

INCH- POUND

MIL-L-2037E

21 August 1990

SUPERSEDING

MIL-L-2037D

30 December 1965

(See 6.10)

MILITARY SPECIFICATION

LUMBER, OAK, WHITE AND RED, FOR SHIP
AND BOAT CONSTRUCTION

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

1. SCOPE

1.1 Scope. This specification covers white and red oak lumber for ship and boat construction, including bending for boat and ship frames or for parts requiring bends of similar severity.

1.2 Classification. White and red oak lumber shall be furnished in the following types, classes and grades, as specified (see 6.2 and 6.3):

Type I - White oak.

Type II - Red oak, preservative treated.

Class 1 - Planking.

Grade A

Grade B

Class 2 - Shaft logs.

Class 3 - Sawn timber.

Grade A

Grade B

Class 4 - Ceiling:

Class 5 - Bending.

Grade A

Grade B

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: Commander, Naval Sea Systems Command, SEA 5523, Department of the Navy, Washington, DC 20362-5101 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 5510

DISTRIBUTION STATEMENT A. Approved for public release; distribution is unlimited.

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2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

FEDERAL

- TT-P-320 - Pigment, Aluminum: Powder and Paste for Paint.
- TT-V-119 - Varnish, Spar, Phenolic-Resin.
- TT-W-571 - Wood Preservation: Treating Practices.

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- MIL-L-14362 - Lumber: Unitizing and Loading of.
- MIL-L-19140 - Lumber and Plywood, Fire-Retardant Treated.

STANDARDS

MILITARY

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

(Unless otherwise indicated, copies of federal and military specifications, standards, and handbooks are available from the Standardization Documents Order Desk, Bldg. 4D, 700 Robbins Avenue, Philadelphia, PA 19111-5094.)

2.2 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DOD adopted are those listed in the issue of the DODISS cited in the solicitation. Unless otherwise specified, the issues of documents not listed in the DODISS are the issues of the documents cited in the solicitation (see 6.2).

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 607 - Standard Specification for Wet Ground Mica Pigments.
(DoD adopted)
- D 4442 - Standard Test Method for Direct Moisture Content Measurement of Wood and Wood Based Materials.
- D 4444 - Standard Test Methods for Use and Calibration of Hand Held Moisture Meters.

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

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NATIONAL HARDWOOD LUMBER ASSOCIATION (NHLA)

Rules for the Measurement and Inspection of Hardwood and Cypress.

(Application for copies should be addressed to the National Hardwood Lumber Association, P.O. Box 34518, Memphis, TN 38184-0518.)

(Non-Government standards and other publications are normally available from the organizations that prepare or distribute the documents. These documents also may be available in or through libraries or other informational services.)

2.3 Order of precedence. In the event of a conflict between the text of this document and the references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Material. White oak lumber shall be cut from trees of species in the white oak group. Red oak lumber shall be cut from trees of species in the red oak group (see 4.4.4 and 6.7). Trees shall have been grown in the United States or Canada.

3.2 Dimensions. Unless nominal size is specified (see 6.2), lumber shall be manufactured to not less than the dimensions specified. Lumber shall have parallel edges and faces, subject to the standard tolerances for variations in sawing or subsequent surfacing (see 4.3.8 and 6.2). Sapwood, wane, or other defects which can be eliminated in sawing or surfacing oversize pieces to the standard nominal dimensions ordered will be permitted for all classes of material.

3.3 Defects. The limitations and permitted defects in lumber shall be as specified in 3.3.1 through 3.3.4 and table I. The defects shall be so located in the piece that no combination of them at any point is more weakening than a single maximum permissible defect.

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TABLE 1. Maximum allowable defects.

Defect	Class 1 - Planking		Class 2 - Shaft logs		Class 3 - Sawn timber		Class 4 - Ceiling		Class 5 - Bending timber	
	Grade A	Grade B			Grade A	Grade B			Grade A	Grade B
Pin and shot worm holes	On any face three holes not more than 1/8-inch in average diameter per linear foot per 8 inches of width proportionately more in wider pieces	On any face four clusters, 1/2-inch or less in average diameter, of three or fewer holes not over 1/4-inch in diameter, in each linear foot, per 8 inches of width, proportionately more in wider pieces	On any face three clusters, 1/2-inch or less in average diameter, of three or fewer holes not over 1/4-inch in diameter, in each linear foot, per 12 inches of width, proportionately more in wider pieces		On any face two clusters, 1/2-inch or less in average diameter, of three or fewer holes not over 1/4-inch in diameter, in each linear foot, per 12 inches of width, proportionately more in wider pieces		For grade B use same as class 1, grade B		None permitted	Three holes in any 6 inches of length
Grub holes	Not over 1/2-inch in average diameter in material 4 inches or less thick and 8 inches or less wide; not over 5/8-inch in average diameter in material thicker than 4 inches or wider than 8 inches. Holes shall extend not more than 2 inches across grain or not more than 3 inches in length, except length of hole along grain that intersects the surface of piece shall not be counted. Classes and grades permit not more than:		1 in 8 feet		1 in 6 feet	1 in 4 feet	1 in 8 feet	1 in 4 feet	1 in 8 feet	None permitted

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TABLE 1. Maximum allowable defects - Continued.

Defect	Class 1 - Planking		Class 2 - Shaft logs	Class 3 - Sawn timber		Class 4 - Ceiling	Class 5 - Bending timber	
	Grade A	Grade B		Grade A	Grade B		Grade A	Grade B
Sound knots	Limited in size to 1 inch in average diameter spaced 2 feet apart	Limited in size to 1-1/2 inches in average diameter, spaced 1-1/2 feet apart Knots must be water tight	Limited in size to 1-1/2 inches in average diameter, spaced 2 feet apart	Limited in size to 1/4 of the width of the face on which they appear but not to exceed 3 inches, except that knots near the edges of wide faces in pieces containing the pith are limited to 1/8 of the width of the face. Two knots of maximum size are not permitted in the same 12 inches of length	Limited in size to 1/3 of the width of the face on which they appear but not to exceed 4 inches, except that knots near the edges of wide faces in pieces containing the pith are limited to 1/4 of the width of the face. Two knots of maximum size are not permitted in the same 6 inches of length	Limited in size to not more than 1/8 the width of face on which it appears, spaced 2 feet or more apart	None permitted	Limited to one sound knot 3/4-inch in diameter within the 12-inch length from each end, except that no knots shall be permitted in middle third of piece
Holes (surface pits)	Limited in size to not over 1/8 the width of the face in diameter and not over 1/8 the thickness in depth, not closer than 8 feet on any surface							None

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TABLE 1. Maximum allowable defects - Continued.

Defect	Class 1 - Planking		Class 2 - Shaft logs	Class 3 - Sawn timber		Class 4 - Ceiling	Class 5 - Bending timber	
	Grade A	Grade B		Grade A	Grade B		Grade A	Grade B
Burl							None permitted	One burl 3/4-inch in diameter within 12 inches from each end, except no burl shall be permitted in middle third of piece
	Limited to the size of the largest permissible knot							
Slope of grain	Limited to 1 inch in 15 inches of length		Limited to 1 inch in 10 inches of length	Limited to 1 inch in 15 inches of length	Limited to 1 inch in 10 inches of length	Limited to 1 inch in 15 inches of length	Limited to 1 inch in 15 inches of length	
Sapwood	Not limited in lumber to be given preservative treatment							
Sapwood in untreated white oak lumber	Not more than 1/8 width of surface on which it appears, at any point		Not more than 1/8 the width of surface on which it appears, at any point				Not over 1/8 of width of surface on which it appears, at any point	
Wane	Not over 1/8 the width of the surface on which it appears, at any point			Not over 1/8 the width of the surface on which it appears and 1/2 the length	Not over 1/4 the width of the surface on which it appears and 1/2 length	Not over 1/4 the width of the surface on which it appears	Not over 1/8 the width of the surface on which it appears or 1/6 the length	

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TABLE 1. Maximum allowable defects - Continued.

Defect	Class 1 - Planking		Class 2 - Shaft logs	Class 3 - Sawn timber		Class 4 - Ceiling	Class 5 - Bending timber	
	Grade A	Grade B		Grade A	Grade B		Grade A	Grade B
Surface checks width and length	Not over 1/32-inch in width and 4 inches in length			Not limited		Not over 1/32-inch in width and 4 inches in length		
Depth	Average depth limited to 1/4 of the thickness of the piece	Average depth limited to 1/3 of the thickness of the piece		Average depth limited to 1/4 of the thickness of the piece	Average depth limited to 1/3 of the thickness of the piece	Average depth limited to 1/4 of the thickness of the piece	Average depth limited to 1/3 of the thickness of the piece	Average depth limited to 1/3 of the thickness of the piece
End checks or splits	Average length limited to 3/4 of the thickness of the piece	Average length limited to the thickness of the piece	None permitted	Average length limited to 3/4 of the thickness of the piece	Average length limited to the thickness of the piece	Not longer than width of piece	Not longer than thickness of piece	Not longer than width of piece
Bow	Not over 1 inch deviation per 6 feet of length					Not over 1/4-inch deviation per 16 feet of length		
Crook	Not over 1 inch deviation per 6 feet of length					Not over 1/4-inch deviation per 16 feet of length		

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TABLE 1. Maximum allowable defects - Continued.

Defect	Class 1 - Planking		Class 2 - Shaft logs	Class 3 - Sawn timber		Class 4 - Ceiling	Class 5 - Bending timber	
	Grade A	Grade B		Grade A	Grade B		Grade A	Grade B
Cup	Not over 3/8-inch depth per 12 inches of width		Not limited (not applicable)	Not limited (not applicable)		Not over 3/8- inch depth per 12 inches of width	Not over 1/8-inch per 12 inches of width	
Twist	Not over 1 inch rise in fourth corner in 6 feet of length					Not over 1 inch rise in fourth corner in 6 feet of length	Not over 1/4-inch rise in fourth corner in 6 feet of length	
Case- hardening	Slight case- hardening permitted		Not applicable		Slight case hardening permitted	Not applicable		

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3.3.1 Defects due to foreign organisms. Lumber shall be free from decay, mold, and stain. The presence of frass, or other indications of active insect attack, shall be cause for rejection. Pinholes and grub holes resulting from dormant insect infestation shall not exceed the limits specified in table I.

3.3.2 Defects due to natural causes. Lumber shall be free from shake and loose knots. Sound knots, burl, sapwood, holes, bark pocket, and wane shall not exceed the limits specified in table I. An unlimited amount of sapwood will be permitted where the lumber is pressure treated with a preservative (see 3.4). White oak may contain untreated sapwood within the limits specified in table I.

~~3.3.3 Defects due to seasoning. Lumber shall be free from honeycombing.~~ Casehardening, surface checks, end checks or splits, bow, crook, cup, and twist shall not exceed the limits specified in table I.

3.3.4 Slope of grain. Lumber shall not have a slope of grain on any face or edge which exceeds the limits specified in table I.

3.4 Preservative treatment. Except as permitted in 3.3.2, all white oak sapwood and all red oak shall be treated in accordance with TT-W-571. Treatment shall be with ammoniacal copper arsenate (ACA), ammoniacal copper zinc arsenate (ACZA), or chromated copper arsenate (CCA) with a retention of 0.4 pound per cubic foot (lb/ft³) in the assay zone. Red oak assay zone shall be from 0.25 to 1.0 inch in depth. White oak assay zone shall be the maximum depth of the sapwood. Penetration of red oak heartwood shall be at least 95 percent of all annual rings. Penetration of any sapwood shall be 95 percent of total depth or thickness. Treatment of white oak heartwood is permitted but not required.

3.5 Moisture content. Lumber shall be seasoned by air or kiln drying to within the following moisture content limits (see 4.4.1):

Class 1	- 17 ± 3 percent.
Class 2 and 3	- Any stage of seasoning.
Class 4	- 15 ± 3 percent.
Class 5	- 15 percent or above.

3.5.1 Moisture content gradient. For classes 1 and 4, the moisture content of the core shall not vary from that of the shell by more than 3 percent (see 4.4.1).

3.6 Specific gravity. Exceptionally lightweight lumber shall be cause for rejection. Lumber suspected of being abnormally light in weight during inspection handling shall be tested (see 4.4.3). The specific gravity shall be not less than: white oak, 0.65 (40.6 lb/ft³), and red oak, 0.61 (38.1 lb/ft³).

3.6.1 Growth rings. Lumber in classes 1, 2, 3, and 4 shall have not more than 20 rings per inch, measured on a representative radial line (see 4.3.7). Class 5 lumber shall have not less than six nor more than 15 growth rings per inch of radius.

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3.7 Application of protective coating.

3.7.1 End coating. The ends of all lumber shall be painted within 24 hours after sawing with two coats of aluminum or mica paint. Aluminum paint shall consist of 2 pounds of aluminum powder paste conforming to type II, class B, of TT-P-320 and 1 gallon of phenolic varnish conforming to TT-V-119 (equal to Navy formula 80). Mica paint shall consist of 2 pounds of mica conforming to ASTM D 607 and 1 gallon of phenolic varnish as above. A drying interval of 24 hours shall elapse before applying the second coat. An alternate end coating may be any commercial end coating satisfactory to the Command or agency concerned.

3.7.2 Side coating. When lumber is required to be side coated (see 6.2), it shall be given two brush or spray applications of aluminum paint as specified in 3.7.1. The side coating shall be applied within 24 hours after sawing, with a drying interval of 24 hours before applying the second coat. Treatment for stain and mold prevention, when required (see 5.2.1), shall precede side-coating applications.

3.7.3 Reapplication of protective coating. End and side coatings shall be renewed when visibly damaged or rendered ineffective by weathering when lumber is stored outdoors for long periods of time.

3.8 Identification marking. When specified in contract or order (see 6.2), each piece of lumber which has passed the examination and tests specified herein, shall be marked for type, class, and grade. Narrow, thin pieces shall be bundle marked. Lumber shall be tagged or marked on one end.

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the contractor is responsible for the performance of all inspection requirements (examinations and tests) as specified herein. Except as otherwise specified in the contract or purchase order, the contractor 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 this specification where such inspections are deemed necessary to ensure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of sections 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of the manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to acceptance of defective material.

4.2 Lot. All lumber of one class and grade to be delivered in one truck or railroad car shall be considered a lot for purposes of inspection.

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4.3 Quality conformance inspection.

4.3.1 Sampling. Unless otherwise specified herein, samples shall be selected from the lumber which has passed the grade and class examination of 4.3.2. The number of pieces in the lot shall be tallied beforehand, and the samples selected in accordance with MIL-STD-105 at inspection levels listed in table II. Any sample piece that does not meet the requirements of 3.2, 3.5, 3.5.1, 3.3.3 and 3.6.1 shall be rejected.

TABLE II. Sampling.

			Inspection level (MIL-STD-105)		
Examination or test	Requirement	Test method	Classes 1 and 4	Classes 2 and 3	Class 5
Dimensions	3.2	4.3.8	II	II	II
Moisture content	3.5	4.4.1	II	II	II
Moisture gradient	3.5.1	4.4.1	I	---	---
Case-hardening	3.3.3	4.4.2	I	---	---
Honeycomb	3.3.3	4.4.2	I	---	---
Growth rings	3.6.1	4.3.7	I	I	I

4.3.2 Class and grade examination. Each piece of lumber in the lot shall be examined to determine compliance with the requirements of 3.3 (except casehardening and honeycombing) and 3.6 (except 3.6.1). Each piece of lumber shall be positively identified as white oak or red oak (see 6.7). Care shall be taken to prevent lumber containing only sapwood from being accepted as all heartwood. Slope of grain shall be determined in accordance with 4.3.5. Each piece not conforming to class and grade examination shall be rejected.

4.3.3 Quantity examination. The quantity of lumber in the lot shall be determined by tally, in accordance with the NHLA grading rules (see 2.2).

4.3.4 Preservation treatment examination. Each lot shall be examined in accordance with TT-W-571 for preservative retention and penetration conformance to 3.4. In the case where the lot of material is preservatively treated as part of a larger treatment charge or batch, the lot shall contribute at least 25 percent of the samples chosen for the batch inspection or one sample per lot piece, whichever is fewer.

4.3.5 Slope of grain. The slope of grain shall be measured on both flatsawed and quartersawed surfaces, over distances great enough to determine the general slope, disregarding short local deviations caused by permissible burls and knots. Where a truly quartersawed or nearly quartersawed surface is present, the slope of grain may be determined by tracing the darker band of the summerwood of a growth ring from the point of inception along the edge of the piece for a convenient distance of 10 or 15 inches from the starting point, and estimating or measuring the divergence from the edge of the piece. Where a truly flat-grained surface is present, the slope of grain may be determined by drawing a line parallel to the pores or to surface checks and extending it until it intercepts

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the edge of the piece. At a convenient distance along this line, such as 10 or 15 inches, estimate or measure the divergence from the edge of the piece. Where there is no flat-grained surface, for example, a square where the growth rings run diagonally from one corner to the opposite one, the slope of grain may be calculated from the angle traced by a swiveled scribe drawn along the surface. Examples of suitable scribes are shown on figure 1.

4.3.6 Knots or holes. The diameter of knots or holes shall be determined by averaging the distance between lines drawn parallel to the edges and ends of the piece and touching the extremities of the knot or hole being measured.

4.3.7 Growth rate. ~~Average annual rings per inch shall be measured on a~~ line at a right angle to the rings of annual growth representative of the average growth in the cross-section at either one end or the other. If the size of the piece permits, the measuring line shall be 3 inches long. In pieces containing the pith, the measurement may exclude an inner portion of the radius amounting to approximately one-quarter of the least dimension of the piece.

4.3.8 Dimensions. Dimensions of both rough and surfaced lumber shall be subject to the standard tolerances specified for hardwood lumber in the NHLA grading rules (see 2.2).

4.3.9 Additional inspection. Unless otherwise specified in the contract or order (see 6.2), where other specifications form part of this specification for lumber, sampling, examination and tests shall be conducted as required in the referenced specification.

4.4 Test methods.

4.4.1 Moisture content. Moisture content shall be determined using a calibrated moisture meter or oven test, as applicable, in accordance with ASTM D 4442 and D 4444, method (a). If a moisture meter is used, it shall be equipped with insulated probes for determining moisture content and gradient from shell to core. If oven method is selected, moisture content and gradient specimens shall be cut as shown on figures 2a and 2b.

4.4.2 Casehardening and honeycomb. Casehardening shall be determined in accordance with figure 2c. Honeycomb (an internal void or check usually developing along the rays) shall be determined by examination of moisture content section, figure 2a.

4.4.3 Specific gravity. The specific gravity shall be determined by ascertaining the ratio of the volume below the waterline (see figure 3) to that of the whole piece. This method consists of the following steps:

- (a) Cut a piece of wood from the lumber to be tested, about 1 by 1 by 12 inches in dimension, the 12-inch dimension being along the grain.
- (b) Dry the piece for 48 hours at 212 to 221 degrees Fahrenheit (°F).
- (c) Dress the piece so that the cross section is rectangular and uniform throughout the length, and trim it to exactly 10 inches in length. Mark off the length in inches starting with 1 near the end that is to be submerged.

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- (d) Place the piece carefully in a tall glass container of water so that the piece floats in an upright position. Note the waterline to which it sinks, quickly remove and mark the waterline (see figure 3). The average position of the waterline corresponds to the point halfway between the two edges of the piece. The position of the waterline indicates the specific gravity of the piece on the basis of oven-dry weight and volume. Thus, if it is halfway between the 7- and 8-inch marks, the specific gravity is 0.75. The test shall be performed quickly up to the time when the waterline is marked, because the oven-dry piece will absorb moisture while it is being dressed, cut, and marked, and particularly after it is placed in the water. When determining the acceptability of suspected material, the required immersion depth may be marked on the pieces before testing.

4.4.4 Species and sapwood. Species and sapwood determination shall be performed with chemical indicators (see 6.7).

4.5 Inspection of packaging. Sample packs, and the inspection of the preservation, packing, and marking for shipment, stowage, and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

5. PACKAGING

(The packaging requirements specified herein apply only for direct Government acquisition.)

5.1 Packaging requirements. Lumber shall be preserved level A, C, or Commercial, packed level A, B, C, or Commercial as specified, marked in accordance with MIL-L-14362, and shall include bar codes and applicable packaging acquisition options therein as specified (see 6.2). In addition, for Navy acquisitions, the following applies:

(a) Navy shipboard stowage fire-retardant requirements.

- (1) Treated lumber and plywood. When specified (see 6.2), all lumber and plywood including laminated veneer material used in shipping containers and pallet construction, members, blocking, bracing, and reinforcing shall be fire-retardant treated material conforming to MIL-L-19140 as follows:

Levels A and B	- Type II - weather resistant.
	Category 1 - general use.
Level C	- Type I - non-weather resistant.
	Category 1 - general use.

5.2 Special requirements.

5.2.1 Stain and mold preventive. When material above 20 percent moisture content that has not been treated with a preservative (see 3.4) is shipped during warm weather, or when the shipment will be in transit or storage for more than 15 days between sawing and using, a treatment to prevent the development of stain or mold causing fungi shall be applied (see 6.2). The preventive treatment shall

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consist of dipping in or spraying with a stain-preventing water solution approved by the contracting activity and having an effectiveness approximately equal to 30 pounds of sodium pentachlorophenate in 100 gallons of water. However, pentachlorophenol or any of its salts shall not be used.

5.2.2 Packing. In addition to the packing required (see 5.1), as far as practicable, the lumber shall be segregated for species (white oak or red oak) and class. Surfaced lumber and kiln-dried lumber shall be shipped only in closed cars or vans and shall be stored under cover at all times. Bending oak shall be prevented from drying during storage and shipping by solid piling and covering (see 6.8).

5.2.3 Marking. In addition to the marking required (see 5.1), tally cards shall be conspicuously posted at access entrance ways within the carrier. The tally cards shall be protected against deterioration and loss. Nomenclature thereon shall be identical with that approved under the contract or order (see 6.2).

6. NOTES

6.1 Intended use. This lumber is intended for use as solid straight or curved members in small boats, patrol craft, mine sweepers, and other wooden boats or ships where high-strength, bendability, and good decay resistance, either natural or acquired by preservative treatment, are required. Type I (white oak) material has good decay resistance throughout the piece except for untreated sapwood, which is strictly limited. It may be resawn or bored without effect. Type II (red oak) material, depending on the character of the individual piece, may have lesser decay resistance due to variable internal treatment. It is not suited to decay hazardous uses which require extensive cutting, shaping, boring, or resawing of the piece after preservation treatment. Good practice dictates that cut ends, bored holes and laying surfaces be given a heavy brush coat of preservative in decay hazard end uses for type I or II material.

6.2 Ordering data. Acquisition documents must specify the following:

- (a) Title, number and date of this specification.
- (b) Type, class, and grade required (see 1.2).
- (c) Issue of DODISS to be cited in the solicitation, and if required, the specific issue of individual documents referenced (see 2.1.1 and 2.2).
- (d) Thickness, width, and length required; actual or nominal dimensions (see 3.2).
- (e) Amount of surfacing desired, if any (see 3.2).
- (f) Whether side coatings are required (see 3.7.2).
- (g) Whether identification marking of each piece is required (see 3.8).
- (h) Whether additional inspection is required (see 4.3.9).
- (i) When fire-retardant treatment is required (see 5.1).
- (j) Level of preservation; packing and marking required (see 5.1).
- (k) Whether anti-stain treatment is required (see 5.2.1).
- (l) When material is protected from precipitation and the direct rays of the sun (see 5.2.2).
- (m) When stain and mold preventive is required (see 5.2.1).
- (n) Special marking required (see 5.2.3).

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6.3 Classification. Classification designations have been changed in this revision as follows:

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Class a
Class b
Class c
Class d
Class e
Grade I
Grade II

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Class 1
Class 2
Class 3
Class 4
Class 5
Grade A
Grade B

6.4 Ordering considerations. Because of the nonconformance to standard commercial dimensions, particularly shaft logs and sawn timber of oak lumber conforming to this specification, it is usually necessary to manufacture it to order. When possible, standard commercial nominal sizes should be specified to reduce cost and increase availability. Generally, less difficulty is experienced with oak cut during the winter season. It is recommended that, when practicable, orders be placed so that advantage may be taken of the foregoing. The use of side coatings as specified in 3.7.2 further reduces the amount of seasoning degrade and should be specified in all requests for oak for use by west coast activities outside the limits of the continental United States. Side coatings are not necessary on oak which has been thoroughly seasoned before shipment.

6.5 Working stresses. Working stresses for lumber in classes 1, 2, or 3 under normal loading in wet conditions are specified in table III. Increases of these stresses for use under dry conditions are listed.

TABLE III. Working stresses for classes 1, 2, and 3 white or red oak in the wet condition under normal loading.

Class and grade	Bending or tension		E x 10 ³	Compression parallel		Compression perpendicular	Shear
	2" to 4"	5" +		2" to 4"	5" +		
1 - A	1,700	1,700	1,500	1,120	1,120	400	150
1 - B and 2	1,350	1,350	1,500	950	950	400	135
3 - A	1,700	1,700	1,500	1,100	1,100	400	150
3 - B	1,300	1,300	1,500	1,000	1,000	400	135
PERCENT INCREASE FOR DRY USE UNDER NORMAL LOADING							
1 - A	15	0	10	25	10	50	10
1 - B and 2	5	0	10	15	10	50	10
3 - A	15	0	10	25	10	50	10
3 - B	5	0	10	15	10	50	10

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6.6 Defects and sapwood. This specification specifies the acceptable extent of defects and sapwood (see 6.7) permitted in the poorest pieces of timber. In cases where it is known that the end use will require fairing or reduction of cross-section of the piece, requirements for wane and sapwood may be liberalized by the contracting activity to account for material that will be removed. The working stresses of table III are not valid if large material has been resawn in the end use so that knots are proportionately larger in the finished piece than permitted in table I.

6.7 Type identification. It is very important that lumber secured under this specification be identified as to white oak or red oak, or sapwood or heartwood. The heartwood of white oak has approximately twice the natural decay resistance of red oak heartwood. The sapwood of both species possesses no natural resistance and is subject to rapid decay; hence, sapwood and heartwood of red oak are restricted in this specification unless preservative treatment is given (see 3.3.2 and 3.4). White oak can be readily differentiated from red oak, as can sapwood from heartwood, by the use of chemical solutions which result in a characteristic color change when applied to questionable boards or timbers. The chemicals and necessary procedures are as follows:

(a) Indicator I - To distinguish oak sapwood from heartwood:

- (1) Prepare a 0.5 percent solution of methyl orange in 25 percent alcohol solution.
- (2) Apply as a brush stripe to freshly surfaced portion:
 - a. Yellow color indicates oak sapwood.
 - b. Red color indicates oak heartwood.

(b) Indicator II - To distinguish red oak from white oak:

- (1) Prepare solution A as follows:
 - a. Dissolve 6.98 grams of benzidine hydrochloride in 10.6 milliliters (mL) of concentrated hydrochloric acid.
 - b. Add 970 mL of distilled water.
- (2) Prepare solution B as a 10 percent aqueous solution of sodium nitrite.
- (3) Mix equal amounts of solutions A and B sufficient for 1 day's use (the two solutions together are unstable for longer periods).
- (4) Apply as a brush stripe to freshly cut or clean bright surface of heartwood only.
- (5) Observe color reaction 20 to 30 minutes after applying:
 - a. Light to medium reddish-orange color indicates red oak.
 - b. Dark greenish-brown color indicates white oak.

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Users are cautioned to prevent skin contact with the chemicals and to avoid spilling of chemicals on clothing. It is necessary to apply indicator II as a 50-50 mixture of solutions A and B, as a misleading color reaction can otherwise occur. The chemicals are readily obtainable and provide positive identification rapidly.

6.8 Storage of class 5 lumber. To insure that bending oak moisture content will be not less than 15 percent at the time of use, stock should be segregated for special handling. Stocks should be well marked to insure against stickering. They should be kept solid piled and protected from high temperature or direct sunlight. A covering should be used to minimize evaporation.

6.9 Subject term (key word) listing.

Ammoniacal copper arsenate
Chromated copper arsenate
Flat sawn
Moisture content
Quarter sawn

6.10 Changes from previous issue. Marginal notations are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:

Navy - SH
Air Force - 99

Preparing activity:

Navy - SH
(Project 5510-0234)

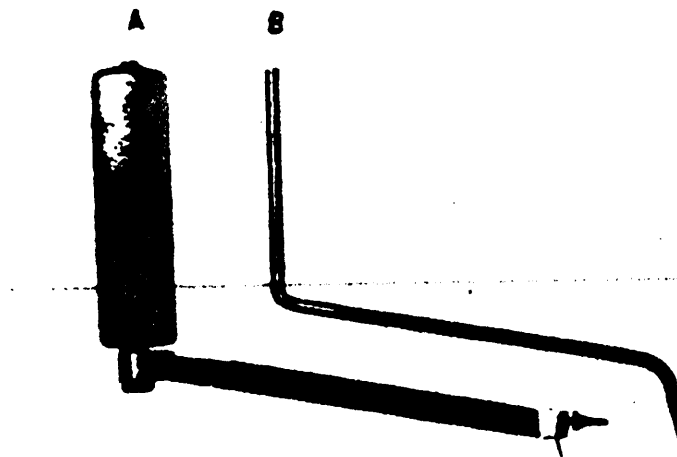
Review activities

DLA-CS
Air Force - 84

User activities

Army - ME
Navy - CG

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NOTES:

- A. is swivelhandled with phonograph-needle point.
- B. is a one piece drill rod bent to the shape and point slightly hardened.

FIGURE 1. Scribes for determining the direction of fibers on the surface wood.

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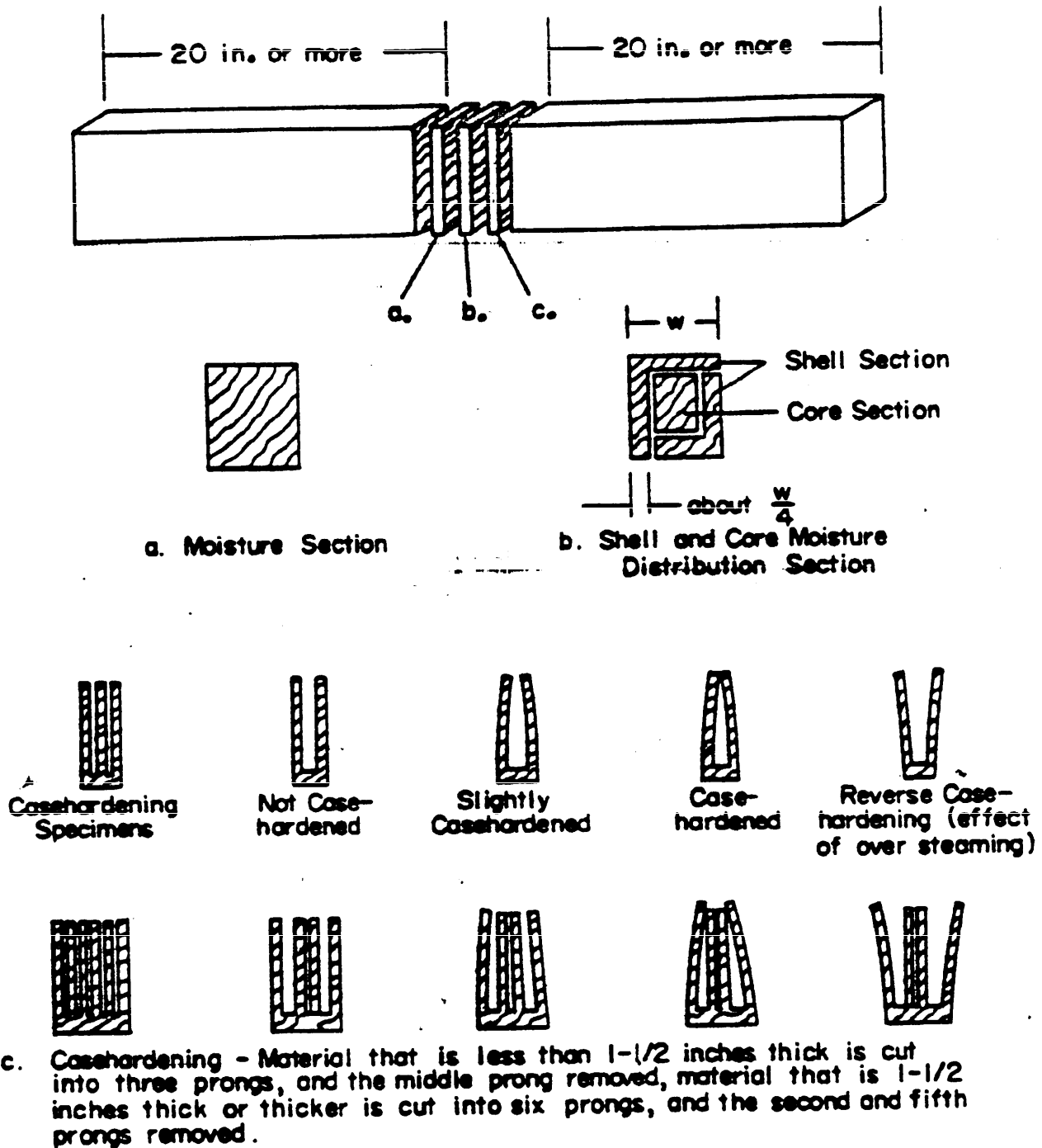


FIGURE 2. Test sections for determining moisture content, moisture distribution and casehardening.

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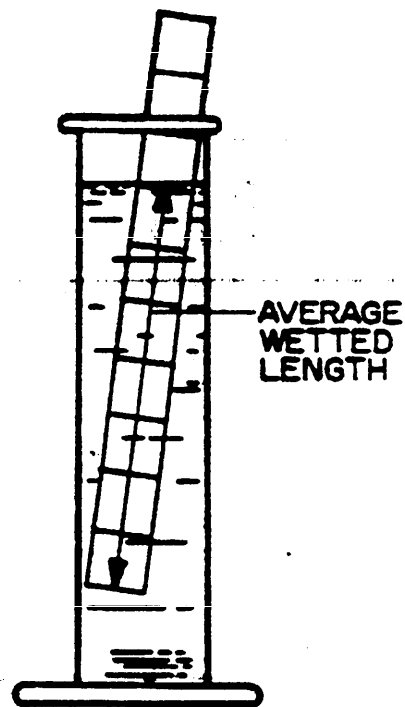


FIGURE 3. Specific gravity.

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

1. The preparing activity must complete blocks 1, 2, 3, and 8. In block 1, both the document number and revision letter should be given.
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1. RECOMMEND A CHANGE:		1. DOCUMENT NUMBER MIL-L-2037E	2. DOCUMENT DATE (YYMMDD)
3. DOCUMENT TITLE LUMBER, OAK, WHITE AND RED, FOR SHIP AND BOAT CONSTRUCTION			
4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)			
5. REASON FOR RECOMMENDATION			
6. SUBMITTER a. NAME (Last, First, Middle Initial)		b. ORGANIZATION	
c. ADDRESS (Include Zip Code)		d. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON (if applicable)	7. DATE SUBMITTED (YYMMDD)
8. PREPARING ACTIVITY			
a. NAME Technical Point of Contact (TPOC): Mr. John Pinto (05M3.1)		b. TELEPHONE (Include Area Code) (1) Commercial (2) AUTOVON	
PLEASE ADDRESS ALL CORRESPONDENCE AS FOLLOWS:		TPOC: 703-602-0146	
c. ADDRESS (Include Zip Code) Commander, Naval Sea Systems Command Department of the Navy (SEA 55Z3) Washington, DC 20362-5101		IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardization Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	