

MIL-L-2594D
14 March 1988
SUPERSEDING
MIL-L-2594C(SHIPS)
28 June 1956
(See 6.9 and 6.11)

MILITARY SPECIFICATION

LUMBER, SHIP AND BOAT CONSTRUCTION, CEDAR, MAHOGANY, AND DOUGLAS FIR

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

1. SCOPE

1.1 Scope. This specification covers high quality lumber of Port Orford cedar, Alaska yellow cedar, Douglas fir, and the species commercially known as mahogany, suitable for ship and boat construction.

1.2 Classification. Lumber shall be of the following types and classes, as specified (see 6.2.1):

Type I - Cedar
Type II - Mahogany
Type III - Douglas fir

Grade A - Bending quality, best appearance
Grade B - High strength, good appearance

2. APPLICABLE DOCUMENTS

2.1 Government documents.

2.1.1 Specifications and standards. The following specifications and standards form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of these documents shall be those listed in the issue of the Department of Defense Index of Specifications and Standards (DoDISS) and supplement thereto, cited in the solicitation.

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

DISTRIBUTION STATEMENT A

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FSC 5510

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SPECIFICATIONS

FEDERAL

- TT-P-320 - Pigment, Aluminum: Powder and Paste for Paint.
- TT-V-119 - Varnish, Spar, Phenolic-Resin.

MILITARY

- MIL-L-14362 - Lumber: Unitizing and Loading 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 and standards required by contractors in connection with specific acquisition functions should be obtained from the contracting activity or as directed by the contracting activity.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted shall be those listed in the issue of the DoDISS specified in the solicitation. Unless otherwise specified, the issues of documents not listed in the DoDISS shall be the issue of the nongovernment documents which is current on the date of the solicitation.

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

- D 607 - Standard Specification for Wet Ground Mica Pigments.
(DoD adopted)
- D 2016 - Standard Test Methods for Moisture Content of Wood.
(DoD adopted)
- D 2395 - Standard Test Methods for Specific Gravity of Wood and Wood-Base Materials.

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

WEST COAST LUMBER INSPECTION BUREAU (WCLIB)

- West Coast Lumber-Standard Grading Rules for Douglas Fir,
Western Hemlock, Western Red Cedar, White Fir and Sitka Spruce.

(Application for copies should be addressed to West Coast Lumber Inspection Bureau, 6890 S.W. Varns Street, P.O. Box 23145, Portland, OR 97223.)

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

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2.3 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein (except for associated detail specifications, specification sheets or MS standards), the text of this specification shall take precedence. Nothing in this specification, however, shall supersede applicable laws and regulations unless a specific exemption has been obtained.

3. REQUIREMENTS

3.1 Material. When specified in the contract or order, a certificate of compliance shall be prepared (see 6.2.2).

3.1.1 Type I. Cedar lumber shall be Port Orford cedar (*Chamaecyparis lawsoniana*) or Alaska yellow cedar (*Chamaecyparis nootkatensis*), as specified (see 6.2.1 and 6.8). Port Orford cedar is grown in southwest Oregon to northwest California. Alaska yellow cedar is grown in the Pacific coast region from south-east Alaska, British Columbia, Washington, Oregon, and northwest California.

3.1.2 Type II. Mahogany lumber shall be African, Philippine, or true (american) mahogany. American mahogany shall be of the species *Swietenia macrophylla* or *Swietenia mahogoni* grown in Mexico, the West Indies, Central America, and South America, as specified (see 6.2.1). African mahogany shall be of the species *Khaya ivorensis* or *Khaya senegalensis* grown in West Africa. Philippine mahogany shall be the dark red lauan species, *Shorea polysperma* (tanguile), *Shorea negrosensis*, (red lauan), and *Shorea aqsaboensis* (tianong) grown in the Philippine Islands (see 6.8).

3.1.3 Type III. Douglas fir lumber shall be of the species *Pseudotsuga menziesii* of the type grown in the coast region of California, Oregon, Washington in the United States and in British Columbia and Alberta in Canada (see 6.8).

3.2 Dimensions. Lumber shall be manufactured to the dimensions specified (see 6.2.1). The lumber shall have parallel edges and faces, cross sections rectangular, and ends trimmed square.

3.2.1 Rough sawn lumber. Unless otherwise specified (see 6.2.1), rough and full sawn lumber shall conform to the dimension tolerances specified in the WCLIB grading rules.

3.2.2 Surfaced lumber. Unless otherwise specified (see 6.2.1), surfaced lumber shall conform to dimension tolerance requirements for finish lumber in WCLIB grading rules.

3.3 End coatings. The ends of each piece of lumber shall be painted with two coats of aluminum or mica paint, the first coat to be applied within 24 hours after sawing. 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. Mica paint shall consist of 2 pounds of mica conforming to ASTM D 607 and 1 gallon of phenolic varnish conforming to TT-V-119. A drying interval of 24 hours shall elapse before applying a second coat. An alternate end coating may be any commercial end coating satisfactory to the contracting activity.

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3.4 Specific gravity. The purpose of this requirement is to eliminate exceptionally lightweight pieces. This shall normally be determined by the usual practice of comparing the weight of several pieces of like size. Pieces with a specific gravity of less than 0.40 (25 pounds per cubic foot (lb/ft³)) for cedar or less than 0.45 (28 lb/ft³) for mahogany or Douglas fir, based on oven-dry weight and oven-dry volume, shall not be accepted. In controversial cases the specific gravity shall be determined in accordance with 4.5.2.

3.5 Lumber characteristics and defects. Except as specified in table I, lumber shall be free of the following defects: decay, sapwood, knots, holes, checks, cross breaks, gum spots and streaks, excessive slope of grain, abnormal lightness, insect attack, excessive moisture, pith, splits, shakes, stain, wane, warp, chipped grain, loosened grain, raised grain, torn grain, skips, bark or pitch pockets, worm holes, pitch streaks, swirl figures, rough edges, and variations in sawing.

TABLE I. Maximum allowable defects.^{1/}

Defect	Grade A	Grade B
Checks (seasoning)	2 "small" per 4 ft ² of face side 4 "small" per 4 ft ² of reverse side	4 "small" per 4 ft ² of face side 4 "small" per 4 ft ² of reverse side
Knots (only sound and watertight allowed)	1/2 inch diameter or 1/2 inch sum of diameters per 8 ft ² of face side 1/2 inch diameter or 1 inch sum of diameters per 8 ft ² of reverse side.	1/2 inch diameter or 1/2 inch sum of diameters per 4 ft ² of face side 3/4 inch diameter or 1 inch sum of diameters per 4 ft ² of reverse side
Slope of grain (maximum slope)	1 in 15	1 in 12
Pitch, gum, or bark pockets	1 "very small" per 4 ft ² of face side 1 "small" or equivalent per 4 ft ² on reverse side	2 "very small" per 4 ft ² of face side 2 "small" or equivalent per 4 ft ² of reverse side
Bright sapwood	1/8 width of face and 1/2 thickness of edge on which it appears, at any point	
Moisture content	13 ± 3 percent ^{2/}	
Growth rate	Not less than 6 annual rings per inch, type I and III Not less than 4 annual rings per inch, type II	

See footnotes at end of table.

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TABLE I. Maximum allowable defects.^{1/} - Continued

Defect	Grade A	Grade B
Splits	2 inches long or less, and "short" in not more than 5 percent of pieces in lot	
Wane (maximum)	1/12 of width of face and 1/2 thickness of edge on which it appears, at any point	
Torn grain, skips	"very light" (1/64 inch depth or less)	
Cup	"very light"	
Pinworm holes	4 per 4 ft ² , none through, not more than 2 in a 1-inch diameter circle	
Cutouts	None permitted	
Cut	Free of heart center (FOHC) Unless otherwise specified (see 6.2.1), vertical, flat, or mixed grain is permitted	

^{1/} Defect descriptions such as "very small", "very light", and so forth, are as defined in the WCLIB Standard Grading Rules.

^{2/} Moisture content is for lumber 4 inches or less in thickness.

3.5.1 The defects permitted in table I shall be so scattered in any one piece that no combination of them at any one point is more weakening than a single maximum permissible defect. Except for splits, no open defects shall extend through the piece.

3.5.2 Insect attack. The presence of frass or other indications of active insect attack shall be cause for rejection.

3.5.3 Lightness. Lightweight, brash lumber shall not be accepted (see 3.4).

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 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 the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

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4.1.1 Responsibility for compliance. All items must 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 assuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling in quality conformance 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 Inspection lot. All lumber of one type and class which is offered for delivery at one time shall be considered a lot for purposes of inspection.

4.2.1 Quantity. The quantity of lumber in the lot shall be determined by tally, in accordance with commercial practice.

4.3 Sampling for dimensions and moisture content. Sample pieces of lumber shall be selected at random from each lot in accordance with MIL-STD-105 at inspection level II and acceptable quality level (AQL) 4.0 percent defective for the examination and tests specified in 4.4.2 and 4.5.1.

4.4 Lot acceptance examination and tests.

4.4.1 Visual examination. Each piece of lumber in the lot shall be visually examined to determine compliance with the requirements of this specification for species, defects, and absence of insect infestation and decay. Lightness (see 3.5) shall be determined during the visual examination and questionable pieces shall be tested in accordance with 4.5.2, if necessary. Nonconforming pieces shall be rejected.

4.4.1.1 Species. Samples of lumber of doubtful species shall be forwarded to a laboratory designated by the contracting activity for positive identification (see 6.8).

4.4.1.2 Slope of grain. Slope of grain shall be measured on each face and edge independently over a distance sufficient to determine the general slope. Slight local variations around permissible defects shall be disregarded.

4.4.1.3 Measurement of knots or holes. The diameter of knots or holes shall be determined in accordance with the methods 201a and 201b of the WCLIB Grading Rules.

4.4.2 Dimensions and moisture content. Each sample piece selected in accordance with 4.3 shall be examined for conformance to the requirements of this specification for dimensions and tested for moisture content (see 4.5.1). Sample pieces which do not meet the requirements shall be rejected. If the number of reject pieces found in any sample exceeds the limits for the AQL specified in 4.3 for that sample, the lot represented by the sample shall be rejected. Rejected lots may be resubmitted for examination and tests after all nonconforming pieces have been removed from the lot.

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4.5 Test methods.

4.5.1 Moisture content. Moisture content shall be determined by one of the methods described in ASTM D 2016. Electric meters shall be used only if provided with correction factors for these species.

4.5.2 Specific gravity. Specific gravity shall be determined by method 1 described in 4.5.2.1 or method 2 specified in 4.5.2.2.

4.5.2.1 Method 1. Specific gravity is the ratio of the volume below the waterline (see figure 1) to that of the whole piece. This method consists of the following steps:

- (a) From the lumber to be tested, cut a piece about 1 by 1 by 12 inches, with the 12-inch dimension along the grain.
- (b) Dry the piece at 212 to 221 degrees Fahrenheit (°F) for 48 hours or until it reaches constant weight.
- (c) Quickly dress the piece so that the cross section is rectangular and uniform throughout the length, and trim it to exactly 10 inches in length.
- (d) Mark off the length in inches starting at the end that is to be submerged.
- (e) 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, and quickly remove the piece and mark the waterline (see figure 1).
- (f) The average position of the waterline should correspond 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. (For example, if the waterline is halfway between the 4 and 5 inch marks, the specific gravity is 0.45.)

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, particularly after it is placed in the water. When determining the acceptability of suspected material, the required immersion depth may be marked on the piece before testing.

4.5.2.2 Method 2. The specific gravity is determined in accordance with one of the methods specified in ASTM D 2395, using oven dry weight and volume.

4.6 Inspection of packaging. Samples packages and packs, and the inspection of the preservation-packaging, packing and marking for shipment and storage shall be in accordance with the requirements of section 5 and the documents specified therein.

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5. PACKAGING

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

5.1 Packing. The lumber shall be prepared and loaded for shipment in accordance with the level and method specified (see 6.2.1) in MIL-L-14362. Rough lumber shall be protected from precipitation and direct sunlight. Surfaced lumber and dried lumber shall be shipped protected from precipitation and direct sunlight, and shall be stored under cover at all times.

5.2 Marking. In addition to any special marking (see 6.2.1), shipments shall be marked in accordance with MIL-STD-129 for carload shipments. Tally cards shall be conspicuously posted at access entrance ways within the carrier. The tally cards shall be protected against deterioration and loss.

6. NOTES

6.1 Intended use. Lumber conforming to this specification is intended for use in construction and repair of naval wood craft. The material is of a quality suitable for direct use, in full size, without further selection or cutting to obtain high grade pieces. Although cedar, mahogany, and Douglas fir are all used in ship and boat work, they are not necessarily interchangeable. Where drawings and specifications call for a particular type, that type should be used. In some cases, a particular species of cedar or mahogany may be required. It can be ordered specifically (see 6.2.1), conforming to the requirements specified herein for that type.

6.1.1 Grade A. Grade A material is intended for use primarily as hull planking, decking, and ceiling, especially where forming to sharp curvature is involved.

6.1.2 Grade B. Grade B material is intended for use as hull planking and ceiling where strength and curvature requirements are less severe and for structural members such as stringers and beams. The high quality and cost of these materials makes it inadvisable to use them for non-structural joinery and cabinetwork. For these uses, standard commercial finish and industrial grades of lumber are satisfactory and less expensive.

6.2 Ordering data.

6.2.1 Acquisition requirements. Acquisition documents should specify the following:

- (a) Title, number, and date of this specification.
- (b) Type, grade, and specific species (if necessary)
(see 1.2, 3.1.1, 3.1.2 and 6.1).
- (c) Dimensions and tolerances (see 3.2, 3.2.1, and 3.2.2).
- (d) More stringent defect requirements, if required
(see 3.5 and table I).
- (e) Grain direction (see table I).
- (f) Level and method of packing required (see 5.1).
- (g) Special marking required (see 5.2).
- (h) Moisture content if other than specified (see table I and 6.7).

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6.2.2 Data requirements. When this specification is used in an acquisition and data are required to be delivered, the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved Contract Data Requirements List (CDRL), incorporated into the contract. When the provisions of DoD FAR Supplement, Part 27, Sub-Part 27.475-1 (DD Form 1423) are invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this specification are cited in the following paragraph.

<u>Paragraph no.</u>	<u>Data requirement title</u>	<u>Applicable DID no.</u>	<u>Option</u>
3.1	Certificate of compliance	DI-E-2121	---

(Data item descriptions related to this specification, and identified in section 6 will be approved and listed as such in DoD 5010.12-L., AMSDL. Copies of data item descriptions required by the contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.)

6.2.2.1 The data requirements of 6.2.2 and any task in sections 3, 4, or 5 of this specification required to be performed to meet a data requirement may be waived by the contracting/acquisition activity upon certification by the offeror that identical data were submitted by the offeror and accepted by the Government under a previous contract for identical item acquired to this specification. This does not apply to specific data which may be required for each contract regardless of whether an identical item has been supplied previously (for example, test reports).

6.3 This specification defines the extent of defects and characteristics permitted in the poorest pieces of lumber acceptable in each grade.

6.4 Grain direction. The most economical way to order lumber is to specify flat or mixed grain. Vertical (edge) grain lumber is more expensive and difficult to obtain and should be used only where this type of grain pattern is specifically desired, or where better wear resistance or lower shrinkage and swelling across the board width is required, such as decking.

6.5 Decking. For decking use where the wood surface is exposed, defects on the wearing surface are undesirable. The material may be ordered with the following restrictions:

- (a) Material should be grade A or B on the reverse side.
- (b) The face side and upper half of edges should contain no defects, except for knots less than 1/4 inch in diameter, spaced not closer than 4 feet.
- (c) Torn grain and skips in accordance with grade A or B should be permitted.
- (d) Vertical or edge grain may be specified and, in the case of Douglas fir, it always should be required.

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6.6 Ordering time. Boat and shipping lumber which does not conform to standard commercial grading rules is manufactured to order, so additional time may be required for acquisition.

6.7 Moisture content. Lumber over 4 inches in thickness is not normally dried and should be specified as "any stage of seasoning." If thicker material is ordered dried, greatly increased costs and leadtime should be anticipated.

6.8 Identification of species.

6.8.1 Type I - cedar. Port Orford cedar has sapwood nearly white to pale yellowish white which is not clearly distinguishable from the heartwood, and is readily discerned by the characteristic pungent, ginger-like odor of the freshly cut surfaces. Alaska yellow cedar has a characteristic odor resembling raw potatoes. Sapwood is nearly white to yellowish white, heartwood is bright clear yellow, darkening upon exposure. Growth rings are normally very closely spaced.

6.8.2 Type II - mahogany.

6.8.2.1 The woods commonly sold in the United States as mahogany, with or without a qualifying term indicating their origin, may be classed in three commercial groups:

- (a) Woods from tropical America consisting of several species of the botanical genus Swietenia and commercially known simply as "mahogany".
- (b) A number of species of the African genus Khaya, termed "Khaya" and frequently called "African mahogany" in the trade.
- (c) Various Philippine hardwoods called "Dark Red Philippine mahogany" in the trade, which belong to the botanical genus Shorea, principally tanguile and red lauan (*S. negrosensis* and *S. polysperma*).

6.8.2.2 The color of all these woods comprises various shades of reddish brown. Tangile, however, which constitutes the bulk of "Philippine mahogany," and some species of khaya, often have a purplish tinge. In "American mahogany", and to a lesser extent in khaya, the color darkens with prolonged exposure to light, whereas unstained tangile becomes lighter colored. To observe the original color, therefore, fresh surfaces should be exposed.

6.8.2.3 All the woods in these three groups usually have interlocked grain and are lustrous, which gives quarter-sawed lumber and radially-cut veneer a pronounced ribbon figure; that is, alternating dark and light stripes an inch, more or less, in width. In all of them, the pores can be seen without a magnifying glass as minute holes on smoothly cut end surfaces and as grooves of varying lengths on planed longitudinal surfaces. The pores are fairly uniform in size and fairly evenly distributed on all surfaces.

6.8.2.4 Wood of a light grey or pale brown color is probably not of the species permitted.

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6.8.2.5 Swietenia and khaya have a distinctive characteristic in common, namely, the occurrence of dark amber-colored gum in many of the pores. This gum can be seen on planed or split longitudinal surfaces without a magnifying glass, but better with a glass, and it distinguishes Swietenia and khaya from Shorea, in which such gum does not occur.

6.8.2.6 Swietenia and khaya can be distinguished from each other by the presence in the former, and absence in the latter, of fine, continuous, light-colored, more or less parallel lines 1/32 to 1/2 inch apart on smoothly cut end-grain and quarter-sawed surfaces, and slightly to considerably farther apart on plain-sawed surfaces. Swietenia frequently contains a white deposit in the pores which is absent in khaya.

6.8.2.7 In Shorea species, the pores are partly filled with iridescent, froth-like growths known as "tyloses". On smoothly cut end surfaces, Shorea species show more or less broken parallel lines 1/8 inch to several inches apart, which are readily visible to the naked eye and appear under a lens as rows of minute openings, smaller than the pores, filled with a white substance.

6.9 Supersession. This specification provides material for the same end uses formerly covered by MIL-L-2549, class PD and by MIL-L-2594, grades A and B.

6.10 Subject term (key word) listing.

African genus khaya
Alaska yellow
Khaya
Port Orford
Shorea
Wood

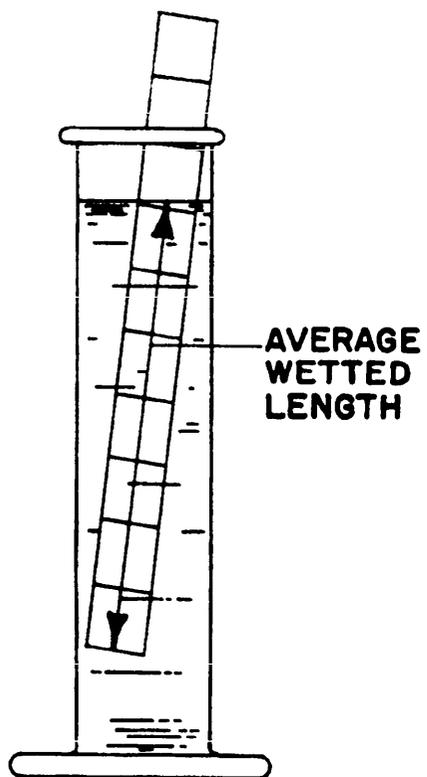
6.11 Changes from previous issue. Asterisks are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

Custodians:
Army - ME
Navy - SH
Air Force - 99

Preparing activity:
Navy - SH
(Project 5510-0181)

Review activity:
DLA - CS

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SH 1127

FIGURE 1. Specific gravity.

INSTRUCTIONS: In a continuing effort to make our standardization documents better, the DoD provides this form for use in submitting comments and suggestions for improvements. All users of military standardization documents are invited to provide suggestions. This form may be detached, folded along the lines indicated, taped along the loose edge (*DO NOT STAPLE*), and mailed. In block 5, be as specific as possible about particular problem areas such as wording which required interpretation, was too rigid, restrictive, loose, ambiguous, or was incompatible, and give proposed wording changes which would alleviate the problems. Enter in block 6 any remarks not related to a specific paragraph of the document. If block 7 is filled out, an acknowledgement will be mailed to you within 30 days to let you know that your comments were received and are being considered.

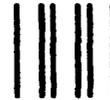
NOTE: This form may not be used to request copies of documents, nor to request waivers, deviations, or clarification of specification requirements on current contracts. Comments submitted on this form do not constitute or imply authorization to waive any portion of the referenced document(s) or to amend contractual requirements.

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