

SEPTEMBER, 1942

EMERGENCY STANDARD
No. (E) D. 643-1942

STANDARDS ASSOCIATION OF AUSTRALIA.

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

AUSTRALIAN STANDARD SPECIFICATION FOR AIRCRAFT MATERIAL
(Emergency Series)

ALUMINIUM ALLOY BARS AND SECTIONS.

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.

This specification covers the alloy generally known as "A.A.3S."

1. Quality of Material.

(a) The aluminium used in the manufacture of this alloy shall comply with the latest issue of British Standard No. L.31.

(b) No scrap shall be used in the manufacture of this alloy other than that produced in the manufacturer's own works.

2. Chemical Composition.

(a) The chemical composition of the alloy shall be :

Manganese	...	...	...	...	...	1.00 to 1.50%
Copper	...	...	...	...	...	0.20% maximum
Iron	...	...	...	...	...	0.70% "
Silicon	...	...	...	...	...	0.60% "
Zinc	...	...	...	...	...	0.03% "
Other metallic impurities, each	...	...	...	...	...	0.03% "
"	"	"	total	...	...	0.10% "
Aluminium	...	...	...	...	...	the remainder

(b) The complete analysis of every cast shall be supplied to the inspector.

3. **Manufacture.** The bars and sections may be extruded, rolled, extruded and drawn, or rolled and drawn.

4. Condition.

(a) Material shall be supplied in either of the following conditions as specified on the order :

- (i) as fabricated ;
- (ii) annealed.

(b) Material in any one of the above conditions shall comply with the mechanical test requirements specified for that condition in Clause 9.

5. Freedom from Defects.

(a) The material shall be uniform in quality and temper, clean, sound, smooth and free from defects of manufacture. Extruded shapes shall be free from harmful die scores and marks, and other extruding defects.

(b) Any material may be rejected for faults in manufacture, notwithstanding that it has been passed previously on chemical composition and mechanical tests.

6. Margins of Manufacture.

(a) The margins of manufacture for bars and sections shall be in accordance with those given in the Appendix.

(b) For bars and sections of larger nominal dimensions than those in the Appendix, the margins of manufacture shall be agreed between the manufacturer and the purchaser.

7. Straightness. All bars and sections shall be straight.

8. Selection and Preparation of Mechanical Test Samples.

(a) Bars of the same size or extrusions of the same sectional form, from the same cast and in the same condition shall be grouped in parcels.

The inspector shall select from each parcel one bar or section from which a test sample consisting of the full section of the material shall be selected for bend testing.

(b) These samples shall be marked as directed by the inspector before they are cut off, and shall not be further mechanically worked or heat-treated before testing.

(c) If samples are under $\frac{3}{4}$ in. diameter or distance between parallel faces, the full section of the bar or section shall be tested.

(d) In the case of samples exceeding $\frac{3}{4}$ in. diameter or distance between parallel faces the bend test piece shall be a machined bar $\frac{3}{4}$ in. diameter prepared in the following manner :

(i) Test pieces from material in the "as fabricated" condition shall be machined in such a manner that a line of the skin of the original bar or section is left on at least one part of the circumference.

(ii) Test pieces from material in the "annealed" condition shall be machined concentrically from the test sample.

(e) The edges of rectangular and square section bend test pieces may be rounded before testing.

9. Bend Test. Bend test pieces selected and prepared in accordance with Clause 8 shall comply with the following requirements to the satisfaction of the inspector.

(a) Test pieces from material in the "as fabricated" condition, shall withstand, without showing signs of cracking, cold bending through 180 degrees around a mandrel having a diameter equal to twice the diameter or thickness of the test piece.

Test pieces prepared in accordance with Clause 8 (d) (i) shall be tested with the line of skin of the original bar or section in tension.

(b) Test pieces from material in the "annealed" condition shall withstand, without showing signs of cracking, cold bending through 180 degrees around a mandrel having a diameter equal to the diameter or thickness of the test piece.

10. Re-tests. Should any test piece fail to meet the requirements of Clause 9, two further test samples shall be selected from the same parcel. One of these samples shall be from the bar or section, from which the original test sample was taken, unless that bar or section has been withdrawn by the manufacturer. Test pieces prepared from these two further samples as specified in Clause 8 shall comply with the requirements of Clause 9.

11. Identification.

(a) Each bar and section shall, unless otherwise agreed between the manufacturer and the purchaser, be colour identified in accordance with the provisions of Australian Standard No. (E)D.500*.

(b) All bars and sections under 1 in. nominal dimension, from the same cast and in the same condition, shall be wired up in bundles to each of which shall be securely attached a durable tag bearing such marks as will ensure full identification of the bars and sections with this specification, with their particular cast and condition and with the manufacturer.

(c) Each bar and section 1 in. and over in any sectional dimension shall be stamped near one end or on the colour bands with such marks as will ensure full identification of the bars and sections with this specification, with their particular cast and condition and with the manufacturer.

*A.S. No. (E)D.500, "Colour Identification of Metallic Materials for Aircraft."

APPENDIX.

MARGINS OF MANUFACTURE.

1.—Round Bars.

1	2
Nominal Diameter of Bar.	Margin of Manufacture.
in.	in.
$\frac{1}{16}$ (0.25) $\frac{3}{16}$ (0.3125) $\frac{1}{4}$ (0.375) $\frac{5}{16}$ (0.4375)	} ±0.002
$\frac{3}{8}$ (0.5) $\frac{7}{16}$ (0.5625) $\frac{1}{2}$ (0.625) $\frac{9}{16}$ (0.75) $\frac{5}{8}$ (0.875)	} ±0.003
1 $1\frac{1}{8}$ (1.125) $1\frac{1}{4}$ (1.25) $1\frac{3}{8}$ (1.375)	} ±0.004
$1\frac{1}{2}$ (1.5) $1\frac{5}{8}$ (1.625) $1\frac{3}{4}$ (1.75)	} ±0.005
$1\frac{7}{8}$ (1.875)	} ±0.006
2	±0.006
Over 2 to 2 $\frac{3}{8}$	±0.008
Over 2 $\frac{3}{8}$ to 3	±0.010

2.—Hexagonal Bars.

1	2	3
Width across Flats.		Margin of Manufacture.
Max.	Min.	in.
in.	in.	in.
0.193	0.189	0.004
0.248	0.244	0.004
0.324	0.320	0.004
0.413	0.409	0.004
0.445	0.441	0.004
0.525	0.521	0.004
0.600	0.596	0.004
0.710	0.706	0.004
0.820	0.815	0.005
0.920	0.915	0.005
1.010	1.005	0.005
1.100	1.095	0.005
1.200	1.195	0.005
1.300	1.295	0.005
1.480	1.474	0.006
1.670	1.664	0.006
1.860	1.854	0.006
2.050	2.042	0.008
2.220	2.212	0.008
2.410	2.402	0.008
2.580	2.570	0.010
2.760	2.750	0.010

3.—Rectangular, Flat and Square Bars.

Tolerance on width = $\pm (0.007 + 0.006 W)$ in.

Tolerance on thickness = $\pm (0.007 + 0.003 (W + t))$ in.

where W = width and t = thickness of the cross section.

4.—Sections

(including standard angles, channels, tees, etc., and special sections).

Tolerance on overall width = $\pm (0.007 + 0.006 W)$ in.

TOLERANCE ON THICKNESS.

Nominal Thickness (up to and including 3 in. overall width).	Tolerance.
Up to and including 0.08 in.	± 0.008 in.
Over 0.08 and including 0.125	± 0.009
“ 0.125 “ “ 0.187	± 0.010
“ 0.187 “ “ 0.250	± 0.012
“ 0.250 “ “ 0.375	± 0.015
“ 0.375 “ “ 0.500	± 0.018
“ 0.500 “ “ 0.625	± 0.022
“ 0.625	$\pm 3.0\%$

Tolerance on thickness shall be increased for sections having overall widths greater than 3 in., in ratio to width, thus :

For overall widths greater than 3 in. and including 4 in., multiply tolerances by $\frac{4}{3}$.

For overall widths greater than 4 in. and including 5 in., multiply above tolerances by $\frac{5}{3}$ and so on.

For all sections :

Maximum tolerance on thickness shall be ± 0.050 in.

Minimum tolerance on thickness shall be ± 0.008 in.

Tolerance on angles shall be $\pm 2^\circ$.

5.—Deep Channels.

(Channels having an internal depth to width ratio greater than 1).

If D = nominal depth in inches, and W = nominal width of gap in inches, then :

The tolerance on overall dimensions, internal or external, across the ends of the flanges shall be :

(a) Where D/W is greater than 1 and not greater than 2.
 $\pm 2 (0.007 + 0.006 W)$ in.

(b) Where D/W is greater than 2 and not greater than 3.
 $\pm 2.5 (0.007 + 0.006 W)$ in.

(c) Where D/W is greater than 3.
 $\pm 3 (0.007 + 0.006 W)$ in.

NOTE.—The above tolerances apply only to dimensions across the open end of the channel ; for tolerances on width across the base of the flanges the tolerance shall be $\pm (0.007 + 0.006 W)$ in.

Tolerance on thickness shall be as for standard sections given in Item 4.

6.—Tapered Sections

(including sections of varying thickness).

The tolerance on thickness at any point shall be that given by the table in Item 4 for the nominal thickness at the point to be measured.

For the purposes of this specification 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 13th August, 1942.

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.