

STANDARDS ASSOCIATION OF AUSTRALIA.

Headquarters:
Science House, Gloucester and Essex Streets, Sydney.AUSTRALIAN STANDARD SPECIFICATION FOR AIRCRAFT MATERIAL
(Emergency Series).

QUEENSLAND MAPLE

(Flindersia brayleyana F.v.M., or Flindersia pimenteliana F.v.M.)

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 - - - - September, 1940.
Revised - - - - November, 1941.

INTRODUCTION.

This specification applies to the selection of timber for aircraft construction and is divided into three sections.

Section I applies to the requirements for the purchase of sawn timber, and is intended to provide material which can subsequently be graded for use under Sections II and III.

Section II applies to material for parts the strength and stiffness of which do not affect the safety of the aircraft.

Section III applies to material for those portions of the aircraft structure the loads of which are laid down in the airworthiness requirements or the failure of which would endanger the safety of the aircraft.

The tests specified shall be carried out in the manner described in the appendices.

Unseasoned timber may be submitted for testing. Under these circumstances the procedure for testing and acceptance shall be in accordance with Appendix F. The visual inspection required under Section I shall, however, be made after seasoning.

The terms and trade and botanical names used in this specification shall be interpreted in accordance with A.S. No. O.1 "Terms and Definitions used in Timber Grading Rules" and A.S. No. O.2 "Nomenclature of Australian Timbers."

SECTION I—ROUGH TIMBER.

1. Timber accepted under this section will require further grading to select pieces which will comply with Sections II and III of this specification.

2. Dimensions. The timber shall be in the form of selected planks.

3. Quality. The timber shall be quarter sawn¹ and free from obvious and incipient decay, knots, splits, shakes, seasoning checks, brittle heart, figured grain, gum veins, compression failures, insect attack, internal checks, want, blemishes due to handling and other injuries, but the following imperfections will be permitted:

(a) pin-knots: not exceeding $\frac{1}{2}$ in. dia., and not closer than 2 in., nor more than 6 in any 1 sq. ft. of face area,

(b) pin-holes: not exceeding $\frac{1}{16}$ in. dia., and not closer than 2 in., nor more than 6 in any 1 sq. ft. of face area,

(c) sloping grain as determined by the splitting test described in Appendix B: not exceeding 1 in 12,

(d) bow: not exceeding 1 in 288 ($\frac{1}{2}$ in. in 12 ft.),

(e) twist: not greater than $\frac{1}{4}$ in. in 12 ft.

4. Seasoning. The timber shall be either air-dried or kiln-dried to the moisture content specified. If kiln-dried the operation shall be carried out under approved supervision in accordance with the appropriate schedule in Appendix G.²

5. Moisture Content. The moisture content as determined by means of an approved electrical moisture meter shall not exceed 17%.

NOTE.—In case of dispute, the moisture content as determined by the electrical moisture meter may be checked by the oven-drying method described in Appendix A.

¹For the purpose of this specification quarter sawn shall mean that the average inclination of the growth rings in any 3 in. of width shall be not less than 45° to a wide face.

²If however, in the opinion of the inspector, the quality of the timber in a charge would be improved by the use of a milder schedule, lower temperatures and/or smaller wet bulb depressions may be used until the moisture content of the wettest sample plank reaches 30%.

6. **Density.** Although no tests are required on timber accepted under this section, it is desirable that the timber shall weigh less than 41 lb. per cu. ft.

7. **Marking.** Each plank accepted under this section shall be stamped with the following particulars:

- (a) the supplier's name or distinguishing mark,
- (b) the number of this specification,
- (c) the inspector's stamp.

SECTION II—GRADE B. TIMBER.

8. Timber which complies with the provisions of Section I shall fulfil the further provisions of this section before being released as Grade B. timber.

9. **Moisture Content.** The moisture content of every plank shall be determined by means of an approved electrical moisture meter. Tests shall be made at points approximately 18 in. from each end, and at the mid-length. The three readings shall be between 15% and 10% and the individual readings shall not vary by more than 2% in any one plank.

NOTE.—In case of dispute, the moisture content as determined by the electrical moisture meter may be checked by the oven-drying method described in Appendix A.

10. **Density.** The density of every plank shall be determined, as described in Appendix C., from two specimens, one from each edge of the plank. The density shall be between 32 and 40 lb. per cu. ft.

11. **Brittleness Test.** A determination of brittleness shall be carried out on specimens from each plank by the method described in Appendix D. For planks 20 ft. and longer four specimens shall be cut from the diagonally opposite corners; for planks less than 20 ft. long not less than two specimens shall be cut from diagonally opposite edges, from one end of the plank; one specimen shall include the corner nearest the pith. Where sloping grain is present, the specimens shall be cut from the end of the plank nearest the pith. No specimen shall have an Izod value less than 5 ft. lb.

12. **Re-test.** A plank which does not comply with the requirements of Clauses 9 to 11 above may be sawn down the wide face. If on re-test one part then complies with these requirements that part may be released.

13. **Marking.** Each plank accepted under this section shall be stamped with the following particulars:—

- (a) the supplier's name or distinguishing mark,
- (b) the number of this specification,
- (c) the grade of timber,
- (d) the inspector's stamp.

SECTION III—GRADE A. TIMBER.

14. Timber which complies with the provisions of Sections I and II shall fulfil the further provisions of this section before being released as Grade A timber.

15. **Compression Strength Parallel to Grain.** The compression strength parallel to the grain shall be determined for every plank by the method described in Appendix E. The determination shall be made on specimens cut from each of the specimens used for the brittleness test described in Clause 11 above. The ultimate compression strength of the timber shall be not less than the value specified in Table I for the appropriate moisture content.

TABLE I.

Moisture Content ^a	Compression Strength Parallel to Grain
%	lb. per sq. in.
10	7,600
11	7,300
12	7,100
13	6,800
14	6,500
15	6,200
16	6,000
17	5,700
18	5,400
19	5,200
20	5,000

16. **Re-test.** A plank which does not comply with the requirements of Clause 15 above may be sawn down the wide face. If on re-test one part then complies with these requirements that part may be released.

17. **Marking.** Each plank accepted under this section shall be stamped with the following particulars:

- (a) the supplier's name or distinguishing mark,
- (b) the number of this specification,
- (c) the grade of timber,
- (d) the inspector's stamp.

^aMoisture content as determined by the method described in Appendix A.

APPENDIX A.

Method of Determination of Moisture Content.

(Oven-drying Test).

Each specimen shall be weighed on a balance, the sensitivity of which is not less than 1 in 500, immediately after cutting, and shall then be dried in an oven at a temperature of 212° to 221° F. (100° to 105°C.) until the weight is constant, and weighed immediately after removal from the drying oven.

The percentage moisture content shall be determined using the formula :

$$M.C. = \frac{W_i - W_o}{W_o} \times 100$$

- M.C. = percentage moisture content.
- W_i = initial weight of specimen.
- W_o = oven-dry weight of specimen.

APPENDIX B.

Splitting Test.

Short specimens, say 4 in. to 6 in. long, shall be split in two planes, one tangential and one radial.

APPENDIX C.

Method of Determination of Density.

The determination of weight shall be correct to within ± 1% and of volume to within ± 3%. The density in lb. per cu. ft. may be calculated by one of the following formulae :

$$\frac{\text{Wt. in pounds} \times 1728}{\text{Vol. in cu. in.}}$$

or

$$\frac{\text{Wt. in grammes} \times 3.81}{\text{Vol. in cu. in.}}$$

or

$$\frac{\text{Wt. in grammes} \times 62.4}{\text{Vol. in cu. cm.}}$$

The density of the timber shall be taken as the average of the two tests, and shall be stated to the nearest lb. per cu. ft.

APPENDIX D.

Method of Determination of Brittleness.

(Izod Test).

A notched specimen, the sides of which are cut radially and tangentially, of the dimensions shown in Fig. D.1 shall be broken in an approved impact testing machine, the blow being applied in the tangential direction. The testing machine shall be of a type which will permit of the test results being determined to within ¼ ft. lb.

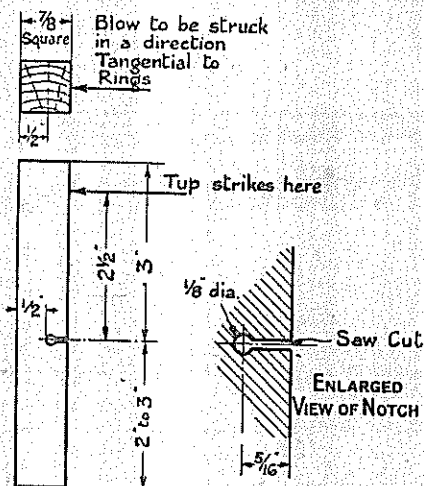


FIG. D.1. Standard Impact Test Specimen.

(NOTE.—An approved type of impact testing machine is shown in Figs. 5 and 6 in B.S. Specification 3 V.4.)

APPENDIX E.

Method of Determination of Compression Strength Parallel to Grain.

The specimens shall be not less than $\frac{3}{4}$ in. square and having a length from two to four times the width.

The test shall be carried out in an approved testing machine and the load shall be so applied that the stress in the specimen increases at a rate of from 3,000 to 6,000 lb. per sq. in. per minute.

The ultimate compression strength of the timber shall be taken as the average of the tests, the corresponding moisture content being taken as the average of the moisture contents of the specimens.

APPENDIX F.

A Permissible Method of Testing Unseasoned Timber.

When unseasoned timber is submitted for testing, it shall be permissible to cut samples at least 6 in. long from the end of the plank (in accordance with Clause 11) which shall then be end-coated to the approval of the inspector. These samples shall be kiln-dried to between 10 and 15% moisture content, in accordance with the schedule given in Appendix G., and then tested. Acceptable planks shall be kiln-dried to the same schedule and not less than 5% of the planks, well distributed throughout the charge, shall be re-tested after drying. The re-tests shall be taken from the same ends of the planks as the original samples, and the averages shall be taken of the results of each of the two series of tests on the same planks. If the average of the re-tests indicates any reduction, the test values on all planks in the kiln charge shall be reduced by the difference between the averages of the two series of tests. If the adjusted test results of any plank then fail to comply with the requirements of this specification, that plank shall be re-tested.

APPENDIX G.

Kiln-Drying Schedules for Queensland Maple.

(a) Up to 1 in.—Quarter Sawn.

Moisture Content Change-points (moisture content of wettest sample plank)	Dry Bulb Temperature	Wet Bulb Depression	Remarks
Green	°F. 130	°F. 12	Maintain this High Humidity Treatment for 24 hours.
40%	130	15	
30%	130	20	
20%	140	20	
12%	160	9	

(b) Over 1 in. and up to 2 in.—Quarter Sawn.

Moisture Content Change-points (moisture content of wettest sample plank)	Dry Bulb Temperature	Wet Bulb Depression	Remarks
Green	°F. 120	°F. 10	Maintain this High Humidity Treatment for 48 hours.
40%	130	12	
30%	130	15	
25%	130	20	
20%	140	20	
12%	160	9	

- Notes.— (i) Seven sample planks, which shall be representative of the stock in the kiln charge, and no two of which are prepared from the same length of timber, shall be included in each kiln charge and shall be well distributed throughout the charge.
- (ii) The moisture content change-points shall be determined by the moisture content of the wettest of the sample boards.
- (iii) For stock which has been partly air-dried, the initial kiln-drying conditions used shall be those shown as applicable to the appropriate moisture content change-point. Should the moisture content of the stock lie between two of the change-points shown, the kiln-drying conditions used shall be those applicable to the wetter of the two change-points.

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 15th October, 1941.

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.

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AMENDMENT.

Page 1. **Clause 3. Quality.** Amend item (e) to read:

"(e) twist: not exceeding $\frac{1}{4}$ in. in 10 sq. ft. of face area."

Page 2. **Clause 10. Density.** Add the following note:

"The density of timber selected for use in the outer laminations of aircraft shall not exceed the value specified above. Such planks shall be clearly marked to indicate they have high density."

Page 2. **Clause 15. Compression Strength Parallel to Grain.**

Add at the end of the second sentence the words "or end matched therewith".

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AMENDMENT.

Page 1, Clause 3. Quality.

Amend the third and fourth lines to read:

“ . . . and other injuries. The following imperfections will be permitted in sawn timber, but their presence in finished parts will be at the discretion of the inspector : ”

Page 1, Clause 5. Moisture Content.

Page 2, Clause 9. Moisture Content.

Add the following at the end of the note:

“ and the value so obtained shall be adopted.”

²Moisture content as determined by the method described in Appendix A.