MIL-T-5695D
3 July 1973

SUPERSEDING
MIL-T-5695C(ASG)
9 May 1966

MILITARY SPECIFICATION

TUBING, STEEL, CORROSION-RESISTANT (304), COLD DRAWN

This specification has been approved by the Department of the Air Force and by the Naval Air Systems Command.

1. SCOPE

1.1 Scope. This specification covers seamless or welded and drawn tubing of corrosion-resistant steel in the cold drawn condition.

1.2 Classification. Tubing covered by this specification shall be of the following types and physical conditions, as specified (see 6.2):

Manufacturing process

Type I - Seamless
Type II - Welded

Physical condition

1/4 H - Cold drawn
1/2 H - Cold drawn

* 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

Fed. Test Method Std. No. 151	Metal; Test Methods
FED-STD-183	Continuous Identification Marking of Iron and Steel Products.

Military

MIL-STD-105	Sampling Procedures and Tables for Inspection by Attributes
MIL-STD-129	Marking for Shipment and Storage
MIL-STD-163	Steel Mill Products, Preparation for Shipment and Storage
MIL-STD-753	Corrosion-Resistant Steel Parts, Sampling Inspection and Testing for Surface Passivation
MS-33532	Square and Rectangular Tubing-Carbon Steel and Alloy Steel .35 Carbon, Maximum
MS-33533	Tolerances-Seamless Corrosion-Resistant Steel Tubing Round
MS-33534	Standard Dimensions for Streamline and Oval Tubular Shapes

(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.

American Society for Testing and Materials (ASTM)

E 8 Methods of Tension Testing of Metallic Materials

(Application for copies should be directed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pa. 19103.)

(Technical society and technical association specifications and standards are generally available for reference from libraries. They are also distributed among technical groups and using Federal agencies.)

3. REQUIREMENTS

3.1 Materials. The grade of austenitic stainless or corrosion-resistant steel shall be manufactured by the electric-furnace process. Sufficient discard shall be taken from each ingot to insure freedom from injurious piping or undue segregation.

3.1.1 Chemical composition. The chemical composition shall conform to table I.

3.2 Surface treatment. The interior and exterior surfaces shall be pickled, bright as drawn, or treated by other methods producing equally satisfactory surface condition, which do not affect the wall thickness or corrosion resistance of the material. Surface treatments other than pickling shall be followed by a passivation treatment.

Table I. Chemical composition

Element	Limits, percent	Check analysis tolerance percent 1/
Carbon	0.08 (max)	+0.01
Manganese	2.00 (max)	+ .04
Phosphorous	.04 (max)	+ .005
Sulfur	.03 (max)	+ .005
Silicon	.75 (max)	+ .05
Nickel	8.00 - 11.00	± .15
Chromium	18.00 - 20.00	± .20
Copper	0.70 (max)	+ .03
Molybdenum	0.70 (max)	+ .05
Iron	Remainder	---

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

3.3 Mechanical properties. The mechanical properties of the tubing shall conform to table II.

Table II. Mechanical properties.

Condition	Tensile strength psi (min)	Yield strength at 0.2 percent offset, psi (min)	Elongation in 2 inches percent (min)	
			Full tube	Strip
1/4 H, 5/16 OD and less	120,000	75,000	12	10
Over 5/16 OD	120,000	75,000	15	12
1/2 H, all sizes	150,000	110,000	7	5

3.4 Standard sizes.

3.4.1 Round tubing. Round tubing shall be furnished in diameter and wall thickness as specified by contract or purchase order.

3.4.2 Streamline and oval shapes. Tubing shall be furnished in size and wall thickness as specified by contract or purchase order. Cross-sectional shapes shall conform to the standard proportions of MS-33534.

3.4.3 Length of tubing.

3.4.3.1 Exact lengths. Tubing of all sizes may be ordered to exact lengths or in lengths as a multiple of a definite unit.

3.4.3.2 Mill lengths. When exact or multiple lengths are not specified, tubing will be accepted in mill lengths of 5 to 24 feet, but not more than 10 percent of any order shall be furnished in lengths shorter than 12 feet.

3.5 Tolerances.

★ 3.5.1 Round welded tubing. Permissible variations from nominal dimensions shall be as specified in MS-33533, except that the tolerances applicable to tubing 5/8 inch OD shall be applicable to tubing 5/8 inch and smaller.

3.5.2 Square and rectangular tubing. The permissible variation from nominal dimensions shall be as specified in MS-33532.

3.5.3 Round seamless tubing. The permissible variation from nominal dimensions shall be as specified in MS-33533.

3.5.4 Streamline and oval tubing. The permissible variation from nominal dimensions shall conform to the limits specified in MS-33534.

3.5.5 Straightness. In no portion of any piece of tubing shall the departure from straightness exceed 0.060 inch in a length of 3 feet, except that tubing 0.100 inch ID and less in the 1/2 H condition shall not depart from straightness more than 0.120 inch in any length of 3 feet.

3.5.6 Length. The permissible variation in the length of cut lengths of tubing shall be as follows:

Length	Permissible variation in length, inch	
	Over	Under
24 ft. and under	1/4	0
Over 24 ft. to 34 ft. incl.	5/16	0
Over 34 ft. 1/	5/16	0

1/ An additional tolerance of +1/16 inch is acceptable for each additional 10 ft. or fraction thereof.

3.6 Identification of product. All sizes of tubing shall be marked for identification in accordance with FED-STD-183. The following marking shall be included:

MIL-T-5695D
Welded or seamless (as appropriate)

* 3.6.1 In lieu of continuous marking, tubing less then 1/4 inch in diameter may be bundled and each bundle identified by metal tags impression-stamped with the above legend (see 3.6) and securely attached near each end of the bundle.

3.7 Workmanship. The surface of all tubing shall be smooth, clean, and free from burrs, seams, tears, grooves, laminations, slivers, pits, scale, carbonaceous residue, heat discoloration, or other injurious defects. Welded tubing shall contain no weld other than the longitudinal weld.

3.7.1 Surface condition. Surface imperfections such as handling marks, straightening marks, light mandrel and die or roll marks, shallow pits, and scale pattern will not be considered as injurious defects provided the imperfections are removable within the diameter and wall thickness tolerances specified herein. The removal of surface imperfections is not required.

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 in the contract or order, the supplier 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 supplies and services conform to prescribed requirements.

4.2 Lot. A lot shall consist of tubing of one size and wall thickness, from one heat of steel, and annealed in the same charge (batch anneal) or within one 4-hour period (continuous anneal).

4.3 Passivation. Surfaces shall be passive when tested in accordance with methods 102 and 103 of MIL-STD-753.

* 4.4 Examination of product.

4.4.1 Visual examination. Tubing shall be visually examined for compliance with surface condition and workmanship requirements.

4.4.2 Dimensional and identification marking examination. Samples selected in accordance with MIL-STD-105, Inspection Level II, AQL 1.5% shall be examined for compliance with nominal dimensions and identification marking requirements. The sample unit shall be one length of tubing. The lot size shall be the number of lengths of tubing in the lot.

4.4.3 Examination of preparation for delivery. Samples selected in accordance with MIL-STD-105, AQL 4.0, Inspection Level I, shall be examined for preparation for delivery in accordance with Section 5. The sample unit shall be one completed shipping unit (crate, bundle, pallet, etc.) ready for loading, except samples may be inspected before final sealing. The lot size shall be the number of shipping units (crates, bundles, pallets, etc.) in the lot.

4.5 Chemical analysis.

4.5.1 Sampling. A sample for chemical analysis shall be selected as specified in FTMS 151, to represent material produced under the same processing conditions, from the same heat of steel, and presented for acceptance at one time. The sample shall be free from dirt, grit, and other foreign matter, and shall consist of not less than 2 ounces of material. Broken tensile specimens may be used for obtaining samples. Samples shall be kept separate and analyzed individually.

4.5.1.1 Samples for chemical analysis may be waived at the discretion of the procuring activity 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.

4.5.1.2 The method of selecting samples specified above is based on the assumption that the material is produced from ingots from the same heat at one time 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, and if the identity of any portion of the shipment is obscure in any respect, the procuring activity shall select the necessary additional samples to determine conformance of all protions of the shipment to this specification.

4.5.2 Method. Analysis shall be by wet chemical, spectrochemical, or other analytic methods. In the event of dispute, analysis shall be by wet chemical methods.

4.6 Tensile test.

★ 4.6.1 Sampling. Sampling shall be in accordance with MIL-STD-105, AQL = 1.5 percent defective, Special Inspection Level S-4. The sample unit shall be one length of tubing.

* 4.6.2 Preparation of specimens. One specimen shall be cut from each piece of tubing comprising the sample and subjected to the tensile test. Tensile test specimens shall be prepared in accordance with ASTM E8.

* 4.6.3 Method. Tensile tests and determinations of yield strength and elongation shall be conducted in accordance with ASTM E8.

4.7 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 contractor or supplier, or both, 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. The preservation, packaging and packing shall be Level A or as specified, in accordance with MIL-STD-163.

5.2 Marking for shipment. Shipping containers shall be marked in accordance with MIL-STD-129.

6. NOTES

6.1 Intended use. The austenitic stainless steel tubing is intended for use in the fabrication of aircraft structural parts requiring a high degree of resistance to corrosion. It is not satisfactory for welding by process other than resistance welding. The tubing is not suitable for use in applications requiring flaring or sharp bends. All tubing defined by this specification shall be considered as critical item application and shall be procured accordingly, unless otherwise specified in the contract or order.

6.2 Ordering data. Procurement documents should specify:

(a) Title, number, and date of this specification.

(b) Type, shape, diameter, wall thickness, physical condition, and length (when exact lengths are required) (see 3.4.3).

(c) Level of packaging and packing (see 5.1).

* 6.3 Identification of changes. The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, deletions) from the previous issue were made. This was done as a convenience only and the Government assumes no liability whatsoever for any inaccuracies in these notations. Bidders and contractors are cautioned to evaluate the requirements of this specification based on the entire content irrespective of the marginal notations and relationship to the latest previous issue.

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