MIL-T-6737C
1 December 1982
SUPERSEDING
MIL-T-6737B
19 August 1969

MILITARY SPECIFICATION

TUBING, STEEL, CORROSION AND HEAT RESISTING (18 - 8 STABILIZED), WELDED

This specification is approved for use by all Departments and Agencies of the Department of Defense.

1. SCOPE

1.1 Scope. This specification prescribes the requirements for welded tubing of stabilized corrosion-resisting and heat-resisting steel in the annealed condition.

1.2 Classification. Tubing material shall conform to one of the chemical compositions as indicated by Table I. Unless otherwise specified (see 6.2.1), either composition may be supplied, except that all material supplied to an individual order shall be of one composition only.

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this specification to the extent specified herein.

STANDARDS

FEDERAL

FED-STD-151	-	Metals, Test Methods.
FED-STD-183	-	Continuous Identification Marking of Iron and Steel Products.

MILITARY

MIL-STD-129	-	Marking for Shipment and Storage.
MIL-STD-163	-	Steel Mill Products, Preparation for Shipment and Storage.

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Engineering Specifications and Standards Department (Code 93), Naval Air Engineering Center, Lakehurst, NJ 08733, by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL-STD-753	-	Corrosion-Resistant Steel Parts, Sampling, Inspection and Testing for Surface Passivation.
MIL-STD-1188	-	Industrial Packaging of Supplies and Equipment.
MS33531	-	Tolerance, Welded Corrosion-Resistant Steel Tubing.
MS33534	-	Standard Dimensions for Streamline and Oval Tubular Shapes.

(Copies of specifications, standards, drawings and publications required by manufacturers in connection with specific acquisition functions should be obtained from the contracting 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. The issues of the documents which are indicated as DoD adopted shall be the issue listed in the current DoDISS and the supplement thereto, if applicable.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM E 8 - Tension Testing of Metallic Materials.

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

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

2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, the text of this specification shall take precedence.

3. REQUIREMENTS

3.1 Materials. The steel shall be manufactured by the electric-furnace process and shall conform to this specification.

3.1.1 Chemical composition. The chemical composition shall conform to the composition limits specified in Table I.

3.2 Surface treatment. The interior and exterior surfaces shall be treated by pickling, bright annealing or other methods producing equally satisfactory surface condition and which does not affect the wall thickness or corrosion resistance of the material. Light belt polishing or buffing may be performed.

3.2.1 Passivation. Treatment of inner and outer surfaces by other than pickling shall be followed by a passivation treatment. The surfaces shall be passive to tests as specified in 4.8.

3.2.2 Resistance to corrosion. The tubing shall exhibit no evidence of intergranular attack or cracks when tested in accordance with 4.9.

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

3.3.1 Flattening. Tubing shall be capable of withstanding flattening at the conditions specified in 4.7.3, without cracking or indication of defects.

3.4 Dimensions and tolerances.

3.4.1 Shape, diameter and wall thickness. Tubing shall be furnished to shape, diameter and wall thickness as specified (see 6.2.1). Standard dimensions for streamline and oval shapes are given in MS33534.

3.4.2 Lengths. Unless otherwise specified, tubing shall be furnished in random lengths 5 to 24 feet, but not more than 10 percent of any order may be furnished in lengths shorter than 12 feet.

3.4.3 Tolerances. Tolerances shall conform to the acceptable limits of MS33531.

3.5 Identification of product.

3.5.1 Outside diameter.

3.5.1.1 1/4 inch or more. Tubing with an outside diameter 1/4 inch or more shall be marked in accordance with FED-STD-183, except that the following items shall be included in the legend:

MIL-T-6737C
Welded tubing
Composition designation (347 or 321, as appropriate)
Annealed tubing

3.5.1.2 Less than 1/4 inch. Tubing with an outside diameter less than 1/4 inch shall be continuously marked in accordance with 3.5.1.1 or securely bundled and tagged. The material in each bundle shall be identified by metal tags, impression stamped with the legend, and securely attached near each end of the bundle.

3.6 Rejectable defects. Tubes shall be uniform in quality and shall have a finish conforming to the best practice for high quality aircraft tubing. The surfaces of the tubing shall be smooth and free from heavy scale or oxide, burrs, seams, tears, grooves, laminations, slivers, pits, cracks and other imperfections. Tubes having discontinuities of depths which are not removable by grinding or buffing without reducing the diameter or wall thickness below dimensional tolerance limits are rejectable. Surfaces of tubing shall be free from contaminants removable by standard pickling procedures. Centerless grinding is not acceptable, unless otherwise approved by the acquisition activity.

3.7 Latent defects. When material, which has been inspected, tested and accepted, contains defects covered by this specification, subsequently exposed, the contractor may be required to replace the defective material without expense to the Government.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all in-

spection requirements as specified herein. Except as otherwise specified in the contract or purchase order, 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 supplies and services conform to prescribed requirements.

4.2 Classification of inspection. The inspection requirements specified herein are classified as quality conformance inspection. The quality conformance inspection of the stabilized corrosion and heat-resisting tubing shall consist of the examinations and tests specified in 4.4 through 4.9.2.

4.3 Inspection lot. A lot shall consist of one size and wall thickness from one heat of steel and annealed in the same charge (batch anneal) or all tubing of the same size and heat annealed at the same temperature, time and atmosphere, without interruption in a continuous furnace.

4.4 Examination of product. Each length of tubing shall be examined visually for compliance with 3.6. Samples selected in accordance with Table III shall be examined for conformance to dimensions and tolerances, identification marking and packaging.

4.5 Chemical analysis.

4.5.1 Sampling. A sample for chemical analysis shall be selected, as specified in Method 111 of FED-STD-151, to represent each heat in the shipment. The sample shall consist of not less than 2 ounces.

4.5.1.1 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 conform to the chemical composition specified herein.

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

4.6 Mechanical properties.

4.6.1 Sampling. Two samples shall be selected to represent each 2,500 feet of tubing of each lot up to 5,000 feet and two additional samples from each additional 5,000 feet of the lot.

4.6.2 Specimens. One specimen shall be cut from each piece of tubing comprising the sample. Specimens shall consist of a full section of tubing, when practicable, or may be machined to conform to the requirements of ASTM E 8.

4.6.3 Method. Specimens shall be tested as detailed in ASTM E 8.

4.7 Flattening.

4.7.1 Sampling. Unless otherwise specified, samples shall be selected in accordance with Table IV.

4.7.2 Specimens. A specimen shall be cut from each length of tubing comprising the sample. Specimens shall be full sections of tubing of a length not less than 1-1/2 times the diameter and in no case less than 2 inches.

4.7.3 Method. Specimens shall be flattened between parallel flat plates by a gradually applied load normal to the axis of the tubing, until the distance between the faces of the plate is equal to three times the wall thickness of the tubing. Specimens of tubing shall be so located that the weld will lie at the point of maximum bending.

4.8 Passivation.

4.8.1 Sampling. One sample shall be selected to represent each lot of tubing.

4.8.2 Method. Tests shall be in accordance with Method 102 or 103 of MIL-STD-753. The tests shall not result in any attack of the surface, either pitting or intergranular. Daily examination for this behavior shall be made using a microscopic method at a magnification of 20 diameters. If there are any indications of either pitting or intergranular attack, the conditions shall be verified by microscopically examining metallographic section through the questionable area at a magnification of 250 to 500 diameters.

4.9 Corrosion susceptibility (acidified copper sulfate test).

4.9.1 Sampling. Two specimens shall be selected from each lot of tubing.

4.9.2 Method. Specimens of the "as received" tubing (full sections whenever practicable) shall be held at 676.7°C (1250°F) for one hour, then immersed for a period of 24 hours in a boiling copper sulfate - sulfuric acid solution of the following formula:

Copper sulfate ($CuSO_4.5H_2O$)	10 g
Sulfuric acid (H_2SO_4 sp. gr. 1.84)	10 ml
Distilled water	90 ml

Specimens shall be covered with a minimum of 30 ml of this solution per square inch of specimen surface area. A reflux condenser or similar device shall be used to prevent change in concentration of the solution. After exposure, full section specimens shall be flattened between parallel plates by a gradually applied load normal to the axis of the tubing, until the distance between the pressure plates is not over four times the wall thickness. Sector specimens shall be subjected to reverse flattening. In the flattening of tubular specimens, any detectable weld zone shall be in the area of smaller bend radii. The folded areas shall be examined at a magnification of 20 diameters for evidence of intergranular attack.

4.10 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 this specimen subject to the retest and rejection provisions of FED-STD-151, except that five test specimens shall be selected for retest.

5. PACKAGING

5.1 Preservation and packing.

5.1.1 Level A or B. Preservation and packing shall be in accordance with MIL-STD-163 (see 6.2.1).

5.1.2 Industrial. Preservation and packing shall be in accordance with MIL-STD-1188 (see 6.2.1).

5.2 Marking.

5.2.1 Level A or B. Marking shall be in accordance with MIL-STD-129 (see 6.2.1).

5.2.2 Industrial. Marking shall be in accordance with MIL-STD-1188 (see 6.2.1).

5.2.3 Additional marking. In addition to the markings specified in 5.2.1 and 5.2.2, all shipments shall include following markings:

TUBING, STEEL, CORROSION AND HEAT RESISTING (18 - 8 STABILIZED), WELDED
MIL-T-6737C
Composition designation
Outside diameter
Wall thickness
National stock no. * (If no NSN is available, leave space therefor)
Contract or order no.
Quantity (aggregate length)
Manufacturer's name or trade-mark

*Information to be entered by the manufacturer.

6. NOTES

6.1 Intended use. Steel tubing covered by this specification is intended for use in applications which require a high degree of resistance to corrosion or to temperatures in the range of 426.7°C to 815.6°C (800° to 1,500°F) or in applications which involve welding and in which the presence of an inside flash is permissible. Exhaust stacks, manifolds, blast tubes and ring collectors of exhaust systems are examples of such applications. The tubing is not intended for use in fluid or pneumatic systems.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

a. Title, number and date of this specification.

b. Composition (type) desired (see 1.2).

c. Outside diameter, wall thickness and length (when exact lengths are required) (see 3.4.1 and 3.4.2).

d. Selection of applicable level of preservation and packing (see 5.1).

e. Selection of applicable level of marking (see 5.2).

6.3 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue, due to extensiveness of the changes.

Custodians:
Army - MR
Navy - AS
Air Force - 20

Review activities:
Army - EA, MI
Navy - OS, SH
Air Force - 99
DLA - CS

Preparing activity:
Navy - AS

(Project No. 4710-0537)

TABLE I. Chemical composition limits.

Element	Composition type designation		Check analysis tolerance over maximum limit (percent)
	347	321	
	Composition (percent)	Composition (percent)	
Carbon	0.08 max	0.08 max	+ 0.01
Manganese	2.00 max	2.00 max	+ 0.04
Phosphorus	0.040 max	0.040 max	+ 0.005
Sulfur	0.030 max	0.030 max	+ 0.005
Chromium	17.0/19.0	17.0/19.0	+ 0.20
Nickel	9.0/12.0	9.0/12.0	+ 0.15
Molybdenum	0.75 max	0.75 max	+ 0.05
Silicon	1.00 max	1.00 max	+ 0.05
Copper	0.50 max	0.50 max	+ 0.05
Columbium 1/	1.10 max	---	+ 0.05
Titanium	---	0.75 max 2/	+ 0.05

1/ Columbium or columbium plus tantalum. The determination of tantalum is not required; however, when determined, the ratio of tantalum to the total of tantalum plus columbium shall not exceed 0.4.

2/ The ratio of titanium-to-carbon shall be not less than 6 to 1.

TABLE II. Mechanical properties.

Nominal outside diameter (inch)	Nominal wall thickness (inch)	Maximum ultimate tensile strength (ksi)	Minimum percent elongation in 2 inches	
			Full section	Strip
0.188 and less	0.016 and less	120.0	35	---
	Over 0.016	105.0	35	---
Over 0.188 to 0.500, incl.	0.010 and less	115.0	35	30
	Over 0.010	105.0	35	30
Over 0.500	0.010 and less	120.0	30	25
Over 0.500	Over 0.010	105.0	35	30

TABLE III. Sampling plan.

Lot size (lengths)	Sample size (lengths)	Acceptance number	Rejection number
1 to 110	5	0	1
111 to 500	7	0	1
501 to 800	10	0	1
801 to 1200	15	0	1
Over 1200	25	0	1

TABLE IV. Sampling plan.

Lot size (lengths)	Sample size (lengths)	Acceptance number	Rejection number
1 to 25	4	0	1
26 to 65	6	0	1
66 to 180	8	0	1
181 to 300	9	0	1
301 to 800	10	0	1
Over 800	15	0	1

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DOCUMENT IDENTIFIER *(Number)* AND TITLE

MIL-T-6737C Tubing, Steel, Corrosion and Heat Resisting (18 - 8 Stabilized), Welded

NAME OF ORGANIZATION AND ADDRESS OF SUBMITTER

☐ VENDOR ☐ USER ☐ MANUFACTURER

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DATE

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