to meet the appropriate standard or restricted thickness tolerance table shown in Specification A 568/A 568M.

NOTE 1—Not all producers are capable of meeting all of the limitations of the thickness tolerance tables in Specification A 568/A 568M. The purchaser should contact the producer regarding possible limitations prior to placing an order.

3.1.7 Coil size and weight requirements (must include inside diameter, outside diameter, and maximum weight),

3.1.8 Application (part identification and description), and

3.1.9 Special requirements (if required).

TABLE 1 Tensile Requirements[A]

	Grade 50	Grade 60	Grade 70	Grade 80
Yield strength, min, ksi (MPa)	50 (345)	60 (415)	70 (485)	80 (550)
Tensile strength, min, ksi (MPa)	60 (415)	70 (485)	80 (550)	90 (620)
Elongation in 2 in. or 50 mm, min, % for thickness:				
Hot Rolled				
Over 0.097 in. (2.46 mm)	24.0	22.0	20.0	18.0
Up to 0.097 in. (2.46 mm), incl	22.0	20.0	18.0	16.0
Cold Rolled	22.0	18.0	16.0	14.0

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

[1] This specification is under the jurisdiction of ASTM Committee A-1 on Steel, Stainless Steel and Related Alloys, and is the direct responsibility of Subcommittee A01.19 on Steel Sheet and Strip.

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

TABLE 2 Chemical Requirements

NOTE—These steels shall also contain one or more of the following elements: Vanadium, Titanium, Columbian (Niobium). Other alloying elements may be present, but are not required.

Element	Composition, max, %
	Cast or Heat (formerly Ladle) Analysis
Carbon	0.15
Manganese	1.65
Phosphorus	0.020
Sulfur	0.025

NOTE 2—A typical ordering description is as follows: ASTM A 715 – XX, Grade 80, hot-rolled high-strength low-alloy steel sheet, pickled and oiled, cut edge 0.100 by 48 by 96 in. for Part 83479, bumper reinforcement bracket.

4. Materials and Manufacture

4.1 Sheet or strip to this specification is produced from killed steel, made to a fine grain practice. The steel may be treated to achieve inclusion control.

5. Chemical Composition

5.1 The cast or heat analysis of the steel shall conform to the chemical requirements shown in Table 2. Where it is of particular importance, the producer should be consulted for specific chemical composition.

5.1.1 Unspecified elements may be present. Limits on elements shall be as stated in Table 3.

5.1.1.1 Each of the elements listed in Table 3 shall be included in the report of the heat analysis. When the amount of an element present is less than 0.02 %, the analysis may be reported as "<0.02 %."

5.2 Steel to this specification contains micro-alloying elements such as columbium, titanium, vanadium, zirconium, etc. which should be considered when selecting a welding procedure to assure the procedure is compatible with the chemical composition for the grade welded.

6. Mechanical Property Requirements

6.1 *Tensile Tests*:

6.1.1 *Requirements*—Material as represented by the test specimen shall conform to the tensile requirements specified in Table 1.

6.1.2 *Number of Tests*—Two tensile tests shall be made from each heat or from each lot of 50 tons (45 Mg). When the amount of finished material from a heat or lot is less than 50 tons (45 Mg), one test shall be made. When material rolled from one heat differs 0.050 in. (1.27 mm) or more in thickness, one tensile test shall be made from both the thickest and thinnest material regardless of the weight represented.

TABLE 3 Limits on Unspecified Elements (see 5.1.1)

Copper, max %[A]	Heat analysis	0.20
	Product analysis	0.23
Nickel, max %[A]	Heat analysis	0.20
	Product analysis	0.23
Chromium, max %[A]	Heat analysis	0.15
	Product analysis	0.19
Molybdenum, max %[A]	Heat analysis	0.06
	Product analysis	0.07

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

6.1.3 *Location and Orientation:*

6.1.3.1 Tensile test specimens shall be taken at a point immediately adjacent to the material to be qualified.

6.1.3.2 Tensile test samples shall be taken from the full thickness of the sheet as rolled.

6.1.3.3 Tensile test specimens shall be taken from a location approximately halfway between the center of the sheet and the edge of the material as-rolled.

6.1.3.4 Tensile test specimens shall be taken with the axis of the test specimen parallel to the rolling direction (longitudinal test).

6.1.4 *Test Method*—Yield strength shall be determined by either the 0.2 % offset method or by the 0.5 % extension under load method unless otherwise specified.

6.2 *Bending Properties*—The minimum forming radius (radii) which steel covered by this specification can be expected to sustain is listed in the Appendix and is discussed in more detail in Specifications A 568/A 568M and A 749/A749M. Where tighter bend radii are required, where curved or offset bends are involved, or where stretching or drawing are also a consideration, the producers should be consulted.

7. General Requirements for Delivery

7.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specifications A 568/A 568M and A 749/A 749M.

8. Workmanship, Finish, and Appearance

8.1 *Surface Finish*—Unless otherwise specified, hot-rolled material shall have an as-rolled, not pickled surface finish. When required, material may be specified to be pickled or blast cleaned. Unless otherwise specified, cold-rolled sheet will be supplied with a dull matte finish. When needed finish may be specified for exposed applications.

8.2 *Oiling*—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. When required, pickled or blast-cleaned material may be specified to be furnished not oiled, and as-rolled material may be specified to be furnished oiled. Cold-rolled sheet can be supplied oiled or dry, as specified. Unless otherwise specified the sheet will be oiled.

8.3 *Edges*:

8.3.1 Hot-rolled sheet can be furnished as mill edge or cut edge, as specified.

8.3.2 Hot-rolled strip can be furnished as mill edge, square edge, or slit (cut) edge, as specified.

8.3.3 Cold-rolled sheet will be furnished as cut edge.

9. Retests

9.1 If the results of an original tensile specimen are within 2 ksi (14 MPa) of the required tensile strength, within 1 ksi (7 MPa) of the required yield strength, or within 2 % of the required elongation, a retest shall be permitted for which one random specimen from the cast or test lot shall be used. If the

results of this retest specimen meet the specified requirements, the cast or test lot will be accepted.

10. Certification

10.1 The manufacturer shall furnish copies of a test report showing the results of the heat or cast analysis and mechanical property tests made to compliance with this specification. The information shall include the purchase order number, ASTM designation number and year of issue, and the cast or lot number correlating the test data with the material represented.

11. Keywords

11.1 alloy steel sheet; alloy steel strip; cold rolled steel sheet; cold rolled steel strip; high strength low alloy steel; hot rolled steel sheet; hot rolled steel strip; steel sheet; steel strip

APPENDIX

(Nonmandatory Information)

X1. BENDING PROPERTIES

X1.1 See Table X1.1 for suggested minimum inside radii for cold bending.

TABLE X1.1 Suggested Minimum Inside Radii for Cold Bending[A]

NOTE 1—(*t*) equals a radius equivalent to the steel thickness.

NOTE 2—The suggested radii should be used as minimums for 90° bends in actual shop practice.

Grade	Minimum Inside Radius for Cold Bending
50	1*t*
60	1 ½ *t*
70	2t
80	2t

[A] Material which does not perform satisfactorily, when fabricated in accordance with the above requirements, may be subject to rejection pending negotiation with the steel supplier.