

MIL-S-7720A
25 October 1967

Superseding
MIL-S-7720
26 June 1951

MILITARY SPECIFICATION

STEEL, CORROSION-RESISTANT (18-8) BARS, WIRE AND FORGING STOCK (AIRCRAFT QUALITY)

This specification is mandatory for
use by all departments and agencies
of the Department of Defense.

1. SCOPE

- * 1.1 Scope - This specification covers the requirements for compositions of corrosion-resistant (18-8) steel bars, rods, wire and forging stock.
- * 1.2 Classification - Material shall be furnished in the following compositions and conditions, as specified (see 6.2):

Composition: (see Table I)

302

316

Physical Conditions:

- (A) Heat-treated (annealed)
- (B) Cold finished
- (C) Hot rolled or forged only

Surface Conditions:

- (a) Scale not removed (hot finished)
- (b) Pickled, blast cleaned or otherwise descaled
- (c) Cold drawn
- (d) Cold rolled
- (e) Turned
- (f) Centerless ground
- (g) Polished

FSC 9510

* 2 APPLICABLE DOCUMENTS

2.1 The following documents, 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:

STANDARDS

Federal

Federal Test Method
STD. No. 151

Metals, Test Methods

Fed. Std. No. 183

Continuous Identification
Marking of Iron and Steel
Products

QQ-S-764

Steel Bar, Corrosion Resisting,
Free Machining

Military

MIL-STD-129

Marking for Shipment and
Storage

MIL-STD-163

Steel Mill Products,
Preparation for Shipment and
Storage

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications - The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply

Society of Automotive Engineers, Inc.

AMS 2241

Tolerances - Corrosion and Heat
Resistant Steel Bars and Wire

(
(
(Copies of aerospace materials specifications are available from the Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York, New York 10017.)

3. REQUIREMENTS

3.1 Material - The steel shall be manufactured by the electric-furnace process. Sufficient discard shall be taken from each ingot to insure freedom from injurious piping and undue segregation.

3.2 Chemical composition - The chemical composition shall conform to the compositions of Table I, as specified (see 6.2)

3.3 Mechanical properties - The mechanical properties shall be as specified by Table II.

* 3.4 Condition - Carbides shall be dispersed and shall not form continuous networks in the structures of materials in physical conditions A and B. The carbide dispersion need not be ascertained in materials in condition C.

3.5 Macrostructure - Visual examination of deep acid etched material shall show no evidence of abnormal segregation, pipes, cracks, seams, or abnormal change in structure from the surface to the center.

* 3.6 Tolerances - Variations from nominal dimensions shall be within the permissible limits of AMS 2241.

3.7 Length -

3.7.1 Exact lengths - When bars of any size are ordered to exact lengths or in lengths expressed as a multiple of a definite unit, the length tolerances shall be as specified in the contract or purchase order

3.7.2 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.

* 3.8 Identification of product - When specified or for direct shipment to the Government, each piece shall be identified in accordance with FED. STD No. 183, and the markings shall include the number of the heat of metal, the composition designator, condition, and designation of this specification

3.9 Material smaller than 1/2 inch in diameter or 3/8 inch in width of flat, shall be banded and tagged at each end with an extra tag included in the bundle.

TABLE I *
Chemical Composition

Designation Composition	302	316
Element	Composition Limits	Check Analysis Tolerance 1/
	Percent	Percent
Carbon	0.12 (max)	+0.01
Manganese	2.0 (max)	+0.04
Phosphorus	0.04 (max)	+0.005
Sulfur	0.03 (max)	+0.005
Chromium	17.0 - 19.0	±0.20
Nickel	8.0 - 10.0	±0.15
Silicon	1.0 (max)	+0.05
Copper 2/	0.50 (max)	+0.03
Molybdenum	---	---
	Percent	Percent
	Composition Limits	Check Analysis Tolerance 1/
	Percent	Percent
Carbon	0.08 (max)	+0.01
Manganese	2.0 (max)	+0.04
Phosphorus	0.04 (max)	+0.005
Sulfur	0.03 (max)	+0.005
Chromium	16.0 - 18.0	±0.20
Nickel	10.0 - 14.0	±0.15
Silicon	1.0 (max)	+0.05
Copper 2/	0.50 (max)	+0.03
Molybdenum	1.75 - 3.00	±0.10

1/ Individual determinations may vary from the specified range to the extent indicated in the check analysis column, except that an element in any-single heat shall not vary both above and below the specified range.

2/ Analysis for copper is ordinarily not required.

TABLE II *

Mechanical Properties

302 Condition	Yield Strength at 0.02 Percent Set or at							
	Diameter or Thickness	Tensile Strength (min)	Extension Indicated		Elongation in 2 Inches (min)	Reduction of Area (min)		
			(min)	Under Load				
							psi	Inches per 2 Inches
Inches	psi				Percent	Percent		
(A)	All sizes	100,000	---	---	35	50		
(B)	Up to 3/4 incl	125,000	100,000	0.0114	12	35		
(B)	Over 3/4 to 1	115,000	80,000	0.0099	15	35		
(B)	Over 1 to 1-1/4 incl	105,000	65,000	0.0088	25	45		
(B)	Over 1-1/4 to 1-1/2 incl	100,000	50,000	0.0077	28	45		
(B)	Over 1-1/2 to 3 incl	95,000	45,000	0.0073	30	45		
(B)	Over 3	80,000	35,000	0.0066	30	45		
(C)	All Sizes							
	Mechanical properties not specified.							
316 Condition								
(B)	3/4 and less	110,000	95,000		15	45		
(B)	Over 3/4 to 1 incl	100,000	80,000		20	45		
(B)	Over 1 to 1-1/4 incl	95,000	65,000		25	45		
(B)	Over 1-1/4 to 1-1/2	90,000	50,000		30	45		
(B)	Over 1-1/2	85,000	40,000		30	45		

1/ Maximum. For materials in physical condition A and surface conditions (c) through (g) incl., or annealed material in straightened and cut lengths, a maximum tensile strength of 125,000 psi is permissible for sizes under 1/4 inch in thickness and 115,000 psi for sizes 1/4 inch and larger.

- * 3.10 Workmanship - Material shall be sound, of uniform quality and condition, free from pipes, laps, cracks, twists, seams, or other defects detrimental to the performance of parts fabricated from the material.

- * 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 inspection - Inspection of the steel is classified as quality conformance inspection (see 4.3 through 4.8).

- * 4.3 Examinations -

- * 4.3.1 Sampling for Examination of Dimensions, Finish, Workmanship, Packaging, and Identification Marking - Units of product shall be randomly selected in accordance with Table III to represent each lot of material of one heat, the same nominal dimensions, and offered for acceptance at one time.

TABLE III *

Sampling for Examination of Product

Lot Size	Sample Size	Acceptance No.
1 to 110	5	0
111 to 500	7	0
501 to 800	10	0
801 to 1200	15	0
Over 1200	25	0

- * 4.3.2 Examination of Preparation for Delivery - Preparation for delivery shall be examined for conformance to Section 5.

- 4.4 Chemical Analysis -

* 4.4.1 Sampling - When products are identified as specified in 3.9, and the heats represented have been analyzed by the manufacturer and are in conformance with specified composition limits, the manufacturer's ladle analysis is acceptable.

* 4.4.2 Test method - Chemical analysis shall be made in accordance with standard wet chemical methods, spectrochemical, or other analytical methods of Fed. Test Method Std. No. 151. In the event of dispute, analysis shall be by wet chemical methods.

4.5 Tensile test - (Not applicable to materials in physical condition C.)

4.5.1 Sampling - One or more tensile-test samples shall be selected from bars or wire produced under the same processing conditions, from the same heat, of the same physical condition, of the same size, essentially uniform in all respects, and submitted for acceptance at one time.

4.5.2 Test method - Specimens shall be tested in accordance with method 211.1 of Fed. Test Method Std. No. 151.

4.6 Metallographic structure -

4.6.1 Sampling - One sample shall be selected to represent products from one heat, of the same shape, nominal dimensions, of the same heat treatment, and presented for acceptance at one time.

* 4.6.2 Microstructure - (Not applicable to materials in physical condition C.) A cross-section of convenient size shall be polished and etched for examination at 300/600 diameters magnification with particular attention paid to the carbide structure for condition 3.4.

* 4.6.3 Macrostructure - A face representing an entire cross-section of bar, wire or billet shall be ground or otherwise suitably prepared to a suitable smooth, flat surface. The specimen shall be prepared in accordance with method 321.1 of Fed. Test Method Std. No. 151 to determine conformity to 3.5.

* 4.7 Additional testing - The frequency of sampling specified above is based on the assumption that the material is produced from ingots from the same heat and is essentially homogeneous in all respects. If the material is taken from stock and is not identifiable as to heat and method of manufacture, or if the identity of any portion of the shipment is obscure in any respect, additional samples and tests for each lot and size, shall be required to determine conformance of all portions of the shipment to this specification.

- * 4.8 Rejection and retest - Failure of a specimen to meet the test requirements shall be cause for rejection of the lot. At the discretion of the procuring activity, retest will be permitted. A retest sample of five specimens shall be tested to replace each failed specimen of the original sample. If one of the retest specimens fail, the lot shall be rejected with no further retesting permitted.

- * 5. PREPARATION FOR DELIVERY

- 5.1 Preservation, packaging, and packing - (see 6.2).

- * 5.1.1 Level A - The material shall be properly separated by composition, conditions, and size when prepared for delivery. The bars and forging stock shall be preserved and packaged in accordance with MIL-STD-163.

- * 5.1.2 Level C - Materials shall be prepared for delivery in accordance with commercial practice.

- * 5.2 Marking of shipments - Marking and labeling shall be in accordance with MIL-STD-129.

- 6. NOTES

- 6.1 Intended use - The material covered by this specification is intended for use in the fabrication of aircraft parts where a corrosion-resistant steel is required.

- 6.1.1 Material in condition (A) may be used where an austenitic steel, having a low magnetic permeability, is desired.

- 6.1.2 The physical properties indicated herein for material in condition (B) are obtained by cold working (strain hardening) and not by heat treatment. Therefore, the material should not be heated to temperature which adversely affect the physical properties or corrosion resistance before, during, or after fabrication. However, the electric spot welding process may be used in the fabrication of the material.

- 6.2 Ordering data - Procurement documents should specify:

- (a) Title, number, and date of this specification.
 - * (b) Composition, conditions, size and shapes required (see 1.2 and 3.1).
 - (c) Exact lengths and length tolerances, if mill lengths are not acceptable.
 - * (d) Levels of preservation, packaging, and packing (see 5.1).

6.2.1 When bars are intended for reforging purposes, it should be so stated.

* 6.2.2 The composition designations have been changed as follows:

New Designation Composition	Old Designation Composition	Characteristic
302	G	General Purpose
316	MCR	Superior Corrosion Resistance

6.2.2.1 Materials formerly procureable as compositions FMS and FMS_e may be procured as compositions 303 and 303Se, respectively of Specification QQ-S-764.

Custodians:

Navy - AS
Air Force - 11
Army - MR

Preparing Activity:

Navy - AS

Review Activities:

Air Force - 85, 82

Project No. 9510-0073

User Activities:

Navy - 5R

Civilian Agencies
Interest

NSA

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DEPARTMENT OF THE NAVY

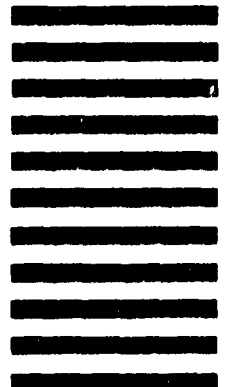


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1 DOCUMENT NUMBER

2 DOCUMENT TITLE

3a NAME OF SUBMITTING ORGANIZATION

4 TYPE OF ORGANIZATION (Mark one)

☐ VENDOR

☐ USER

☐ MANUFACTURER

☐ OTHER (Specify)

5 PROBLEM AREAS

a. Paragraph Number and Wording

b. Recommended Wording

c. Reason/Rationale for Recommendation

6 REMARKS

7a NAME OF SUBMITTER (Last, First, MI) Optional

b. WORK TELEPHONE NUMBER (Include Area Code) - Optional

c. MAILING ADDRESS (Street, City, State, ZIP Code) Optional

8 DATE OF SUBMISSION (Y1MMDD)

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