

WW-T-825B
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 SUPERSEDING
 Fed. Spec. WW-T-825A
 October 4, 1957

FEDERAL SPECIFICATION

TUBE, MAGNESIUM-ALLOY, EXTRUDED

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

* 1. SCOPE

1.1 This specification covers magnesium-alloy tubes furnished in the as extruded condition and of the compositions AZ31B, AZ61A, M1A, and ZK60A.

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.

Federal Specifications:

PPP-B-585 - Boxes, Wood, Wirebound.
 PPP-B-601 - Boxes, Wood, Cleated-Plywood.
 PPP-B-621 - Boxes, Wood, Nailed and Lock Corner.

Federal Standards:

Fed. Test Method Std. No. 151 - Metals; Test Methods.
 Fed. Std. No. 245 - Tolerances for Aluminum Alloy and Magnesium Alloy Wrought Products.

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly 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 required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, DC, Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

Military Specifications:

MIL-C-104 - Crates, Wood; Lumber and Plywood, Sheathed, Nailed and Bolted.
 MIL-M-3171 - Magnesium Alloy, Processes for Pretreatment and Prevention of Corrosion on.
 MIL-L-10547 - Liners, Case and Sheet, Overwrap, Water-vaporproof or Waterproof, Flexible.

Military Standard:

MIL-STD-129 - Marking for Shipment and Storage.

(Copies of Military Specifications and Standards required by contractors in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

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* 2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply.

Uniform Classification Committee, Agent:

Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Room 202 Union Station, 516 W. Jackson Blvd., Chicago, IL 60606.)

3. REQUIREMENTS

3.1 Material. The metal used shall be of a quality suitable to produce tubes which comply with all the requirements of this specification.

3.2 Chemical composition. The chemical composition of tubes furnished under this specification shall conform to the requirements shown in Table I.

3.2.1 The contractor shall furnish an analysis of each melt showing the percentage of each of the elements designated in Table I.

* 3.2.2 Chemical analysis by the contractor of the individual melts may be waived at the discretion of the procuring activity provided that the producer's method of composition control is acceptable or that all material in the lot can be identified as being from melts previously analyzed and found to be in conformance with the chemical composition requirements.

3.3 Mechanical properties. The mechanical properties of the tubes shall be as specified in Table II.

3.4 Tolerances. The tolerances shall not exceed those specified in Fed. Std. No. 245 for outside diameter or distance between parallel faces, wall thickness, width, depth, twist, major and minor axes, major and minor dimensions, straightness and length of tubes as applicable.

3.5 Marking for identification. Unless otherwise specified, each length of tubing shall be marked with the manufacturer's name or trademark, the alloy number and the number of this specification, and the temper in which furnished. The marking shall be clearly legible and shall be applied to the material by suitable marking fluid, which cannot be obliterated by normal handling, at intervals of not more than 3 feet along the length of the piece. Where it is not practicable to mark as specified above because of size or shape of the material, cloth or metal tags marked by ink or impression stamping and showing information shall be securely fastened to each bundle.

3.6 Requirements for sizes not specifically covered. Mechanical properties for size of material not specifically covered by this specification shall be as specified in the contract or order.

* 3.7 Protective treatment. Magnesium alloy tubes shall be either oiled or chrome pickled, as specified, in final process before shipment. Unless otherwise specified, tubing shall be given a chrome pickle treatment in accordance with type I or MIL-M-3171.

* 3.8 Workmanship. The tubes shall be uniform in quality and condition. The exterior and interior surfaces shall be clean, smooth, and free from injurious seams, slivers, laminations, grooves, cracks and other similar defects.

* 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 that supplies and services conform to the prescribed requirements.

* 4.2 Sampling and inspection.

4.2.1 Sampling.

4.2.1.1 Lot. A lot shall consist of tubes of the same composition and same wall thickness and outside diameter submitted for inspection at the same time.

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4.2.1.2 Chemical analysis.

4.2.1.2.1 A sample for chemical analysis shall be obtained, as described in Fed. Test Method Std. No. 151 see par 4.3.4.1, from 4,000 pounds or less of material comprising a lot. When the sample for wet chemical analysis is taken from the fabricated product, it shall consist of equal quantities of chips taken from at least four representative pieces and shall represent the full thickness of the material.

TABLE I. Chemical requirements

Alloy	Aluminum	Zinc	Manganese, minimum	Silicon, maximum	Calcium, maximum	Copper, maximum	Nickel, maximum	Iron, maximum	Zirconium, minimum	Total Other elements, maximum	Magnesium
	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Percent	Remainder
AZ31B	2.5 - 3.5	0.60 - 1.4	0.20	0.10	0.04	0.05	0.005	0.005	-----	0.30	Remainder
AZ61A	5.8 - 7.2	.40 - 1.5	.15	.10	-----	.05	.005	.005	-----	.30	Remainder
M1A	-----	-----	1.20	.10	0.30	.05	.010	-----	-----	.30	Remainder
ZK60A	-----	4.8 - 6.2	-----	-----	-----	-----	-----	-----	0.45	.30	Remainder

¹ Analysis shall regularly be made only for the elements specifically mentioned in the table. If, however, the presence of other elements is indicated in the course of routine analysis, further analysis shall be made to determine that the total thereof does not exceed 0.3 percent.

TABLE II. Mechanical requirements

Alloy and condition	Tubing wall thickness	Tensile strength, minimum	Yield strength at 0.2 percent offset or at extension indicated		Elongation in 2 inches, minimum
			Minimum	Extension under load, in 2 inches	
	Inch	P.s.i.	P.s.i.	Inch	Percent
AZ31B-F	0.028 - 0.250	32,000	16,000	0.0089	8
AZ61A-F .....	.251 - 0.750	32,000	16,000	.0089	4
M1A-F .....	.028 - 0.750	36,000	16,000	.0089	7
ZK60A-F .....	.028 - 0.750	28,000	-----	-----	2
ZK60A-F .....	.028 - 0.250	40,000	28,000	.0126	5
ZK60A-T5 .....	.028 - 0.250	46,000	38,000	.0157	4

4.2.1.2.2 Chemical analysis shall be made by wet chemical or spectrochemical methods. In case of dispute, the chemical analysis by wet chemical methods shall be the basis for acceptance. If the producer's method of composition control is acceptable, samples for check chemical analysis may be waived at the discretion of the procuring activity.

4.2.2 Inspection of product. Each piece of tubing shall be carefully examined to determine conformance with this specification with respect to workmanship and protective treatment. Sufficient spot checks shall be made to ensure conformance with the tolerances specified. On approval of the procuring activity, a system of statistical quality control may be used for dimensional and workmanship inspection.

* 4.3 Test methods.

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4.3.1 Number of tests required. For material having a nominal weight of less than 1 pound per lineal foot, one tension test sample shall be selected from each lot of 500 pounds or less. For lots greater than 500 pounds, one additional sample shall be selected for each 1,000 pounds or fraction thereof in excess of the first 500 pounds. For material having a nominal weight of 1 pound or more per lineal foot, one tension test sample shall be selected from each lot of 500 feet or less. An additional sample shall be selected for each 1,000 feet or fraction thereof in excess of the first 500 feet.

4.3.2 Mechanical test specimens. For tube less than 0.500 inch in wall thickness, which is not tested in full section, the standard 1/2 inch wide longitudinal tension test specimen (specimen No. 1 in Figure 13 of ASTM E8) for large diameter tubular products shall be used. For tube having a wall thickness of 0.500 inch or more, a standard 0.500 inch diameter round tension test specimen shall be used, or small size specimens proportional to the standard having a nominal diameter of 0.350 inch or 0.250 inch.

4.3.3 Location of test specimens.

4.3.3.1 Tube. Tension test specimens shall be taken from the tube in the longitudinal direction as specified in the detailed specification. From tube in wall thicknesses 0.5 to 1.5 inches, inclusive, tension-test specimens shall be taken with the axis midway between the inside and outside diameter surfaces; from tube having wall thickness greater than 1.5 inches, the axis of the tension-test specimen shall be three fourths of the distance from one surface to the other.

4.3.4 Tensile tests.

4.3.4.1 Tensile strength. Tensile strength shall be determined in accordance with Fed. Test Method Std. No. 151.

4.3.4.2 Yield strength. The yield strength shall be determined either by the offset method or the extension-under-load method in accordance with Fed. Test Method Std. No. 151. In case of dispute, the offset method shall be used.

4.3.5 Retests. If any specimen fails to conform to the requirements of this specification, it shall be cause for rejection of the specimen subject to the retest provisions of Fed. Test Method Std. No. 151. When no sampling plan is provided, or approved by the procuring agency, and when there is evidence that indicates that a failed specimen was not representative of the lot of material, and when the detail specification does not specify otherwise, at least two specimens shall be selected to replace each test specimen which failed. All specimens so selected for retest shall meet the requirements of the specification or the lot shall be subject to rejection.

5. PREPARATION FOR DELIVERY

5.1 Packing. (See 6.2.)

5.1.1 General. Unless otherwise specified, all tubes shall be separated by shape, wall thickness, size, etc., and composition when packed for shipment. The gross weight of shipping containers or bundles shall not exceed approximately 750 pounds whenever practical. Containers shall be designed to fit the contents in a compact manner. Tubing shall be adequately blocked, braced, or otherwise secured to prevent movement within the shipping containers. Bundled tubes shall be so protected as to prevent damage to tube ends.

5.1.2 Level A. Unless otherwise specified, tubes shall be packed in cleated plywood, nailed wood, or wirebound boxes conforming to PPP-B-601 (overseas type), MLL-C-104, PPP-B-585. All containers shall be case lined in accordance with MLL-L-10547.

5.1.3 Level B. Unless otherwise specified, tubes shall be packed in shipping containers conforming to PPP-B-601 (domestic type), PPP-B-621, or PPP-B-585. If acceptable to the procuring activity, tubes may be bundled.

5.1.4 Level C. Tubes shall be packed in a manner which will insure acceptance and safe delivery to destination by common or other carrier at the lowest rate. Containers shall comply with the Uniform Freight Classification Rules or other carrier regulations applicable to the mode of transportation in effect at time of shipment. In this case protective treatment of the tubes shall conform to standard commercial practices.

5.2 Marking

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5.2.1 Civil agencies activities. Unless otherwise specified, all shipping containers, bundles and unpacked tubing shall be marked with the name of the material, as specified on the purchase order, composition of the tubing, this specification number, the gross weight and quantity, the name of the contractor and the number of the contract or order.

5.2.2 Military agencies. In addition to the marking specified in 5.2.1 and special markings required in the contract or order, marking shall be in accordance with MIL-STD-129.

6. NOTES

* 6.1 Intended use.

6.1.1 Alloy AZ31B possesses a combination of good mechanical properties and cold bending characteristics. This material is also suitable for welding.

6.1.2 Alloy AZ61A possesses relatively high mechanical properties and good stability. Excessive concentrations of stress must be guarded against when designing with this material.

6.1.3 Alloy ZK60A is used where high strength and toughness are required.

6.1.4 Alloy M1A is intended for lightly stressed applications where improved resistance to corrosion and good welding properties are required.

6.1.5 Residual stresses set up by welding or forming operations should be relieved by an annealing treatment at approximately 500°F. for 15 minutes except for ZK60A-T5 where a temperature of 300°F. for 60 minutes is used to retain maximum strength.

6.2 Ordering data. Purchasers should select the preferred options permitted herein and include the following information in procurement documents, the composition, length, size, wall thickness, etc., of material required and level of packing desired: (see 1.1, 3.2.1, 3.4, 3.5, 3.6, 3.7, and 5.)

6.3 It is believed that this specification adequately describes the characteristics necessary to secure the desired material and that normally no samples will be necessary prior to award to determine compliance with this specification. If for any particular purpose samples with bids are necessary, they should be specifically asked for in the invitation for bids, and the particular purpose to be served by the bid sample should be definitely stated, the specification to apply in all other respects.

6.4 Federal specifications do not include all types, classes, grades, sizes, etc., of the commodities indicated by the titles of the specifications or which are commercially available, but are intended to cover the types, classes, etc., which are suitable for Federal Government requirements.

* 6.5 Changes from previous issue. The margins of this specification are marked with an asterisk to indicate where changes (addition, modifications, corrects, 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 document based on the entire content irrespective of the marginal notations and relationship to the last previous issue.

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CUSTODIANS:

Army - MR
Navy - AS
Air Force - 11

Preparing activity:

Navy - AS
(Project No. 4710-0153)

Review activities:

Army - MR, MU, WC

User activities:

Navy - OS
Army - AV, ME

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