

STANDARDS ASSOCIATION OF AUSTRALIA.

Headquarters :

Science House, Gloucester and Essex Streets, Sydney.

AUSTRALIAN STANDARD SPECIFICATION FOR AIRCRAFT MATERIAL
(Emergency Series)OIL-IMPREGNATED SINTERED BRONZE
in the Form of Bearings, Bushes and Thrust Washers

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.

GENERAL REQUIREMENTS.

1. **Scope.** This specification applies to two types of oil-impregnated sintered bronze. Part I deals with the material in the form of bushings and split bushings for use in the manufacture of bearings, and Part II with the material in the form of thrust washers.

2. **Chemical Composition.** The chemical composition of the finished articles when analysed in the oil-free condition, shall comply with the following requirements :

	Alloy A.	Alloy B.
Copper - - - - -	88.0 to 90.0%	88.0 to 90.0%
Tin - - - - -	9.5 to 10.5%	7.5 to 9.5%
Zinc - - - - -	1.0% max.	2.0% max.
Solid non-metallics - - - - -	2.0% max.	2.0% max.
Lead - - - - -	—	1.0% max.
Impurities - - - - -	0.5% max.	0.5% max.

3. **Freedom from Defects.**

(a) The articles shall be uniform in composition, colour and porosity, both on the surface and when cut or fractured, and shall be free from defects which will affect their serviceability.

(b) Any article may be rejected for faults in manufacture notwithstanding that it has been passed previously for chemical composition and mechanical properties.

4. **Manufacture.** The articles shall be of the size specified on the order or on the drawings accompanying the order, and shall be within the tolerances prescribed thereon.

5. **Lubrication.** The finished articles shall be supplied impregnated with a high grade, non-gumming petroleum oil, as specified by the purchaser.

6. **Packing.** Articles shall not be shipped or stored in porous containers such as wood or unglazed cardboard. The actual method of packing shall be specified by the purchaser.

7. **Identification.** All articles complying with this specification shall, before delivery, be identified by the mark of the inspector, the number of this specification, the manufacturer's name or distinguishing mark, and such other marking as shall ensure full identification of the material. Small bushings or thrust washers shall be tied up in bundles containing approximately 50 articles and tagged.

PART I. BEARINGS OR BUSHINGS
(not over 4 in. outside diameter).

8. Selection and Preparation of Test Samples.

(a) Test samples selected and prepared in accordance with the following sub-clauses shall comply with the tests specified in Clause 9.

(b) *Oil Absorption Test Sample.*

(i) One article shall be selected at random from each furnace batch for testing as specified in Clause 9 (a), provided that, in the case of small articles, at least 25 g. of material shall be tested.

Any articles submitted for check testing shall be free from oil.

(c) *Compression Test Samples.*

(i) Wherever possible, the compression test shall be carried out on a test piece machined from an actual bearing to the dimensions specified in Clause 8 (c) (iii) below.

(ii) In these cases one bearing for testing shall be selected at random from each 500 of the same type made from the same batch of material and sintered together.

(iii) The length of the test pieces shall be in accordance with Table I.

TABLE I.

Wall Thickness of Bearings.	Length of Test Piece.
Up to $\frac{3}{32}$ in.	$\frac{1}{2}$ in.
Over $\frac{3}{32}$ up to $\frac{3}{16}$	$\frac{1}{2}$
Over $\frac{3}{16}$ up to $\frac{3}{8}$	1

All test pieces shall have the ends machined normal to the axis of the bearing.

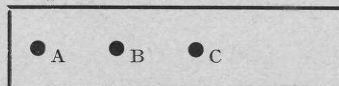
(iv) In cases where it is not possible to obtain test pieces as specified in Clause 8 (c) (iii) above, three identical test pieces shall be prepared from the same mix to represent each furnace batch.

Such test pieces shall be one of the sizes given in Table II.

TABLE II.

Test Piece.	Length.	Dimensions.		To Represent Bearings of Wall Thickness
		Outside Diameter.	Wall Thickness.	
a (hollow)	$\frac{1}{2}$ in.	$\frac{3}{8}$ in.	$\frac{1}{16}$ in.	Up to $\frac{3}{32}$ in.
b (")	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{4}$	Over $\frac{3}{32}$ up to $\frac{3}{16}$
c (")	1	$1\frac{1}{2}$	$\frac{1}{4}$	Over $\frac{3}{16}$ up to $\frac{3}{8}$
d (solid)	$\frac{13}{16}$	$\frac{13}{16}$	—	Over $\frac{3}{8}$

The test samples shall be sintered with the articles and located centrally in the furnace tray at the end, quarter and half points longitudinally :



Test samples A and C are provided for regular testing and test sample B for check tests if necessary.

9. Test Requirements and Procedure.

(a) *Oil Absorption Test.* When tested in accordance with the method described in Appendix A, the oil absorption of the bearings selected at random from the furnace batch shall not be less than 25%. The oil absorption of the special compression test pieces (see Clause 8 (c) (iv)) shall not be below that of the bearings by more than 10% of the value obtained for the bearings themselves.

The oil absorption test shall be carried out after any machining or re-pressing required on the bearings.

(b) *Compression Test.* When compressed axially test pieces shall withstand, without failure, the minimum stress values at the percentage reduction in length given in Table III.

TABLE III.

Wall Thickness of Test Piece.	Reduction in Length.	Minimum Stress.
Up to $\frac{3}{32}$ in.	%	lb. per sq. in.
Over $\frac{3}{32}$ up to $\frac{3}{16}$	15	20,000
Over $\frac{3}{16}$ up to $\frac{3}{8}$	20	20,000
Solid	20	20,000
		40,000

The compression test shall be carried out after impregnation of the specimen with oil. The maximum cross head speed of the testing machine shall not exceed 0.1 in. per min.

10. Re-tests.

(a) Should any test piece fail to meet any of the requirements of Clause 9, the manufacturer may withdraw the parcel concerned or two further test samples shall be subjected to the test under which the original test sample failed.

(b) If either of these test pieces fails to comply with the test requirements the parcel shall be rejected.

PART II. THRUST WASHERS.

(To be included in subsequent issue of specification.)

APPENDIX A.

Method of Determining Oil Absorption.

The test samples shall be wiped clean and placed in an oven at a temperature of not less than 105° C. for at least 15 min.

The oil absorption percentage shall be determined as follows:

The weight of the sample in air (W_1) shall be determined.

The sample shall then be impregnated in a vacuum with a straight mineral oil having a viscosity of 45 to 55 centistokes at 100° F. The temperature of the oil shall be at least 60° C.

After impregnation the sample shall be wiped clean and its weight in air (W_2) determined.

The weight of the sample immersed in oil shall then be determined (W_3). The weights W_1 , W_2 and W_3 shall each be determined correct to the nearest milligram.

The oil absorption percentage of the sample shall then be determined from the following formula:

$$\% \text{ oil absorption} = \frac{W_2 - W_1}{W_2 - W_3} \times 100.$$

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 4th August, 1943.

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.