

MIL-S-7998A

6 March 1970

SUPERSEDING

MIL-S-7998

26 November 1952

## MILITARY SPECIFICATION

## SANDWICH CONSTRUCTION CORE MATERIAL, BALSA WOOD

This specification is mandatory for use by all Departments and Agencies of the Department of Defense.

## 1. SCOPE

1.1 Scope - This specification covers one grade of balsa for use as a core material in the preparation of sandwich sheets and shapes for aircraft.

## 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 the specification to the extent specified herein.

## SPECIFICATION

Military

MIL-W-6110 Wood, Determination of Moisture Content of

## STANDARDS

Military

MIL-STD-105 Sampling Procedures and Tables for Inspection by Attributes

MIL-STD-129 Marking for Shipment and Storage

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

- \* 2.2 Other publications - The following document forms a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

U. S. Department of Agriculture

## Agricultural Handbook No. 188

(Applications for copies should be addressed to: Superintendent of Documents,  
U. S. Government Printing Office, Washington, D. C. 20360.)

## 3. REQUIREMENTS

3.1 Material -

3.1.1 Only balsa (*Ochroma lagopus*) is acceptable material.

\* 3.1.2 The balsa furnished under this specification shall have been kiln-dried at the source in accordance with Agricultural Handbook No. 188, to safeguard against infection and decay.

3.1.3 Condition - The balsa may be rough-cut, except that both ends shall be smooth enough to permit classification of the transverse area. The condition of the lateral faces of the balsa shall be such that the grain direction may be ascertained.

\* 3.2 Dimensions - When dimensions are not specified, the following shall apply:

(a) Length may be random but not less than 2 feet.

(b) Width may be random but not less than 2 inches.

(c) Thickness may be random but not less than 1.5 inches.

3.2.1 Basis of measurement - The basis of measurement shall be in board-foot units.

3.3 Moisture content - Balsa shall have been kiln-dried to contain not more than 15 nor less than 5 percent moisture (based on oven-dry weight) in any one piece. Any lot of balsa submitted for inspection in accordance with this specification shall have an average moisture content of not more than 12 percent, and shall be stored subsequently under conditions suitable for maintaining this moisture content.

\* 3.4 Density - The density of each piece shall be not less than 7 nor more than 14 pounds per cubic foot, oven-dry weight, and shall be within the density range specified in the contract or order.

3.5 Corcho or low-density balsa - Granular corcho shall not be allowed; however individual pieces containing pockets or bands of low-density (corcho) material may be accepted if the width of any single area, as measured in the radial direction, does not exceed 1/8 inch.

3.6 Grain - The slope of the grain, determined as specified herein shall be not steeper than 1 in 8 on one surface combined with straight grain on the adjacent surface, or equivalent combinations. Combinations equivalent to 1 in 8 are as follows:

1:9 and 1:20  
1:10 and 1:16  
1:11 and 1:14  
1:12 and 1:12

Local grain deviations greater than 1 in 8, caused by permissible defects, are acceptable when not over 1 inch in length.

\* 3.7 Defects - Balsa shall show no evidence of inferior quality, including damage caused by external agents, which is not removable in the ordinary process of smooth finishing. This includes kiln-drying defects, decay, excessive brashness, compression failures, oil or grease, partial or included pith, water heart, unsound or loose knots, worm holes, and wane in the form of bark or lack of wood and bark. However, the following are acceptable:

- (a) Scattered pinworm holes, burls, twig-specs, birds'-eye and pinknot clusters.
- (b) Occasional mineral stains and mild blue stain not associated with decay.
- (c) Checks or splits no wider than 1/32 inch on each lateral surface. Length shall be no greater than 40 percent of the thickness of the board.
- (d) Sound, tight knots will be permitted provided the average diameter of individual knots does not exceed 1/2 inch and adjacent knots are not closer than 2 inches.

3.8 Workmanship - The workmanship, including kiln-drying shall be in accordance with high-grade manufacturing practice for balsa.

#### 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

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inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by 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 supplies and services conform to prescribed requirements.

- \* 4.1.1 Classification of tests - All the tests required for the testing of balsa material are classified as quality conformance tests.
- \* 4.2 Sampling -
  - \* 4.2.1 Lot - The unit for sampling is a bundle. Unless otherwise specified in the contract or order, for purposes of sampling, the lot shall consist of all the bundles of balsa of the same finish offered for delivery at one time.
  - \* 4.2.2 Sampling plans - Unless otherwise specified, sampling plans and procedures in the determination of the acceptability of products submitted by a supplier shall be in accordance with the provisions set forth in MIL-STD-105.
  - \* 4.2.2.1 Visual and dimensional examination - A random sample of balsa wood shall be selected from each lot in accordance with the requirements of MIL-STD-105, Inspection Level II and Acceptance Quality Level 2.5 percent defective for visual and dimensional examination and packaging and packing requirements.
  - \* 4.2.2.2 Sampling for individual tests - Each piece of balsa wood shall be examined to determine conformance with this specification.
- 4.3 Moisture content - The moisture content shall be determined in accordance with MIL-W-6110.
- \* 4.3.1 Density - The average density of each plank shall be determined by weight, moisture content (4.3) and volume measurements. Accuracy within reasonable limits commensurate with the rough condition of the balsa shall be observed.
- 4.3.2 Presence of low-density (corcho) material - Determination of the presence of low-density (corcho) material shall be made by visual observation of the smooth transverse cut ends. The end fibers shall be ruptured with a narrow, thin, flat, blunt instrument as, for example, the point of a dull knife blade, held in a position approximately perpendicular to the cut section and dragged across the section in a radial direction. Low-density balsa will rupture easily under slight pressure, resulting in the abrupt tearing out of small chunks of wood, with a consequent "pithy" or "cork-like" appearance of the ruptured surface. Balsa of acceptable density will resist rupture when tested as indicated. If subjected to sufficient

pressure, fibers in the higher density material will bend or possibly tear loose, but will present a characteristically different appearance than in the case of low-density wood.

4.3.3 Grain - The slope of the grain shall be determined by drawing a sharply pointed steel scribe in the direction in which the grain runs, and measuring the slope of the grain as compared with the edges of the piece. The slope of grain is usually expressed by the ratio between a 1-inch deviation of the grain from the edge or axis of a piece and the distance within which this deviation occurs.

4.4 Acceptance stamp - Each piece of balsa accepted shall be marked with the number of this specification.

4.5 Rejection - Balsa wood that fails to meet any of the requirements of this specification shall be rejected.

## 5. PREPARATION FOR DELIVERY

5.1 Packing - Unless otherwise specified, the balsa shall be bundled with a minimum of two flat steel straps for lengths of 2 to 5 feet, and a minimum of three flat steel straps for lengths over 5 feet, to prevent breaking of the bundles during shipment. Steel strapping shall be 0.500 inch by 0.020 inch or heavier. The edges of the bundles shall be protected against cutting by the strapping, by the use of adequate edge protectors or by wooden slats placed across the top and bottom of the bundle beneath the strapping. Exposed faces of dressed balsa must be adequately protected by layers of rough lumber placed on the top and bottom of the bundle. The gross weight shall not exceed approximately 200 pounds. Bundles shall consist of pieces of the same standard thickness and lengths as specified under the particular contract or order.

5.1.1 Protection - The balsa shall be protected against condensation drip during shipment, if shipment is made under such conditions that condensation is probable. Nails shall not be driven into any of the material comprising the shipment.

5.1.2 Storage - Before processing, balsa wood shall be stored under conditions suitable for maintaining an average moisture content of not less than 8 nor more than 12 percent in each piece.

### 5.2 Marking and labeling -

5.2.1 Bundle - Each bundle shall be marked with the following information:

BALSA (FOR SANDWICH CONSTRUCTION CORE)  
Density range  
Specification MIL-S-7998A

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Stock No.  
 Contract or Order No.  
 Quantity  
 Name of Manufacturer  
 Name of Contractor (if different from manufacturer)

CAUTION: Store balsa under conditions suitable for maintaining an average moisture content of not more than 12 percent in the wood.

5.2.2 In addition to the above, marking shall conform to the applicable requirements as specified in MIL-STD-129.

## 6. NOTES

6.1 Intended use - This material is intended for use as the core component of composite sandwich constructions used in aircraft.

\* 6.2 Ordering data - Requisitions, contracts, and orders should state the length, width, and thickness desired, and the acceptable density range.

### 6.3 Definitions -

- (a) Bird's-eye: A grain irregularity consisting of a small central spot with wood fibers arranged about it in the form of an ellipse so as to give the appearance of an eye.
- (b) Decay: A disintegration of wood substance caused by wood-destroying fungi.
- (c) Pinworm hole: Hole not over 1/16 inch in diameter.
- (d) Corcho or low-density balsa: Balsa wood having a density of less than 0.08 (based on weight and volume when oven-dry) as applied to any portion of the wood, rather than to the average or bulk density of a piece. Such low-density wood is characterized by a relatively large number of short, large-diameter, thin-walled fibers, and comparatively few long, thick-walled, small-diameter fibers.
- (e) Stain: Discoloration of fiber caused by fungi, bacteria, minerals, or mold not appreciably weakening the wood.
- (f) Kiln-drying defects:

- (1) Collapse: Collapse of cellular structure in wood caused by poor kiln-drying practice. Extensive areas may be affected giving appearance of great dimensional shrinkage.
  - (2) Honeycombing: Internal checking of wood structure caused by poor kiln-drying practice.
  - (3) Casehardening: A condition in lumber in which unequal stresses are set up by improper moisture gradient caused by poor kiln-drying practice.
  - (4) Kiln burn: Usually discernible in balsa by presence of light brown surface stain which is caused by use of excessively high temperatures during kiln-drying.
  - (5) Crook, warp, and twist: Condition in which the faces of lumber deviate from a relatively flat, planar surface.
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- (g) Check: Void caused by separation of fibers in a radial plane along the grain.
  - (h) Shake: Void caused by partial or complete separation of fibers along the grain within or between two growth rings.
  - (i) Compression failure: Localized buckling or creases across the grain produced by endwise compression of fibers beyond their elastic limit. They are discernible as fine, wavy lines at right angles to grain direction.
  - (j) Blue stain: Stain produced by fungi that feed on contents of cells and do not cause appreciable cell wall destruction or breakdown of wood structure.
  - (k) Mineral stain: Stain produced by deposition of mineral substances in cellular structure.
  - (m) Water heart: Water heart is a wet zone of pyramidal or conical shape, usually limited to the lower 5 to 8 feet of butt logs.
  - (n) Brashness: A brittle wood which breaks with a clean instead of a splintery fracture and without warning. This is sometimes caused by too severe temperatures and is associated with a darkening in color.

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6.4 Changes from previous issue - The margins of this specification are marked with an asterisk to indicate where changes (additions, modifications, corrections, 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.

**Custodians:**

Army - ME

Navy - AS

Air Force - 11

**Preparing activity:**

Navy - AS

(Project No. 5680-0045)

**Review activities:**

Navy - AS

Air Force - 11

DSA - CS

Review/user information is current as of the date of this document. For future coordination of changes to this document, draft circulation should be based on the information in the current Federal Supply Classification Listing of DOD Standardization Documents.



SPECIFICATION ANALYSIS SHEET		Form Approved Budget Bureau No. 119-R004
<p align="center"><b>INSTRUCTIONS</b></p> <p>This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity (as indicated on reverse hereof).</p>		
SPECIFICATION		
MIL-S-7998A SANDWICH CONSTRUCTION CORE MATERIAL, BALSA WOOD		
ORGANIZATION (Of submitter)		CITY AND STATE
CONTRACT NO.	QUANTITY OF ITEMS PROCURED	DOLLAR AMOUNT
MATERIAL PROCURED UNDER A		
<input type="checkbox"/> DIRECT GOVERNMENT CONTRACT <input type="checkbox"/> SUBCONTRACT		
1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?		
A. GIVE PARAGRAPH NUMBER AND WORDING		
B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.		
2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID		
3. IS THE SPECIFICATION RESTRICTIVE?		
<input type="checkbox"/> YES <input type="checkbox"/> NO      IF "YES", IN WHAT WAY?		
4. REMARKS (Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)		
SUBMITTED (Printed or typed name and activity)		DATE