

NOVEMBER, 1946

EMERGENCY STANDARD
No. (E) 3D.619—1946
[Superseding No. (E) 2D.619—1941]
Being British Air Ministry
Material Specification
No. D.T.D. 310C*
endorsed without amendment

381 Base Agm

STANDARDS ASSOCIATION OF AUSTRALIA.

Headquarters :
Science House, Gloucester and Essex Streets, Sydney.

AUSTRALIAN STANDARD SPECIFICATION FOR AIRCRAFT MATERIAL
(Emergency Series)

SOFT ALUMINIUM ALLOY TUBES
(Suitable for Oil, Petrol, Gas Starters and General Low Pressure Purposes)

This standard forms one of a series prepared by the Standards Association of Australia at the request of departments of the Commonwealth Government for use in relation to the supply of materials required for defence purposes. In appropriate cases these specifications will be reviewed for inclusion in the normal series of Australian standards.

First Issued - - - - August, 1940
Revised - - - - September, 1941
Revised - - - - November, 1946

1. Quality of Material.

- (a) The aluminium used for making this alloy shall be in accordance with the latest issue of British Standard Specification No. L. 31.
(b) No scrap shall be used other than that derived from the manufacturer's own manufacture.

2. Chemical Composition.

- (a) The chemical composition of the material of the tubes shall be:
- | | | |
|-----------|---------|---|
| Magnesium | | not less than 1.5 nor more than 3.0 per cent. |
| Manganese | | not more than 0.5 per cent. |
| Chromium | | not more than 0.5 per cent. |
| Iron | | not more than 0.75 per cent. |
| Silicon | | not more than 0.6 per cent. |
| Copper | | not more than 0.15 per cent. |
| Aluminium | | the remainder. |
- (b) The analysis of not less than 5 per cent. of the casts of alloy shall be submitted to the Inspector. The minimum number of analyses required may be increased by the Inspector if he is not satisfied with the conditions of manufacture.
(c) A *cast* shall be defined as:
- The product of one furnace melt.
 - The product of one crucible melt.
 - The product of a number of crucible or furnace melts where such are aggregated and mixed prior to casting.
 - The amount of metal tapped from the furnace without any further additions having been made, where a continuous melting process is employed, or
 - As may be otherwise defined from time to time.

3. Method of Manufacture.

- (a) The tubes shall be seamless.
(b) The tubes shall be supplied in the softened condition.

4. Freedom from Defects.

- (a) The tubes shall be free from defects.
(b) Any tube may be rejected for faults in manufacture, notwithstanding that it has been passed previously on chemical composition and mechanical tests.

* In order to avoid confusion it is recommended that this specification be referred to by its British Air Ministry classification No. D.T.D. 310C, by which it is already well known.

5. **Dimensions.** The tubes shall be of the dimensions specified on the order. The outside diameter and wall thickness of the tubes must not differ from the specified dimensions by more than the tolerances given in the table in the latest issue of B.S. Specification T. 4.

6. **Selection and Preparation of Mechanical Test Samples.**

(a) Tubes up to and including 1 inch outside diameter from the same cast, softened together, and of the same nominal outside diameter shall be grouped in parcels.

Tubes over 1 inch outside diameter from the same cast and softened together shall be grouped in parcels of not more than 400 feet.

(b) The Inspector shall select test samples from each parcel as follows:

(i) *Tensile Test.* One test sample from a tube of the greatest nominal wall thickness for the tensile test specified in Clause 7 (b).

(ii) *Drifting Test.* Ten per cent. of the tubes in each parcel for the drifting test specified in Clause 7 (c). At least one tube of each nominal size shall be tested.

(c) The test samples shall be marked as directed by the Inspector before they are cut off, and shall not be further heat-treated or mechanically worked before being tested.

(d) The tensile test pieces shall be either pieces machined from the selected test samples or the samples of tube themselves with their ends flattened or plugged sufficiently for gripping and an effective unflattened or unplugged length of not less than 4 inches.

7. **Mechanical Tests.**

(a) All tests shall be carried out to the satisfaction of the Inspector.

(b) *Tensile Test.* The tensile test pieces, selected and prepared as specified in Clause 6, must give the following result:

Ultimate tensile stress* not more than 14.0 tons per sq. in.

The load shall be applied axially.

(c) *Drifting Test.* Each end of each tube selected as specified in Clause 6 shall be drifted to an angle of 30° as shown in Fig. 1, until the outside diameter of each drifted end exceeds the original outside diameter of the tube by not less than the percentage shown in the table below. The tubes must then show no signs of cracking.

Outside Diameter of Tube.	Minimum Percentage Increase.
Inch	
$\frac{3}{16}$ up to and including $\frac{1}{4}$	45
Over $\frac{1}{4}$ up to and including $\frac{3}{8}$	40
Over $\frac{3}{8}$	25

NOTE.—Drifting tests are to be made by application of steadily applied pressure to the drift. Belling of the tube by spinning methods for test purposes is not acceptable.

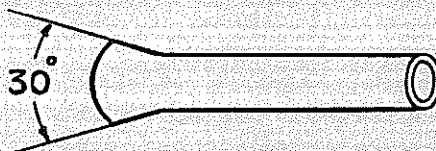


FIG. 1.

(d) *Bore Test.* (i) *Tubes having a Bore Diameter of less than $\frac{1}{4}$ inch.* The bore of each tube shall permit a metallic bob or a wire to be passed through freely. The diameter of the bob or wire shall be 80 per cent. of the nominal diameter of the tube. The length of the bob shall be not less than twice its diameter.

(ii) *Tubes having a Bore Diameter of $\frac{1}{4}$ inch and over.* The bore of each tube shall be examined as in paragraph (i) above, but those whose length does not exceed that specified below may alternatively be examined visually and shall be to the satisfaction of the Inspector.

Internal Diameter	Maximum Length
$\frac{1}{4}$ inch.	8 feet.
$\frac{3}{8}$ inch.	10 feet.
$\frac{1}{2}$ inch and over.	12 feet.

(iii) All tubes which fail to comply with the appropriate bore test shall be rejected.

(e) *Hydraulic Test.* (i) All tubes shall be subjected to and must withstand without permanent distortion the appropriate internal test pressure shown in the Appendix.

(ii) All tubes which fail to comply with the hydraulic test shall be rejected.

* The following particulars are given for information only:
 The ultimate tensile stress of these tubes may be expected to be not less than 9.0 tons per sq. in.

8. Re-Tests.

(a) *Tensile Test.* If any test piece fails to comply with the tensile test specified in Clause 7 (b), the Inspector shall select for test two further samples from tubes of the greatest nominal wall thickness in the same parcel. One of the samples shall be from the tube from which the original test sample was taken, unless the tube has been withdrawn by the manufacturer. Test pieces prepared from these further samples, as specified in Clause 6, must comply with the tensile test specified in Clause 7 (b).

(b) *Drifting Test.* If any tube fails to comply with the drifting test, each tube in the same parcel as that which failed shall be tested similarly at each end. All tubes which fail to comply with the test shall be rejected.

9. Identification. All tubes passed by the Inspector shall be identified by the mark of the Inspector and such other marking as will ensure full identification of the material.

APPENDIX.

Hydraulic Test Pressures.

For tubes of the sizes given in the table below, the test pressure shall be as shown.

Gauge.	Test Pressure—lb. per sq. in.									
	Nominal Outside Diameter.									
	$\frac{3}{8}$ in.	$\frac{1}{2}$ in.	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	$\frac{7}{8}$ in.	$\frac{1}{2}$ in.	$\frac{5}{8}$ in.	$\frac{3}{4}$ in.	$\frac{7}{8}$ in.	1 in.
16 S.W.G.	—	4,000	4,000	3,000	3,000	2,500	2,000	1,500	1,500	1,000
18 S.W.G.	—	4,000	3,000	2,500	2,500	2,000	1,500	1,250	1,000	1,000
20 S.W.G.	4,000	3,000	2,500	2,000	1,500	1,500	1,000	1,000	750	500
22 S.W.G.	3,000	2,500	2,000	1,500	1,250	1,000	1,000	750	500	500
24 S.W.G.	2,000	1,500	1,250	1,000	1,000	750	500	500	—	—

For tubes of outside diameter greater than 1 inch, the test pressure shall be 200 lb. per sq. in.

Tubes shall not be required to be tested to a higher pressure than that given above for the appropriate size.

For the purposes of this specification as an Australian standard the term "Inspector" shall be interpreted in the manner directed by the Australian Airworthiness Authority concerned.

This specification, prepared by the Special Committee on Aircraft Materials and Components, was approved on behalf of the Council of the Association on 25th September, 1946.

NOTE.

In order to keep abreast of progress in the industries concerned, Australian standards are subject to periodical review. Suggestions for improvement, addressed to the Headquarters of the Association, will be welcomed.