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INTERNATIONAL
400 Commonwealth Drive, Warrendale, PA 15096-0001

AEROSPACE MATERIAL SPECIFICATION

SAE AMS-S-8559

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Submitted for recognition as an American National Standard

Steel Bars, Carbon, AISI (1095), Aircraft Quality

NOTICE

This document has been taken directly from U.S. Military Specification MIL-S-8559A, Amendment 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 MIL-S-8559A, Amendment 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 technical report.

1. SCOPE:

1.1 Scope:

This specification covers carbon steel (1095) bars.

1.2 Classification:

Bars shall be furnished in one grade only, and in one of the following physical and surface conditions, as specified (see 6.2):

Physical conditions:

(a) As forged
(b) As rolled
(c) Spheroidized

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1.2 (Continued):

Surface conditions:

1. Black as forged or rolled
2. Pickled or blast cleaned
3. Rough turned
4. Cold rolled or cold drawn
5. Surface ground

1.2.1 Unless otherwise specified, bars 1 inch and less in diameter or thickness shall be furnished in condition (C) (4), and bars over 1 inch in diameter or thickness shall be furnished in condition (C) (2) (see 6.2).

2. APPLICABLE DOCUMENTS:

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

2.1 SAE Publications:

Available from SAE, 400 Commonwealth Drive, Warrendale, PA 15096-0001.

AMS 2301 Aircraft Quality Steel Cleanliness-Magnetic Particle Inspection Procedure

2.2 U.S. Government Publications:

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

P-D-680	Dry Cleaning Solvent
PPP-B-621	Boxes, Wood, Nailed and Lock-Corner
PPP-C-650	Crates, Wood, Open and Covered
MIL-L-7870	Lubricating Oil, General Purpose, Low Temperature
MIL-C-11796	Corrosion Preventive Compound, Petrolatum, Hot Application
MIL-C-16173	Corrosion Preventive Compound, Solvent Cutback, Cold Application
FED-STD- 48	Tolerances for Steel and Iron Wrought Products
FED-STD-151	Metals; Test Methods
MIL-STD-163	Steel Mill Products, Preparation for Shipment and Storage
FED-STD-183	Continuous Identification Marking of Iron and Steel Products

2.3 ASTM Publications:

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

ASTM E 381-68 Rating Macroetched Steel

3. REQUIREMENTS:

3.1 Material:

The steel shall be of aircraft quality. The materials shall be magnetically inspected in accordance with the procedures of AMS 2301, and shall not exceed the size and frequency rating limits indicated in the paragraph entitled “Disposition” of AMS 2301 (see 4.8).

3.2 Manufacturing process:

The steel shall be manufactured using an acceptable process for aircraft quality, unless a specific process is specified in the contract or order.

3.2.1 Sufficient discard shall be taken from each ingot to ensure freedom from piping and undue segregation.

3.3 Chemical composition:

The chemical composition shall be as specified in table I.

TABLE I. Chemical composition 3/

Element	Analysis (percent)	Check-analysis 1/ tolerance (percent)
Carbon	0.90 - 1.05	±0.03
Manganese	0.30 - 0.50	±0.03
Phosphorus	0.040 (max) 2/	±0.008
Sulfur	0.050 (max)	±0.008

1/ The average of all the separate determinations made shall be within the limits specified in the “Analysis” column. Individual determinations may vary to the extent shown in the “Tolerance” column, except that the several determinations of a single element in any one heat shall not vary both above and below the specified range.

2/ Maximum of 0.05 permitted when acid steel is specified.

3/ When Silicon is required, the following range shall be specified, 0.15/0.35.

3.4 Hardness limits for condition (C):

Material furnished in condition (C) shall have a maximum hardness of Brinell 207 (Rockwell B-95). The hardness of material in condition (C) (4) shall not exceed Brinell 229.

3.5 Grain size:

The grain size shall be predominantly No. 5 or finer, with grains as large as No. 3 permissible.

3.6 Macrostructure:

Visual examination of deep-acid etched reforging stock in sizes up to and including 36 square inches shall be equal to or better than S2R1C2; sizes over 36 to and including 100 square inches shall be equal to or better than S2R2C3 per ASTM E 381.

3.7 Tolerance:

3.7.1 Diameter or thickness: The permissible variation in dimensions of the bars shall be as shown on FED-STD-48, except that when intended for reforging purposes, the requirements of FED-STD-48 are waived.

3.8 Lengths:

3.8.1 Exact lengths: Bars may be ordered to exact lengths or in lengths expressed as a multiple of a definite unit, with tolerances as specified in the contract or order.

3.8.2 Mill lengths: When exact or multiple lengths are not ordered, bars will be accepted in mill lengths of 6 to 20 feet, but not more than 10 percent of any order shall be furnished in lengths shorter than 10 feet.

3.9 Identification of product:

When specified or for direct shipments to the Government, each bar 1/2 inch or more in diameter or 3/8 inch or greater in width, shall be legibly marked throughout its length with a row of continuously recurring symbols in accordance with FED-STD-183. The symbols shall be applied with a marking fluid which is not affected by the solvents used in MIL-C-11796, class 1; MIL-C-16173, grade 1; water, or solvent conforming to P-D-680. The gap between recurring legends shall not exceed 2 feet. The marking used shall not rub off or be smeared by contact incident to normal handling during shipment or storage. The following information shall be included:

MIL-S-8559
Condition
Manufacturer's name or trademark

3.9.1 Cold finished bars: All bars smaller than 1/2 inch in diameter or 3/8 inch in width of flat shall be bundled and tagged at each end with the information listed in 3.9, using an oilproof tag, with an extra tag included in the bundle.

3.9.2 Hot rolled bars: Hot rolled bars, 1 inch and over in diameter or width and with the surface conditions indicated in the specification, shall be marked with the specification number on or near each end of the bar. Hot rolled bars under 1 inch shall be bundled. Bundles should be tagged at each end and an extra tag included in the bundle.

3.10 Workmanship:

Bars shall be sound, commercially straight, of uniform quality and condition, free from pipes, laps, cracks, twists, seams, damaged ends, or other injurious defects, and shall have a smooth finish of the best quality. Bars shall be commercially machinable and shall be capable of taking a good finish.

3.10.1 Condition (4) bars shall be free from scale or other surface imperfections.

4. QUALITY ASSURANCE PROVISIONS:

4.1 Responsibility for inspection:

Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any other commercial laboratory acceptable to 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 supplies and services conform to prescribed requirements.

4.2 Classification of inspection:

The examination and testing of the steel shall be classified as quality conformance inspection.

4.3 Examinations:

4.3.1 Examination of product: Each bar shall be carefully examined to determine conformance with this specification with respect to tolerances, identification, workmanship, surface condition, and dimensions.

4.3.2 Preservation, packaging, and packing: Preparation for delivery shall be examined for conformance to section 5.

4.4 Chemical analysis:

4.4.1 Sampling: One or more samples for chemical analysis shall be selected in accordance with FED-STD-151 to represent each heat of steel. The sample shall consist of not less than 2 ounces.

4.4.1.1 Location: Samples for chemical analysis shall be taken parallel to the axis of the bar selected, at an area midway between the center and surface, except that material less than 1-1/4 inches thick shall be sampled through the entire cross section.

4.4.1.2 Waiver: Samples for chemical analysis may be waived provided that all of the material under inspection can be identified as being made from a heat previously analyzed and found to be in conformance with the chemical composition specified herein.

4.4.1.3 Unidentified material: Where the material is not identified in accordance with 3.9 by the producer, or the identity of any portion of the shipment is obscure in any respect, sampling shall be in accordance with table II.

TABLE II. Sampling.

Lot size	Sample Size	Acceptance No.
1 to 7	All	0
8 to 40	7	0
41 to 110	15	1
111 to 180	25	2
181 to 301	35	3
Over 301	50	4

:

4.4.2 Test methods: Samples shall be prepared in accordance with FED-STD-151, and shall be tested by wet chemical, spectrographic, or other analytical methods. In the event of dispute, analysis shall be by wet chemical methods.

4.5 Hardness limits for condition (C):

4.5.1 Sampling: Sampling shall be in accordance with table II.

4.5.2 Preparation of specimen: Hardness test specimens shall conform to FED-STD-151.

4.5.3 Method: Hardness tests shall be conducted in accordance with FED-STD-151.

4.6 Grain size determination:

4.6.1 Sampling: One or more representative samples from each heat in the shipment shall be selected for the determination of grain size.

4.6.2 Method: Specimens shall be sectioned and polished to appropriate fineness by metallographic methods and suitably etched to reveal the grain structure. The austenitic grain size shall be determined by Procedure C or D of FED-STD-151.