

MIL-T-5066B
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Superseding
MIL-T-5066A
3 January 1951

MILITARY SPECIFICATION

TUBING, CARBON STEEL (1025), SEAMLESS AND WELDED (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 carbon steel (1025) tubing of aircraft quality.

1.2 Classification. -

1.2.1 Type. - Tubing shall be one of the following types as specified (see 6.2):

Type I - Welded
Type II - Seamless

1.2.2 Physical condition. - Unless otherwise specified, tubing shall be of the following physical conditions (see 6.2):

(A) As welded
(B) Normalized
(C) Cold drawn and stress relieved

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:

SPECIFICATIONS

Military

MIL-I-6868
MIL-C-22235

Inspection Process, Magnetic Particle
Corrosion Preventive Oil, Nonstaining

FSC 4710

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STANDARDSFederal

FED. TEST METHOD

STD. NO. 151

Metals; Test Methods

FED. STD. NO. 183

Continuous Identification Marking of
Iron and Steel ProductsMilitary

MIL-STD-163

Steel Mill Products, Preparation for
Shipment and Storage

MS33532

Square and Rectangular Tubing - Carbon
Steel and Alloy Steel .35 Carbon,
Maximum

MS33534

Standard Dimensions for Streamlined and
Oval Tubular Shapes

AND10102

Tubing - Standard Dimensions for Round
Alloy Steel

(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 documents form 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 (Aerospace Material Specifications)AMS 2301 Aircraft Quality Steel Cleanliness Magnetic
Particle Inspection Procedure

AMS 2253 Tolerances, Carbon and Alloy Steel Tubing

AMS 2640 Magnetic Particle Inspection

(Copies of SAE publications may be obtained from the Society of Automotive Engineers, Inc., 485 Lexington Avenue, New York, N.Y. 10017.)

3. REQUIREMENTS

3.1 Material. - The tubing shall be of aircraft quality. The material 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 4.4).

3.1.1 Welded tubing. - Welded tubing shall be made from flat rolled steel by a continuous welding process.

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3.2 Test data. - Test data shall be submitted in accordance with 4.1.1.

3.3 Chemical composition. - The chemical composition of the steel shall be as specified in table I.

Table I. Chemical composition 1/

Element	Composition limits (percent)	Check analysis tolerance (percent)
Carbon	0.22 - 0.28	+ 0.02
Manganese	.30 - 0.60	+ .03
Phosphorous	.025 (max)	+ .008
Sulfur	.025 (max)	+ .008

1/ The average of all separate determinations shall be within the limits specified in the composition column. Individual determinations may vary to the extent shown by the tolerance column, except that several determinations of a single element in the samples from a single inspection lot shall not vary both above and below the specified range.

3.4 Mechanical properties. - The mechanical properties of the tubing as received shall conform to the requirements of table II.

Table II. Mechanical properties

Tensile strength (minimum)	Yield strength at 0.2 percent offset or at extension indicated		Elongation in 2 inches	
	Minimum	Extension under load	Full tube (minimum)	Strip (minimum)
PSI	PSI	Inch in 2 inches	Percent	Percent
55,000	36,000	0.0064	<u>1/</u> 22	<u>1/</u> 13

1/ For each 2,000 pounds per square inch in excess of 55,000 pounds per square inch tensile strength, a reduction in elongation of 1 percent to a minimum elongation as follows will be allowed: full tube specimen - 10 percent; strip specimen - 8 percent.

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3.4.1 The tubing shall be capable of developing the properties specified in table II when normalized by heating to 1625° to 1675° F and cooling in still air.

3.4.2 Crushing. - Welded tubing shall withstand crushing without cracking or indicating any defect in the weld when subjected to the crushing test (see 4.8)

3.5 Dimensions. - The dimensions of round tubing shall conform to the standard dimensions shown on AND10102. The dimensions for streamline and oval tubing shall be as specified in MS33534. The dimensions for rectangular or square tubing shall be as specified in the contract or purchase order.

3.6 Length. -

3.6.1 Exact lengths. - Tubing may be ordered to exact lengths or as a multiple of a definite unit, with tolerances as specified in the contract or order.

3.6.2 Mill lengths. - When exact or multiple lengths are not specified (see 6.2), tubing will be accepted in mill lengths of 5 to 20 feet, but not more than 10 percent of any order will be accepted in lengths of less than 12 feet.

3.7 Tolerances: -

3.7.1 Round tubing. - The permissible variations in dimensions shall conform to AMS 2253.

3.7.2 Shapes other than round. - The permissible variations in dimensions of tubing other than round shall be as shown on MS33532.

3.8 Identification of product. - Each length of tube 1/2-inch O.D. and over shall be marked in accordance with FED. STD. NO. 183, and in addition, shall include the type and number of this specification. Secured lifts, bundles, and containers of sizes not required to be marked shall be tagged in two places with the required identification markings.

3.9 Workmanship. - The tubing shall have a finish conforming to the best practice for aircraft quality material. It shall be smooth, clean, and free from heavy scale or oxide on the interior and exterior surfaces, and shall be free from burrs, tears, grooves, laminations, slivers, pits, and other injurious defects. Surface imperfections, such as handling marks, straightening marks, light mandrel and die marks, shallow pits, and scale pattern will not be considered as injurious defects, provided the imperfections are removable within the tolerances specified for diameter and wall thickness. The removal of surface imperfections is not required. Discontinuities in excess of those permitted by 3.8.1 which cannot be removed shall be cause for rejection.

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3.9.1 Weld.- The weld shall not contain defects greater than 1/16-inch long or depths greater than one-half the wall thickness. The welded tubing may be pickled or otherwise cleaned, if necessary, to meet surface conditions specified herein.

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 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.

4.1.1 Test report. - The material supplier shall furnish with each shipment a report of the results of the tests for chemical composition, magnetic particle inspection rating, deep acid etch, and hardenability of each heat in the shipment. This report shall also include:

- (a) Purchase order number
- (b) Heat number
- (c) Material specification number
- (d) Size
- (e) Quantity from heat
- (f) If forgings are supplied:
 - (1) Part number
 - (2) Size of stock used to make forgings
 - (3) Physically marked with heat number
 - (4) Forging serial number

4.2 Classification of inspections. - All the examinations and tests specified herein for the testing of tubing are classified as quality conformance inspections.

4.3 Lot. - A lot shall consist of tubing produced from the same heat, which is essentially homogeneous in all respects, in the same condition, of the same type, size, and wall thickness offered for delivery at the same time.

4.4 Examination of product. - Each length of tubing shall be visually examined for compliance with surface condition and workmanship requirements. Samples selected in accordance with table III shall be examined to assure compliance with the specified dimensions and tolerances, identification marking, and preparation for delivery requirements.

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Table III. Sampling plan

Lot size	Sample size	Acceptance number rejectable
1 to 15	All	0
16 to 180	15	0
181 to 300	35	0
301 to 500	50	1
Over 500	75	2

4.5 Magnetic inspection. - Specimens shall be selected and rated in accordance with the procedures of AMS 2301. Inspection shall be in accordance with MIL-I-6868 or AMS 2640.

4.6 Chemical analysis. -

4.6.1 Sampling. - At least one sample, consisting of not less than 2 ounces, shall be selected for check chemical analysis in accordance with Method 111 or Method 112 of Fed. Test Method Std. No. 151.

4.6.2 Method. - Specimens shall be prepared in accordance with Method 111 or Method 112 of Fed. Test Method Std. No. 151 and analysis made by wet chemical, spectrochemical, or other analytic methods. In the event of dispute, analysis shall be by wet chemical methods.

4.6.3 Waiver. - Samples for check of chemical analysis may be waived provided that all of the material in the lot can be identified as being made from a heat previously analyzed and found to conform to the chemical composition specified herein.

4.7 Mechanical properties. -

4.7.1 Sampling. - At least one sample shall be selected from each 1,000 feet or less of tubing from each lot for determination of mechanical properties.

4.7.2 Preparation of specimens. - Tension test specimens shall consist of full sections of tubing whenever practicable. When not practicable, specimens conforming to types T1 and T2 of Method 211, Fed. Test Method Std. No. 151 shall be used, and when the tubing is welded, the test section shall include the weld.

4.7.3 Method. - Tension tests and determination of yield strength and elongation shall be conducted in accordance with Method 211 of Fed. Test Method Std. No. 151.

4.8 Crushing test (welded tubing only). -

4.8.1 Sampling. - One or more samples, consisting of full sections of tubing and of a length equal to or greater than 1-1/2 times the diameter of the tubing, shall be selected from each 1,000 feet or less of tubing from each lot.

4.8.2 Preparation of specimens. - The ends shall be machined normal to the longitudinal axis of the specimen.

4.8.3 Method. - Specimens shall be subjected to a gradually applied axial compressive loading until the cross-sectional dimension is increased in one zone by 25 percent, until one complete fold is formed, or until the specimen is reduced in length to two-thirds the original length.

4.9 Rejection and retest. - If any specimen fails to conform to the requirements of this specification, it shall be cause for rejection of the material represented by the specimen subject to the retest provisions of Fed. Test Method Std. No. 151, except that five specimens shall be selected for retest.

4.10 Preservation, packaging, packing, and marking. - Preparation for delivery shall be inspected for conformance to section 5.

5. PREPARATION FOR DELIVERY

5.1 Preservation, packaging, and packing. - Tubing shall be properly separated by type, size, and condition when prepared for delivery. Unless otherwise specified, tubing shall be prepared for shipment in accordance with level C of MIL-STD-163, using preservative conforming to MIL-C-22235 for coating all surfaces of the tubing. (See 6.2)

5.2 Marking of shipment. - Marking of shipments shall be in accordance with MIL-STD-163.

6. NOTES

6.1 Intended use. - The material covered by this specification is intended for use in the manufacture of miscellaneous aircraft parts not requiring the use of high-strength material.

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6.2 Ordering data. - Procurement documents should specify:

- (a) Title, number, and date of this specification.
- (b) Type and condition (see 1.2).
- (c) Dimensions (see 3.4).
- (d) The exact length, when random lengths are not desired (see 3.5.1).
- (e) Shape, if other than round tubing is desired (see 3.6.2).
- (f) Level of preservation, packaging, and packing (see 5.1).

6.2.1 It should be noted that the tolerances applicable to welded and cold-drawn and stress-relieved tubing are not equivalent.

Custodians:

Army - MR
Navy - AS
Air Force - 11

Preparing activity:

Air Force - 11

Project No. 4710-0120

Reviewer activities:

Army - MR
Navy - AS
Air Force - 11, 69

SPECIFICATION ANALYSIS SHEET

Form Approved Budget
Bureau No. 119-104

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity.

SPECIFICATION MIL-T-5066B Tubing, Carbon, Steel (1025) etc., Aircraft Quality

ORGANIZATION

CITY AND STATE

CONTRACT NO.

QUANTITY OF ITEMS PROCURED

DOLLAR AMOUNT

\$

MATERIAL PROCURED UNDER A

 Direct Government Contract Subcontract

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID.

3. IS THE SPECIFICATION RESTRICTIVE?

 YES NO

IF "YES", IN WHAT WAY?

4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity.)

SUBMITTED BY (Printed or typed name and activity)

DATE