Designation: A 794 – 97 (Reapproved 2002)

Standard Specification for Commercial Steel (CS), Sheet, Carbon (0.16 % Maximum to 0.25 % Maximum), Cold-Rolled[1]

This standard is issued under the fixed designation A 794; 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 cold-rolled commercial steel (CS) sheet in coils and cut lengths, in which the maximum of the specified carbon range is over 0.15 and not over 0.25 %, and the maximum of the specified manganese range is not over 0.90 %. This material is ordered to chemical composition.

1.2 This specification is not applicable to the steels covered in Specifications A 366/A 366M, A 611, A 109, and A 109M.

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 366/A 366M Specification for Commercial Steel (CS), Sheet, Carbon, (0.15 % Maximum), Cold-Rolled[2]

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

A 611 Specification for Structural Steel (SS), Sheet, Carbon, Cold-Rolled[2]

A 749/A 749M Specification for General Requirements for Steel, Carbon and High-Strength, Low-Alloy, Hot-Rolled Strip[2]

E 527 Practice for Numbering Metals and Alloys (UNS)[3]

2.2 *Society of Automotive Engineers Standard:*[4]

J 1086 Numbering Metals and Alloys

3. Ordering Information

3.1 It is the purchaser's responsibility to specify in the purchase order all ordering information necessary to purchase the needed material. Examples of such information, include but are not limited to, the following:

3.1.1 ASTM specification number and year of issue,

3.1.2 Name of material (cold-rolled commercial steel (CS) sheet),

3.1.3 Grade designation or chemical composition or both,

3.1.4 Copper-bearing steel (if required),

3.1.5 Finish; indicate unexposed with matte (dull) finish, or exposed with either matte (dull), commercial bright or luster finish, as required,

3.1.6 Specify oiled or not oiled, as required,

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 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 (must include inside diameter, outside diameter, and maximum mass),

3.1.9 Quantity,

3.1.10 Application (show part identification and description),

3.1.11 Special requirements (if required), and

3.1.12 Cast or heat analysis report (request, if required).

NOTE 2—A typical ordering description is as follows: ASTM A 794-XX, Cold-Rolled Commercial Steel (CS), Grade 1018, Exposed, Matte Finish, Oiled, 0.030 by 36 by 96 in., 100 000 lb., for Part No. 5226 Steel Shelving.

4. Manufacture

4.1 *Condition*—The material shall be furnished in the annealed and temper-rolled condition but may be supplied full hard if specified.

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

[3] *Annual Book of ASTM Standards*, Vol 01.01.

[4] Available from Society of Automotive Engineers (SAE), 400 Commonwealth Dr., Warrendale, PA 15096.

5. Chemical Composition

5.1 The cast or heat (formerly ladle) analysis of the steel shall conform to the chemical requirements shown in Table 1, or chemical compositions can be specified from carbon 0.16 % maximum to 0.25 % maximum, inclusive, and manganese 0.90 % maximum, inclusive, which conforms to the ranges and limits in Appendix X1 of Specifications A 568/A 568M.

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 copper, nickel, chromium, or molybdenum is less than 0.02 %, the analysis may be reported as <0.02 %. When the amount of vanadium or columbium is less than 0.008 %, the analysis may be reported as <0.008 %.

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

6. Bending Properties

6.1 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/A 749M. When tighter bend radii are required, or curved or offset bends are involved, or when stretching or drawing are also a consideration, the producers shall be consulted.

TABLE 1 Typical Grade Designations and Chemical Compositions[A]

UNS Designation[B]	Grade Designation	Carbon, %	Mn, %	P, Max, %	S, Max, %
G10150	1015	0.12–0.18	0.30–0.60	0.030	0.035
G10160	1016	0.12–0.18	0.60–0.90	0.030	0.035
G10170	1017	0.14–0.20	0.30–0.60	0.030	0.035
G10180	1018	0.14–0.20	0.60–0.90	0.030	0.035
G10200	1020	0.17–0.23	0.30–0.60	0.030	0.035
G10210	1021	0.17–0.23	0.60–0.90	0.030	0.035
G10230	1023	0.19–0.25	0.30–0.60	0.030	0.035

[A] Copper, when specified, shall have a minimum content of 0.20 % by cast or heat analysis.

[B] Designation established in accordance with Practice E 527 and SAE J 1086.

TABLE 2 Limits on Additional 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 %[AB]	Heat analysis	0.15
	Product analysis	0.19
Molybdenum, max %[AB]	Heat analysis	0.06
	Product analysis	0.07
Vanadium, max %	Heat analysis	0.008
	Product analysis	0.018
Columbium, max %	Heat analysis	0.008
	Product analysis	0.018

[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.

[B] The sum of chromium and molybdenum shall not exceed 0.16 % 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.

7. General Requirements for Delivery

7.1 Material furnished under this specification shall conform to the applicable requirements of the current edition of Specification A 568/A 568M, unless otherwise provided herein.

8. Certification and Reports

8.1 When requested, the producer shall furnish copies of a report showing test results of the cast or heat analysis. The report shall include the purchase order number, ASTM designation number, and the cast or heat number representing the material.

9. Keywords

9.1 carbon steel sheet; carbon steel strip; cold rolled steel sheet; cold rolled steel strip; steel sheet; steel strip

APPENDIX

(Nonmandatory Information)

X1. BENDING PROPERTIES

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.

Maximum of Specified Manganese Range, %	Minimum Inside Radius for Cold Bending
To 0.60 incl.	1½ *t*
Over 0.60 to 0.90 incl.	2 *t*

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