

WW-T-700/3F
29 December 1983
SUPERSEDING
WW-T-700/3E
August 16, 1972

FEDERAL SPECIFICATION SHEET

TUBE, ALUMINUM ALLOY, DRAWN, SEAMLESS, 2024

This specification was approved by the Assistant Administrator, Office of Federal Supply and Services, General Services Administration, for the use of all Federal Agencies.

The complete requirements for procuring seamless tube drawn from aluminum alloy 2024 described herein shall consist of this document and the latest issue of WW-T-700/GEN (see 2.1).

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the specific requirements for seamless tube drawn from aluminum alloy 2024.

1.2 Classification.

1.2.1 Tempers. The drawn seamless tube shall be of the following tempers: 0, T3, T42, T81, and F, as specified (see 6.2 and 6.3). The definition of these tempers shall be as specified in WW-T-700/GEN.

1.2.2 Types. The tube shall be of the following types:

| <u>Type</u> | <u>Appearance</u> |
|-------------|--------------------------|
| I | - Round |
| II | - Rectangular and square |
| III | - Streamline |
| IV | - Oval |
| V | - Odd shapes |

2. APPLICABLE DOCUMENTS

2.1 Government publications. The issues of the following documents, in effect on date of invitation for bids or solicitation for offers, form a part of this specification to the extent specified herein.

Federal Specification

WW-T-700/GEN - Tube, Aluminum and Aluminum Alloy, Drawn, Seamless, General Specification for

FSC 4710

WW-T-700/3F

(Activities outside the Federal Government may obtain copies of Federal specifications, standards, and commercial item descriptions, as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

(Single copies of this specification and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from the General Services Administration Business Service Centers in Boston, MA; New York, NY; Philadelphia, PA; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MO; Fort Worth, TX; Houston, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, Standards, and Commercial Item Descriptions from established distribution points in their agencies.)

3. REQUIREMENTS

3.1 Chemical composition. The chemical composition shall conform to the requirements specified in table I.

TABLE I. Chemical composition 1/

| Element | Percent | |
|---------------------------------|-----------|---------|
| | Minimum | Maximum |
| Silicon | - | 0.50 |
| Iron | - | 0.50 |
| Copper | 3.8 | 4.9 |
| Manganese | 0.30 | 0.9 |
| Magnesium | 1.2 | 1.8 |
| Zinc | - | 0.25 |
| Titanium | - | 0.15 |
| Other elements, each | - | 0.05 |
| Other elements, total <u>2/</u> | - | 0.15 |
| Aluminum | Remainder | |

1/ Except for "Aluminum" and "Others", analysis normally is made for elements for which specific limits are shown

2/ The sum of those "Others" metallic elements 0.010 percent or more each, expressed to the second decimal before determining the sum

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3.2 Mechanical properties.

3.2.1 Tensile strength, yield strength and elongation. The tensile strength, yield strength and elongation mechanical properties parallel to the direction of drawing shall conform to the requirements specified in table II.

TABLE II. Tensile strength, yield strength and elongation properties

| Temper | Wall thickness, inch | Tensile strength, minimum, ksi | Yield strength | | Percent elongation in 2 inches or 4D <u>1/</u> , minimum, . kind of specimen | |
|---------------|-------------------------|---|---|--|---|---------|
| | | | At 0.2 per- cent, offset, minimum, ksi | At extens- ion under load, inch per inch | Full section | Cut-out |
| 0 | 0.018 to 0.500, incl. | 32.0 2/ | 15.0 2/ | 0.0034 | - | - |
| T4 | 0.018 to 0.024, incl. | 64.0 | 42.0 | 0.0060 | 10 | - |
| | 0.025 to 0.049, incl. | 64.0 | 42.0 | 0.0060 | 12 | 10 |
| | 0.050 to 0.259, incl. | 64.0 | 42.0 | 0.0060 | 14 | 10 |
| | 0.260 to 0.500, incl. | 64.0 | 42.0 | 0.0060 | 16 | 12 |
| T42 <u>1/</u> | 0.018 to 0.024, incl. | 62.0 | 38.0 | 0.0058 | 10 | - |
| | 0.025 to 0.049, incl. | 62.0 | 38.0 | 0.0058 | 12 | 10 |
| | 0.050 to 0.259, incl. | 62.0 | 38.0 | 0.0058 | 14 | 10 |
| | 0.260 to 0.500, incl. | 62.0 | 38.0 | 0.0058 | 16 | 12 |
| T81 | 0.010 to 0.024, incl. | 66.0 | 58.0 | 0.0063 | - | - |
| | 0.025 to 0.049, incl. | 66.0 | 58.0 | 0.0063 | 5 | 4 |
| | 0.050 to 0.249, incl. | 66.0 | 58.0 | 0.0063 | 6 | 5 |
| F | All | 4/ | 4/ | 4/ | 4/ | 4/ |

1/ Round tube 2 inches or less in outside diameter and square tube 1-1/2 inches or less on a side shall be tested in full section unless the limitations of the testing machine preclude the use of such a specimen. For round tube over 2 inches in diameter, for square tube over 1-1/2 inches on a side, for all sizes of tube other than round or square, or in those cases when a full section specimen cannot be used, a cut-out specimen shall be used.
D represents diameter of cut-out specimen

2/ Maximum

3/ Material in the T42 temper is not available from the materials producers

4/ No requirements

3.2.2 Flattening. When specified (see 6.2), round tube (type I) in 0 and T3 tempers shall withstand, without cracking, the flattening test or the alternative bend test specified in WW-T-700/GEN. The values for flattening factor "F" are specified in table III.

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TABLE III. Flattening factor

| Temper | Wall thickness, inch | F |
|--------|----------------------|---|
| 0 | Up through 0.049 | 3 |
| | 0.050 and over | 4 |
| T3 | All | 8 |

3.2.3 Alternative bend test. The values for the alternative bending factor "N" are specified in table IV.

TABLE IV. Bending factor

| Temper | N |
|--------|---|
| T3 | 6 |

3.2.4 Leak test. When specified (see 6.2), round tube (type I) shall withstand either the pressure test or the electromagnetic (eddy current) test specified in WW-T-700/GEN.

3.2.5 Mechanical properties after heat treatment. In addition to conforming to the requirements of 3.2.1, material in the tempers identified in the following paragraphs shall, after having been processed to tempers also specified therein, have properties conforming to those specified in Table II, as applicable.

3.2.5.1 Material in the 0 and F tempers. Without the subsequent imposition of cold work or forming operations, material in the 0 and F tempers shall, after proper solution heat treatment and natural aging, develop the properties specified for the T42 temper.

3.2.5.2 Material in the T4 and T6 tempers. Material in the T3 temper, without the subsequent imposition of cold work or forming operations, shall be heat treatable to the properties specified for the T42 temper. Such capability shall be demonstrated when specified (see 6.2 and 6.3).

4. QUALITY ASSURANCE PROVISIONS (see WW-T-700/GEN)

4.1 Heat treatment.

4.1.1 Aging period before testing. Specimens in the T4 and T42 tempers will not be required to be tested within 4 days after completion of the solution heat treatment. If, within this period, the manufacturer elects to test specimens, which thereupon fail to meet the requirements, he can discard these initial test results and test additional specimens selected after 4 days of aging. These specimens shall be selected from the same location in the production lot or sample as those tested previously.

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4.1.2 Sampling for heat treatability: From material in each temper of those specified for heat treatability demonstrations in 3.2.5 and 6.2, an additional number of specimens equal to that required by WW-T-700/GEN shall be taken and tested after heat treatment to each temper specified, as applicable, to determine conformance to 3.2.5.

5. PREPARATION FOR DELIVERY (see WW-T-700/GEN)

6. NOTES

6.1 Intended use. This tube is intended for use when a high strength is required, and when poor resistance to corrosion can be tolerated. This tubing is not applicable for use in transferring hydraulic/pneumatic mediums.

6.2 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number and date of this specification
- (b) Temper of material required (see 1.2.1)
- (c) Type of tube required (see 1.2.2)
- (d) Whether round tube (type I) in O and T3 tempers should withstand flattening test (see 3.2.2)
- (e) Whether round tube (type I) should withstand the leak test (see 3.2.3)
- (f) Dimensions required
- (g) Requirements for sizes not specifically covered (see WW-T-700/GEN)
- (h) Whether demonstration of capability to develop properties in tempers other than those supplied is required (see 3.2.5).
- (i) Selection of applicable levels of preservation and packing (see WW-T-700/GEN)

6.3 Mechanical properties after heat treatment. Mechanical properties of producer-supplied material are certified for the temper of material supplied. The producer's "capability" demonstration is not evidence that user-treated material conforms to property requirements of a given temper. Frequently, user heat treated material may develop a lower level of properties; especially if any cold, warm or hot work is introduced, prior to heat treatment. The user should be held responsible for demonstrating that his processing is acceptable.

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MILITARY INTEREST:

Custodians

Army-MR
Navy-AS
Air Force-20

Review Activities

Army-AR, EA
Navy-OS
Air Force-99
DLA-CS

User Activities

Army-MI
Navy-MC

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA-FSS
COMMERCE-NBS
HEW-FEC
NASA-KSC, MSF
USDA-AFS

PREPARING ACTIVITY:

NAVY-AS

DoD Project 4710-0709

Orders for this publication are to be placed with the General Services Administration, acting as an agent for the Superintendent of Documents. See Section 2 of this specification to obtain extra copies and other documents referenced herein.

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STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

(See Instructions - Reverse Side)

1. DOCUMENT NUMBER

WW-T-700/3F

2. DOCUMENT TITLE

TUBE, ALUMINUM ALLOY, DRAWN, SEAMLESS, 2024

3a. NAME OF SUBMITTING ORGANIZATION

4. TYPE OF ORGANIZATION (Mark one)

☐

VENDOR

☐

USER

☐

MANUFACTURER

☐

OTHER (Specify): _____

b. ADDRESS (Street, City, State, ZIP Code)

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

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8. DATE OF SUBMISSION (YYMMDD)