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INTERNATIONAL
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AEROSPACE MATERIAL SPECIFICATION

SAE AMS-QQ-S-700

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Submitted for recognition as an American National Standard

Steel, Sheet and Strip, Medium and High Carbon

NOTICE

This document has been taken directly from Federal Standard QQ-S-700D, Notice 1 and contains only minor editorial and format changes required to bring it into conformance with the publishing requirements of SAE technical standards. The initial release of this document is intended to replace QQ-S-700D, Notice 1. Any part numbers established by the original specification remain unchanged.

The original Military Specification was adopted as an SAE standard under the provisions of the SAE Technical Standards Board (TSB) Rules and Regulations (TSB 001) pertaining to accelerated adoption of government specifications and standards. TSB rules provide for (a) the publication of portions of unrevised government specifications and standards without consensus voting at the SAE Committee level, and (b) the use of the existing government specification or standard format.

Under Department of Defense policies and procedures, any qualification requirements and associated qualified products lists are mandatory for DOD contracts. Any requirement relating to qualified products lists (QPL's) has not been adopted by SAE and is not part of this SAE technical document.

1. SCOPE AND CLASSIFICATION:

1.1 Scope:

This specification covers medium and high carbon sheet and strip steel for general fabrication purposes.

1.2 Classification:

Steel sheet and strip shall be furnished in accordance with the following classification (see 6.1).

1.2.1 Hot rolled sheet and strip:

(a) Hot rolled
(b) Hot rolled stress-relief annealed.
(c) Hot rolled and annealed
(d) Hot rolled and spheroidized annealed.

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1.2.2 Cold rolled sheet:

(a) Cold rolled annealed last.
(b) Cold rolled spheroidized annealed.
(c) Cold rolled, annealed, and skin passed (temper rolled).
(d) Cold rolled full hard.

2. APPLICABLE DOCUMENTS:

The following publications, of the issue in effect on date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

2.1 U.S. Government Publications:

Available from DODSSP, Subscription Services Desk, Building 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.

FED-STD-66	Steel: Chemical Composition and Hardenability
FED-STD-123	Marking for Shipment (Civilian Agencies)
FED-STD-151	Metals; Test Methods
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-163	Steel Mill Products, Preparation for Shipment and Storage

2.2 ASTM Publications:

Available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

ASTM A 568	General Requirements for Steel, Carbon and High-Strength Low-Alloy Hot-Rolled Sheet, Hot-Rolled Strip, and Cold-Rolled Sheet
ASTM E 8	Tension Testing of Metallic Materials
ASTM E 18	Rockwell Hardness and Rockwell Superficial Harness of Metallic Materials
ASTM E 290-68	Semi-Guided Bend Test for Ductility of Metallic Materials

2.3 National Motor Freight Traffic Association, Inc., Agent:

Available from American Trucking Association, Inc., Traffic Department, 1616 P Street, N.W., Washington, DC 20036.

National Motor Freight Classification

2.4 Uniform Classification Committee, Agent:

Available from Uniform Classification Committee, Room 1106, 222 South Riverside Plaza, Chicago, IL 60606.

Uniform Freight Classification

3. REQUIREMENTS:

3.1 Type of steel:

Steel shall be fully silicon killed unless otherwise specified in the contract or order (see 6.1). Aluminum may be added in sufficient amounts to control grain size.

3.2 Chemical composition:

Chemical composition is specified either to ranges and limits, or to steel grade designations (see 6.2.1 for commonly used steels). In both cases, the specified composition shall satisfy the requirements of “Ranges and Limits for Alloy Steel Sheet and Strip” specified in FED-STD-66.

3.2.1 Heat analysis: The supplier shall furnish a heat analysis of each heat of steel.

3.2.2 Product analysis: When specified by the purchaser (see 6.1), the steel shall be subject to product analysis. The chemical composition determined shall be within the ranges specified by the procuring agency. Individual determinations may vary from the specified ranges to the extent specified in FED-STD-66, but the several determinations of any element in a heat may not vary both above and below the range.

3.3 Mechanical properties:

3.3.1 Tensile or hardness properties: When tensile or hardness property requirements are specified in the contract or order (see 6.1), the test specimens representing the steel sheet or strip shall meet the requirements specified.

3.3.2 Cold bending: When specified in the contract or order (see 6.1), the specimens representing the steel sheet or strip shall withstand cold bending without cracking on the outside of the bent portion at room temperature, as indicated in table I except that sheet and strip as hot rolled, hot rolled stress-relief-annealed, and cold rolled full hard shall be exempt from the cold bending requirement.

TABLE I. Cold bending requirement

Degree of bend	Ratio inside radius to thickness	Relation of bend to rolling direction
180	3t	Longitudinal
180	4t	Transverse

3.4 Spheroidization and decarburization:

Unless otherwise specified in the contract or order (see 6.1), cold rolled steel sheet and strip, specified spheroidized annealed, shall be free of lamellar pearlite. Hot rolled steel sheet and strip, specified spheroidized annealed, shall be spheroidized to meet the requirements of blanking and forming as indicated by the manufacturing requirements. Manufacturing details should be made known to the steel producer at the time of order entry. Decarburization limits, as agreed upon between the supplier and procuring agency, may be specified (see 6.1).

3.5 Size and dimensional tolerances:

Steel sheet and strip shall be furnished to the sizes specified (see 6.1), and shall meet the applicable tolerance requirements of ASTM A 568.

3.6 Edges:

3.6.1 Hot-rolled sheet and strip: Unless a particular edge is specified in the contract or order (see 6.1), hot rolled sheet and strip shall be furnished with either mill edges, or cut or slit edges, at the option of the supplier.

3.6.2 Cold-rolled sheet: Unless otherwise specified in the contract or order (see 6.1), cold-rolled sheet shall be furnished with sheared edges.

3.7 Finish:

3.7.1 Hot-rolled sheet and strip: Unless otherwise specified in the contract or order (see 6.1), hot-rolled sheet and strip shall be furnished pickled. The surfaces of the pickled material shall be commercially free of scale.

3.7.2 Cold-rolled sheet: Cold-rolled sheet shall be furnished with a No. 1, dull finish (see 6.3); and, unless otherwise specified in the contract or order (see 6.1), shall be oiled.

3.8 Identification marking:

Marking for identification shall be as specified in the invitation for bids, contract, or order (see 6.1).

3.9 Workmanship:

Sheet and strip shall be clean and free from injurious defects such as pipe and laminations. Surface defects and segregation shall be consistent with commercial practice for this quality of sheet and strip.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract, the contractor is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract, the contractor may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Lot:

Unless otherwise specified (see 6.1), a lot shall consist of all sheet or strip of the same heat, the same condition and finish, the same thickness, and when heat treated, subjected to the same heat treatment procedure. For product analysis, a lot shall be defined as one heat.

4.3 Sampling:

4.3.1 For chemical composition: When specified (see 6.1), at least one sample shall be taken from each lot for product analysis in accordance with method 111 or 112 of FED-STD-151.

4.3.2 For mechanical properties:

4.3.2.1 Tension test: When tensile properties are specified (see 6.1), one tension-test sample shall be taken for each 60,000 pounds or fraction thereof in a lot.

4.3.2.2 Hardness tests: When hardness requirements are specified (see 6.1), one hardness determination shall be made for each 10,000 pounds or fraction thereof in each lot for sheet and strip in cut lengths. For material in coils, hardness determinations shall be taken at both the front and back end of 5 percent of the coils in the lot, but not less than 2 coils in each lot.

4.3.2.3 Cold-bending test: One sample from each 60,000 pounds or fraction thereof shall be taken from each lot for the cold bending test, but not less than 5 tests shall represent each lot. For material in coils, samples for cold bending tests shall be taken from the front and back end of 5 percent of the coils in the lot except that not less than 2 coils shall be tested in each lot.

4.3.3 For spheroidization: For material ordered spheroidized annealed, at least one sample shall be taken from each lot of sheet or strip for microscopic examination.

4.3.4 For decarburization: When decarburization limits are specified in the contract or order (see 6.1), at least one sample for each lot shall be taken for microexamination.

4.4 Examination:

4.4.1 Visual: Unless otherwise specified in the contract or order (se 6.1), all sheet, strip, or coils in each lot shall be examined for conformance with the requirements for edge (see 3.6), finish (see 3.7), identification marking (see 3.8), and workmanship (see 3.9).

4.4.2 Dimensions and tolerances: A representative number of measurements or weights shall be taken on each lot to determine compliance with the size, weight, and dimensional tolerances.

4.4.3 Preparation for delivery: Prior to shipment, examination shall be made to determine compliance with the requirements of section 5.

4.5 Tests:

4.5.1 Chemical analysis: Specimens for chemical check analysis shall be prepared and tested in accordance with method 111 or 112 of FED-STD-151. In case of dispute, analysis by method 111 shall be the basis for acceptance or rejection.

4.5.2 Mechanical properties:

4.5.2.1 Tension tests: Specimens for tensile testing shall be prepared and tested in accordance with ASTM E 8.

4.5.2.2 Hardness tests: Specimens for hardness testing shall be prepared and tested in accordance with ASTM E 18.

4.5.2.3 Cold bending: Specimens for cold bending shall be prepared and tested in accordance with ASTM E 290.

4.5.2.4 Spheroidization and decarburization: Specimens for microexamination for spheroidization shall have a prepared surface at least one-half inch long and shall represent the full thickness of the material. The specimen shall be taken perpendicular to the rolling direction and shall be obtained from a location one-quarter of the width from the edge of the material. Spheroidization and decarburization examination shall be conducted at sufficient magnification to give reliable results and shall be compared to the standards furnished by the procuring agency.

4.6 Rejection and retest:

Unless otherwise specified in the contract or order (see 6.1), rejection and retest shall be conducted in accordance with the general section of FED-STD-151.

5. PACKAGING:

5.1 Preservation and packaging:

Preservation and packaging shall be level A or C as specified (see 6.1).

5.1.1 Level A: Preservation for shipment shall be in accordance with MIL-STD-163.

5.1.2 Level C: Cleaning, drying, preservation, and packaging shall be in accordance with the manufacturer's commercial practice.

5.2 Packing:

Sheet and strip shall be packed for shipment in accordance with level A or C as specified (see 6.1).

5.2.1 Level A: Packing for shipment shall be in accordance with MIL-STD-163.

5.2.2 Level C: Packing shall be in accordance with commercial practice adequate to ensure acceptance and delivery by the carrier for the mode of transportation employed. Containers shall comply with the requirements of the Uniform Freight Classification Rules or National Motor Freight Classification Rules, as applicable to the mode of transportation.

5.3 Marking:

5.3.1 Civil agencies: In addition to any special marking specified in the contract or order (see 6.1), marking for shipment shall be in accordance with FED-STD-123.

5.3.2 Military activities: In addition to any special marking specified in the contract or order (see 6.1), marking for shipment shall be in accordance with MIL-STD-129.

6. NOTES:

6.1 Ordering data:

Purchasers should select the preferred options permitted herein and include the following information in procurement documents:

(a) Title, number, and date of this specification.
(b) Classification (see 1.2).
(c) When other than fully silicon killed steel is required (see 3.1).
(d) Chemical composition (see 3.2).
(e) When product analysis is required (see 3.2.2).
(f) Tensile or hardness properties, if required and specified (see 3.2, 4.3.2.1, and 4.3.2.2).
(g) Bend test, if required (see 3.3.2).
(h) Decarburization limits, if required and specified (see 3.4 and 4.3.2).

6.1 (Continued):

(i) Size, thickness, width, and length and if special tolerances are required (see 3.5).
(j) Edge requirements, if other than as specified herein (see 3.6.1 and 3.6.2).
(k) Finish requirements, if other than as specified herein (see 3.7.1 and 3.7.2).
(l) Identification marking required (see 3.8).
(m) When a lot size other than as specified herein is required (see 4.2).
(n) When sampling for chemical analysis is required (see 4.3.1).
(o) When visual examination other than as specified herein is required (see 4.4.1).
(p) When rejection and retest other than as specified herein is required (see 4.6).
(q) Level of preservation and packing (see 5.2).
(r) Special marking, when required (see 5.3.1 and 5.3.2).

6.2 Selection of chemical composition:

6.2.1 Steel grade designation numbers: While it is not common practice to specify to numerical designations indicating chemical composition, designations covering compositions (product analysis) commonly produced to this specification are shown in table II and may be used as a guide in procurement.

TABLE II. Chemical composition - cast or heat analysis; percent a/

UNS Number b/	SAE Number	Carbon	Manganese	Phosphorus (max.)	Sulfur (max.)
G10250	1025	0.22 to 0.28	0.30 to 0.60	0.040	0.050
G10300	1030	.27 to .34	.60 to .90	.040	.050
G10350	1035	.31 to .38	.60 to .90	.040	.050
G10450	1045	.42 to .50	.60 to .90	.040	.050
G10500	1050	.47 to .55	.60 to .90	.040	.050
G10550	1055	.52 to .60	.60 to .90	.040	.050
G10650	1065	.59 to .70	.60 to .90	.040	.050
G10740	1074	.69 to .80	.50 to .80	.040	.050
G10800	1080	.74 to .88	.60 to .90	.040	.050
G10840	1084	.80 to .94	.60 to .90	.040	.050
G10850	1085	.80 to .94	.70 to 1.00	.040	.050
G10860	1086	.80 to .94	.30 to 0.50	.040	.050
G10950	1095	.90 to 1.04	.30 to .50	.040	.050

a/ When silicon is required, the following ranges and limits are commonly used:

	Per Cent
1025	0.10 max., 0.10-0.25 or 0.15-0.30
Over 1025	0.10-0.25 or 0.15-0.30

b/ See 6.4.