



Designation: A 607 – 98

Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Columbium or Vanadium, or Both, Hot-Rolled and Cold-Rolled¹

This standard is issued under the fixed designation A 607; 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 columbium, or vanadium hot-rolled sheet and strip, or cold-rolled sheet, or combinations thereof, in either cut lengths or coils, intended for applications where greater strength and savings in weight are important. The material is available as two classes. They are similar in strength level except that Class 2 offers improved weldability and more formability than Class 1. Atmospheric corrosion resistance of these steels is equivalent to plain carbon steels. With copper specified, the atmospheric corrosion resistance is twice that of plain carbon steel.

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

1.3 Class 1 material was previously A 607 without a class designation.

2. Referenced Documents

2.1 ASTM Standards:

A 568/A 568M Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for²

A 749/A 749M Specification for Steel, Strip, Carbon and High-Strength, Low-Alloy, Hot-Rolled, General Requirements for²

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 specification number and year of issue, grade, type, and class. When a class is not specified Class 1 will be furnished,

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

3.1.3 Copper bearing steel (when required),

3.1.4 Finish (cold-rolled)—indicate exposed (E) or unexposed (U). Matte (dull) finish will be supplied unless otherwise specified (see 7.3.2),

3.1.5 Condition (specify oiled or dry, as required) (see 7.2),

3.1.6 Edges (must be specified for hot-rolled sheet and strip), and

3.1.7 Dimensions (thickness, width, and whether cut lengths or coils).

3.1.7.1 As agreed upon between the purchaser and the producer, material ordered to this specification will be supplied to meet the appropriate standard or restricted thickness 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.

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

3.1.9 Application (show part identification and description), and

3.1.10 Special requirements (if required) or supplementary requirements of S1.

NOTE 2—A typical ordering description is as follows: “ASTM A 607 – XX, Grade 45 Type 1 Class 2 hot-rolled high-strength low-alloy steel sheet, dry, mill edge, 0.075 by 36 by 96 in. for tote box frame members.”

4. Materials and Manufacture

4.1 High-strength low-alloy columbium and/or vanadium hot-rolled sheet and strip, and cold-rolled sheet are ordinarily produced from capped or semi-killed steel. Should fully killed steel be required, the order should so indicate.

4.2 The material shall be furnished hot-rolled or cold-rolled as specified on the purchase order.

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.



5. Chemical Composition

5.1 The steel shall conform to the requirements as to chemical composition prescribed in Table 1 for the class specified.

5.1.1 Unspecified elements may be present. Limits on elements shall be as stated in Table 2.

5.1.1.1 Each of the elements listed in Table 2 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 When the steel is used in welded applications, welding procedure shall be suitable for the steel chemistry and the intended service.

5.3 When a class is not specified, Class 1 will be furnished.

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 3.

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 the thickest and thinnest material regardless of the weight represented.

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 ex-

TABLE 2 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.

pected to sustain is listed in Appendix X1, Table , and is discussed in more detail in Specifications A 568/A 568M and A 749/A 749M. 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. Workmanship, Finish, and Appearance

7.1 Edges:

7.1.1 *Hot-Rolled*—In the as-rolled condition the material has mill edges. Pickled or blast-cleaned material has cut edges. When required, as-rolled material may be specified to have cut edges. If mill edge material is required it must be specified.

7.1.2 *Cold-Rolled*—Cold-rolled material shall have cut edges only.

7.2 Oiling:

7.2.1 *Hot-Rolled*—Unless otherwise specified, hot-rolled as-rolled material shall be furnished dry, 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 dry, and as-rolled material may be specified to be furnished oiled.

7.2.2 *Cold-Rolled*—Unless otherwise specified, cold-rolled material shall be oiled. When required, cold-rolled material may be specified to be furnished dry, but is not recommended due to the increased possibility of rusting.

7.3 Surface Finish:

TABLE 1 Chemical Requirements, Composition, %^A

NOTE 1—Class 2 requirements for manganese, phosphorus, sulfur, columbium, and vanadium are the same as shown for Class 1.

Element	Grade 45		Grade 50		Grade 55		Grade 60		Grade 65		Grade 70	
	Heat or Cast Analysis	Product Analysis	Heat or Cast Analysis	Product Analysis	Heat or Cast Analysis	Product Analysis	Heat or Cast Analysis	Product Analysis	Heat or Cast Analysis	Product Analysis	Heat or Cast Analysis	Product Analysis
Class 1												
Carbon, max	0.22	0.26	0.23	0.27	0.25	0.29	0.26	0.30	0.26	0.30	0.26	0.30
Manganese, max	1.35	1.40	1.35	1.40	1.35	1.40	1.50	1.55	1.50	1.55	1.65	1.70
Phosphorus, max	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05	0.04	0.05
Sulfur, max	0.04	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.04	0.06	0.04	0.06
Columbium or vanadium, min	Cb 0.005 V 0.01	0.004 0.005	Cb 0.005 V 0.01	0.004 0.005	Cb 0.005 V 0.01	0.004 0.005	Cb 0.005 V 0.01	0.004 0.005	Cb 0.005 V 0.01	0.004 0.005	Cb 0.005 V 0.01	0.004 0.005
Nitrogen, max	...	...	...	...	...	...	...	...	0.012	0.015	0.012	0.015
Class 2												
Carbon, max	0.15	0.18	0.15	0.18	0.15	0.18	0.15	0.18	0.15	0.18	0.15	0.18
Nitrogen, max	...	...	...	...	...	...	0.020	0.024	0.020	0.024	0.020	0.024

^A Copper, when specified, shall have a minimum content of 0.20 % by heat or cast analysis (0.18 % by product analysis).