

PPP-B-576 – Boxes, Wood-Cleated Panelboard

Subject/Scope:

This specification covers the requirements for wood-cleated panelboard boxes intended for use as containers for domestic and overseas shipment of general materials and supplies, not exceeding 500 pounds for domestic or 400 pounds for overseas shipments (see 6.1).

Keywords:

Box, cleat, class, type, panel, panelboard, wood, test, fastener, nail, style, strapping, requirement, skid, specification, domestic, joint, overseas, minimum, inspection, fiberboard, dimension, weight, water, specimen, staple, container, content, table, load, area, federal, treatment, cleated, wire, nail, material, surface, style, corrugated, preservative, closure, document, government, mil, conform, group, strap, fire, assembly, loading, block, shipment, specification, commercial, material

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Text in blue boxes such as this one is instructional and is intended to assist you in understanding the document.

Text in red boxes such as this explains changes made to the document by The Wooden Crates Organization.

Red text has been added to the document or modifies the document since its final version was officially published.

Soft Conversion of Imperial to Metric

Conversions, when made, consider materials that are available in metric or imperial sizes rather than converting sizes exactly. For example: Panelboard (plywood) in the US is typically 4 feet X 8 feet (1220 x 2440 mm) while panelboard in metric countries is typically 1200 X 2400 mm. Since the standard was developed based on readily available materials these variations in material sizes could not have been practically considered.



The content of the document below has not been modified.

INCH-POUND

PPP-B-576C
December 22, 1993
SUPERSEDING
Fed. Spec. PPP-B-576B
August 19, 1966
Fed. Spec. PPP-B-591B
April 23, 1971

FEDERAL SPECIFICATION

BOXES, WOOD-CLEATED PANELBOARD

The General Services Administration has authorized the use of this federal specification, for all federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the requirements for wood-cleated panelboard boxes intended for use as containers for domestic and overseas shipment of general materials and supplies, not exceeding 500 pounds for domestic or 400 pounds for overseas shipments (see 6.1).

1.2 Classification.

1.2.1 Type. Boxes covered by this specification are identified by the panelboard material and shall be of the following types as specified (see 6.1 and 6.2).

- Type I - Veneer paper overlaid
- Type II - Corrugated plastic
- Type III - Corrugated and solid fiberboard

Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be used in improving this document should be addressed to: U.S. Army Natick Research, Development and Engineering Center, Natick, MA 01760-5018 by using the Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

AMSC N/A

FSC 8115

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PPP-B-576C

1.2.2 Class. Cleated-panel boxes shall be of the following classes as specified (see 6.2):

Class 1 - Domestic
Class 2 - Overseas

1.2.3 Style. Cleated-panel boxes shall be of the following styles as specified (see figure 1 and 6.2):

Style A - Standard box corner (see fig. 1)
Style A1 - style A box modified with skids and when specified
(see 6.2) unnailed top panel closure (see figure 1-A)
Style B - Interlocking three way corner (see figure 2) Style C
thru K - Limited to Type III Fiberboard box for class domestic
(see figure 1 and 6.2)

1.2.4 Treatment. Boxes shall be provided the following treatment as specified (see 6.2).

Treatment a. - Without water preservative or fire retardant
treatment
Treatment b. - With water preservative treatment
Treatment c. - With fire retardant treatment

2. APPLICABLE DOCUMENTS

2.1 Government documents. The following documents, of the issues in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein:

Federal Specifications

FF-F-133 - Fasteners, Corrugated Wood Joint, (Saw Edge)

FF-N-105 - Nails, Brads, Staples, and Spikes: Wire Cut and Wrought

Federal Standard

FED-STD-123 - Marking for Shipment (Civil Agencies)

(Activities outside the federal Government may obtain copies of federal specifications, standards, and commercial item descriptions as outlined under General Information in the Index of Federal Specifications, Standards and Commercial Item Descriptions. The Index, which includes cumulative bimonthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402-0001.)

(Single copies of this specification and other Federal specifications and commercial item descriptions required by activities outside the Federal Government for bidding purposes are available without charge from the General Services Administration Business Service Centers, Regional Offices in Boston, MA; New York, NY; Washington, DC; Atlanta, GA; Chicago, IL; Kansas City, MD; Fort Worth, TX; Denver, CO; San Francisco, CA; Los Angeles, CA; and Seattle, WA.)

(Federal Government activities may obtain copies of Federal standardization documents and the Index of Federal Specifications, standards and Commercial [tan Descriptions from established distribution points in their agencies.]

Military Specifications

MIL-L-19140 - Lumber and Plywood Fire-Retardant Treated
MIL-P-83668 - Plastic Board (For Packaging Applications)

Military Standards

MIL-STD-105 - Sampling Procedures and Tables for Inspection by
Attributes
MIL-STD-129 - Marking for Shipment and Storage
MIL-STD-731 - Quality of Wood Members for Containers and Pallets

(Copies of military specifications and standards required by contractors 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 documents form a part of this specification to the extent specified herein. Unless a specific issue is identified, the issue in effect on date of invitation for bids or request for proposal shall apply:

American Society for Testing and Materials (ASTM)

D 996 - Standard Terminology of Packaging and Distribution
Environments
D 1990 - Standard Practice for Establishing Allowable Properties
for Visually Graded Dimensions, Lumber from in Grade
Test of Full Size Specimens
D 3951 - Standard Practice for Commercial Packaging
D 4727 - Standard Specification for Corrugated and Solid Fiberboard Sheet
Stock (Container Grade) and Cut Shapes

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103-1187.)

American Plywood Association (APA)

PS1-83 - Construction and Industrial Plywood

(Application for copies should be addressed to the American Plywood Association, 7011 South 19th Street, P.O. Box 11700, Tacoma, WA 98411-0700.)

(Federal Government activities may obtain copies of those non-Government documents which have been indexed in the Department of Index of Specifications and Standards from the DOD Single Stock Point, 700 Robbins Avenue, Building 4D, Philadelphia, PA 19111-5094.)

3. REQUIREMENTS

3.1 Materials. It is encouraged that recycled material be used when practical. All materials used in the manufacture of boxes, either recovered, recycled or virgin shall meet the requirements of this and referenced documents. In addition materials shall not affect or be effected by the product being packed. Fiberboard panelboard shall have no more than 40 percent post consumer recovered material.

3.1.1 Panelboard. Panelboard shall be as specified (see 6.2 and 6.6).

3.1.1.1 Type I veneer paper-overlaid (pov). Panelboard for classes 1 and 2 boxes shall be in accordance with MDO of PS-1. The kraft paper faces used in manufacturing panelboard with veneer core thicknesses up to and including 3/16 inch shall be a minimum basis weight of 42 pounds per 1000 square feet. For core thicknesses over 3/16 inch and including 1/4 inch, the kraft paper faces shall be a minimum basis weight of 69 pounds per 1000 square feet for thickness requirements (see 3.2.1).

3.1.1.2 Type II corrugated plastic. Panelboard shall be polyethylene, containing 1/2 percent ultraviolet (UV) inhibitor and shall conform to MIL-P-83668, type II. The basis weight of the plastic panel shall be 245 to 255 pounds per 1000 square feet.

3.1.1.3 Type III corrugated and solid fiberboard. Panelboard shall conform to ASTM D 4727. Class 1 domestic and class 2 overseas single wall (SW), solid (SF) and V board SF shall conform to the requirements of 3.2.1.

3.1.2 Lumber. Lumber shall conform to MIL-STO-731, class 2 for cleats (see 3.2.2) and class 3 for skids (see 3.4) and shall conform to commercial standards in accordance with ASTM D 1990.

3.1.3 Fasteners.

3.1.3.1 Nails, Nails shall be made of steel wire and shall conform to the requirements of FF-N-105 and as specified in 3.2 and 3.3,

3.1.3.2 Staples or wire stitches. Staples or wire stitches shall be made of steel wire not less than 0.0625 inch diameter (16 gage). The bearing surface of the crown (the underside) shall be not less than 5/16 inch except that for type III boxes the bearing surface shall be not less than 1/2 inch long.

3.1.3.3 Single legged fasteners. Single legged fasteners shall be formed automatically into a nail from sheared off bright, smooth, knurled, or helically fluted low-carbon steel or medium carbon steel (stiff-stock) minimum 15 gage (0.072 inch diameter) wire and driven subsequently by special machine at rapid rate, with sheared-bevel or sheared-square point. The nail length, before driving, shall be a minimum of 1/8 inch longer than the thickness of the material being joined. The automatic machine for driving shall be provided with needle-point knives, J-clinch plate and 1/32 inch counter sink. Single leg fastener shall not be used in joining panel board to cleats.

3.1.3.4 Other fastenings. Other fastenings may be used to the extent specified under 3.2. Steel wire used for these fasteners shall have a diameter of not less than 0.0625 inch (16 gage). Points of fasteners and shanks shall be determined by the test specified in 4.4.1 for the applicable application. The holding power of these fasteners shall be equal to nails specified in 3.1.3.1.

3.1.3.5 Corrugated fasteners. Corrugated fasteners shall conform to FF-F-133 and as specified in 3.2.

3.1.4 Wood preservative, water repellent. Water repellent preservative shall be composed of either a 2 percent copper napthenate or a 3 percent zinc napthenate (M-GARD W 550) or a 1.8 percent copper-8-quinolinolate (PQ 56) (see 6.4).

3-2 Fabrication of panels. Panels shall be fabricated by nailing, stapling or gluing panel-board to cleats placed as shown on figures 1, 1A and 4 and as specified in 3.2.2.

3.2.1 Panelboard. Panelboard material as specified in 3.1.1.1, 3.1.1.2 and 3.1.1.3 shall be joined to cleats by fasteners or glue to make a panel for a box to carry weights of contents as specified in table I and II and herein. Panelboard for one and two piece panels shall be as specified in 3.2.1.1, 3.2.1.2 and 3.2.1.3. The weight of contents for type II panel boxes shall not exceed 500 pounds for class 1 nor more than 400 pounds for class 2. Glue shall not be used to secure plastic panelboard to cleats nor veneer paper overlaid panels to cleats.

TABLE I. Type I veneer paper/overlaid panelboard
thickness requirement

Weight of contents (pounds)		Class 1 (domestic) minimum thickness (inch)		Class 2 (overseas) minimum thickness (inch)	
Exceeding	Not exceeding	Type I and II loads 1/	Type III loads 1/	Type I and II loads 1/	Type III loads y
0	75	0.070	0.090	0.070	0.120
75	100	.115	.140	.115	.120
100	150	.115	.140	.140	.180
150	225	.115	.140	.140	.195
225	250	.170	.195	.170	.195
250	300	.170	.195	.225	
300	350	.225		.225	
350	400	.225			

1/ Type of load shall be as specified in 6.2 and as specified for use in 6.3.

TABLE II. Type III corrugated and solid fiberboard requirements

Weight of contents (pounds)		Class 1 (domestic)		Class 2 (overseas)
Exceeding	Not exceeding	CF D SW grades 1/	SF D grades 1/	SF grades 1/ 2/
0	75	200	200	V3S or V4S
75	150	275	275	V3S or V4S
150	200	350	350	V3S or V4S
200	300	350	350	
300	400		500	

1/ As defined in ASTM D 4727 CF or SF (corrugated or solid fiberboard) D (Domestic), SW (Single-Wall), grades as stated.

2/ Overseas (weather-resistant) boxes are limited to Styles A or B and shall not exceed dimensions of 4 feet in length, 3 feet in width or 3 feet in depth.

3.2.1.1 One piece and two piece panels. Bottom panels of boxes not exceeding 72 inches in length or 41 inches in width, shall consist of a single piece of panelboard. All panels of all style A, A1 and B boxes shall consist of one or two pieces of panelboard joined by either lap or butt joint as specified in 3.2.1.1.1 or 3.2.1.1.2. Each piece of panelboard in two piece panels, shall be not less than 24 inches in length or width. Panelboard joints in adjacent panels shall be not closer than 12 inches of being in line with adjacent parallel joints. Adjacent panels shall be designed for assembly with joints running perpendicular to each other.

3.2.1.1.1 Lap joint. The adjacent edges of the two pieces of panelboard shall be lapped not less than 3 inches and fastened by metal stitches, specified in 3.1.3.2, which shall pass through both pieces and be clinched. There shall be not less than two parallel rows of stitches spaced not less than 2 inches apart, and the spacing of stitches in each row shall not exceed 4 inches. The lap joint of type III, class 1 fiberboard panelboard may be firmly glued together with a water resistant glue bond. The fiberboard lap joint of panels shall be firmly glued to each other over the entire surface area of contact so that when tested in accordance with 4.4.1.2.1, the fiberboard or layer of fiberboard shall remain in contact with not less than 75 percent of the contact area of the other piece of fiberboard.

3.2.1.1.2 Butt joint. The adjacent edges of two pieces of panelboard shall be butted at the mid width of a joint cleat specified in a. and b. herein and each piece fastened to the cleat. The fastening panelboard to cleats using metal stitches shall be in accordance with 3.2.1.1.1 passing through the fiberboard and into the cleat. When glue is used to secure the panelboard joint to the cleat, the fiberboard butt joint area shall be glued over the entire area of surface contact. When tested in 4.4.1.2.1, the fiberboard or layer of fiberboard shall remain in contact with not less than 75 percent of the area of contact with the cleat.

3.2.1.1.3 Top panel modification for unnailed closure, style A1. The top panel of style A1 boxes shall be modified by providing through edge cleats and filler edge cleats on the underside of the panel (see figure 1A). The underside cleats shall be of the same width and thickness as required for the outer cleats. Inside through cleats shall be used to reinforce the inside top edge of ends of the box, and shall be as shown on figure 1A. The underside cleats shall be positioned on the panel so the cleat edges fit snugly within the applicable side and end panels of the box. Intermediate or reinforcing cleats required for the top panel of the style A box are not applicable for cleating the underside of the top panel.

3.2.2 Cleats. Cleats shall be made from wood specified in 3.1.2. The size of cleats shall be as specified in tables III, IV and V. Arrangement of cleats on panels shall be as shown on figures 1, 1A and 4. When assembling cleats to panelboard, the clearance between the end of each filler or intermediate cleat and through cleat shall be approximately equal. When filler and intermediate cleats are cut or notched as shown on figure 4 for water drainage, the clear area of the cut or notch shall be adjacent to the panelboard and end of the filler cleat shall abutt the edge of the through cleat. Intermediate cleats and additional cleats shall be as specified in 3.2.2.1 and 3.2.2.2.

TABLE III. Size of cleats for type I box panels

Weight of contents (pounds)		Class 1 (domestic), size of cleats (inches)		Class 2 (overseas), size of cleats (inches)	
Exceeding	Not exceeding	minimum width	minimum thickness	minimum width	minimum thickness
0	75	1-3/8	5/8	1-3/4	5/8
75	100	1-3/4	5/8	1-3/4	5/8
100	150	1-3/4	5/8	1-3/4	3/4
150	225	1-3/4	3/4	1-3/4	3/4
225	250	1-3/4	3/4	1-3/4	3/4
250	300	1-3/4	3/4	1-3/4	13/16
300	350	1-3/4	13/16	1-3/4	13/16
350	400	1-3/4	13/16		

TABLE IV. Size of cleats for type II box panels

Weight of contents (pounds)		Class 1 (domestic), size of cleats (inches)		Class 2 (overseas), size of cleats (inches)	
Exceeding	Not exceeding	minimum width	minimum thickness	minimum width	minimum thickness
0	100	1-3/4	3/4	1-3/4	3/4
100	150	1-3/4	3/4	2-1/4	3/4
150	225	2-5/8	3/4	2-5/8	3/4
225	250	3	3/4	3	3/4
250	300	3	3/4	3	3/4
300	350	3	3/4	3	3/4
350	400	3	3/4	3	3/4
400	500	3	3/4		

Style of box	Weight of contents (pounds)		Minimum size of cleats		
	Exceeding	Not exceeding	Thickness		Width
			Groups I and IX woods (inch)	Groups III and IV woods (inch)	All groups of woods (inches)
C through K	0	75	11/16	5/8	1-1/2
C through K	75	150	3/4	11/16	1-11/16
A and B	0	75	5/8	9/16	1-1/2
A and B	75	150	11/16	5/8	1-11/16
A and B	150	300	3/4	11/16	1-3/4
A and B	300	400	1	13/16	1-3/4
Class 2 (Overseas)					
Style of box	Weight of contents (pounds)		Minimum size of cleats for all wood groups (inches)		
	Exceeding	Not exceeding	Minimum thickness	Minimum width	
A or B only	0	200	3/4	1-3/4	

3.2.2.1 Intermediate cleat requirements for panels for class 1 (domestic) and class 2 (overseas) boxes with type 1 or 2 loads (see 6.3). When one or both dimensions of a panel measured between the inside edge of edge cleats (unframed area) exceeds 24 inches for class 1 (domestic) and class 2 (overseas), styles A and B boxes, one or more intermediate cleats of the same width and thickness as the edge cleats shall be applied perpendicular to the greater of the two dimensions between the edge cleats. The distance between edge cleats which are parallel with the intermediate cleats, or between intermediate cleats, shall not exceed 24 inches. When both dimensions of a panel (unframed area) exceed 24 inches and are approximately the same dimensions, the intermediate cleat(s) shall be perpendicular to the filler edge cleats on the ends, top, and bottom, and perpendicular to the through edge cleats on the sides. The drainage requirements of intermediate cleats on top and bottom panels shall be as specified in 3.2.1 for filler edge cleats. Spacing of cleats for type III boxes class 2 (overseas) shall be as for all other boxes except that the spacing shall be not more than 20 inches.

3.2.2.2 Additional cleats. Any panel of a box having the load concentrated near the center of an unframed area shall be reinforced with an additional cleat of the same width and thickness as the edge cleat.

3.2.2.2.1 Joint cleat for class 1 (domestic) boxes. The thickness of each joint cleat for class 1 (domestic) boxes shall be the same as the edge cleats. The width of each joint cleat shall be not less than 2-1/4 inches, except if the width of the edge cleat is greater than 2-1/4 inches, the joint cleat shall be the same width as the edge cleat. The length of the joint cleat shall be not less than the distance between edge cleats. The maximum deviation shall be minus 1/8 inch.

3.2.2.2.2 Joint cleat for class 2 (overseas) boxes. The thickness of each joint cleat shall be as specified for edge cleats and the width shall be not less than 1-1/3 times the required width of the edge cleat, but under no circumstances shall the width of the cleat be less than 2-1/4 inches.

3.2.3 Fastening of panelboard to cleats. Fasteners for joining panelboard to cleats shall conform to 3.1.3 for nails and 3.1.3.2 for staples and the sizes specified in table VI. Nails and staples shall be driven through the panelboard and into the cleats. Fastener length shall be long enough to be clinched not less than 1/8 inch. Shiners (protrusion of fastener points) shall not be permitted. Convergent or divergent staples that are of the specified length (not less than the sum of the thickness of the panelboard and cleat, plus 1/8 inch) normally will not protrude through the cleat do not have to be clinched. The bearing surface of the fastener shall not be over driven more than 10 percent of the panelboard thickness. The average spacing of the fasteners lengthwise of the cleat shall be not less than 3 inches between centers (see figure 2). The distance between the nearest edge of any fastener and the edge of the cleat shall be not less than 3/8 inch (see figure 2). Also, the distance between the nearest edge of any fastener and the end of the cleat shall be not less than 3/4 inch or more than 1-1/2 inches (see symbol D figure 2 and 3). Fasteners positioned lengthwise of a cleat shall be staggered to form two parallel rows approximately 3/8 inch from the edges of the cleat (see figure 2).

TABLE VI. Size of Nails and Staples for joining panelboard and cleats

Weight of contents (pounds)	Wire gage	Nails Diam. not less than		Staples & other Diam. not less	Length of all fasteners as specified
		Inch	Head Inch		
0-150	15	0.072	13/64	as specified in 3.1.3.2, 3.1.3.3, and 3.1.3.4	see 3.1.3 thru 3.1.3.4
150-500	14	0.080	13/64		

1/ Dimensions of nails for style c thru k of type III boxes shall be not less than 1 inch in length and have head diameter of not less than 1/4 inch.

2/ Staple crown for type III boxes shall be not less than 1/2 inch long,

3.2.3.1 Corrugated Fasteners. Corrugated fasteners shall be used for fastening butt joints for type III class 1 (domestic) boxes only. The depth of the fastener shall be not less than 5/8 inch. Alternatively, staples may be used at the butt joints of all type III box cleats.

3.3 Assembly of boxes. Each box shall be in agreement with figure 1 through 5 for the style of box as specified in the contract or order. Panels of styles A, C, F, H, I, J and K shall be joined with standard box corners in accordance with figure 2, style A. Panels of style B, D, E, and G shall be joined with interlocking three-way corners in accordance with figure 3, style B.

3.3.1 Nailing, Each nail fastening the panel board and edge cleat of a panel to the edge cleat of an adjacent panel shall be spaced as specified in table VIII or IX, as applicable, for the thickness of the cleats used (see symbol identification "S" of box assembly, figures 2 and 3). Boxes assembled with the box nails specified in 3.1.3.1 shall have approximately 10 percent more nails than boxes assembled with cooler or sinker nails. When cleats used are 2-1/4 inches or more in width, two nails shall be driven through the cleat near the end into the side of the appropriate cleat on the abutting panel (See figures 2 and 3). Nails used in the assembly of boxes shall be cement-coated, acid etched, or mechanically deformed (screw type or annular-ring type). Adjacent cleated panels shall be fastened together with coolers, sinkers, corkers or box nails using the nail size and spacing specified in tables VIII and DC, as applicable.

TABLE VII. Class 1 (domestic) type I, II and III boxes, size and spacing of nails for fastening together adjacent cleated panels

Cleats thickness (Inch)	Maximum spacing of nails for all wood groups (Inches)		Size of nails (penny) for wood groups 1/			
	Types I and II loads	Type III load	Group I wood	Group II wood	Group III wood	Group IV wood
9/16-5/8	6	5	6	6	6	5
11/32-24/32	5	4	7	7	7	6
3/4	5	4	7	7	7	6
13/16-1	3	3	8	7	7	7

1/ If the nail protrudes through the last edge cleat or splits cleat, then the next smaller size penny nail shall be used.

TABLE VIII. Class 2 (overseas) type I, II and III boxes, size and spacing of nails for fastening together adjacent cleated panels

Cleats thickness (Inch)	Maximum spacing of nails for all wood groups (Inches)		Size of nails (penny) for wood groups 1,/			
	Types I and II loads 2/	Type III load 37	Group I wood	Group II wood	Group III wood	Group IV wood
3/4	5	4	9	8	7	6

1/ If the nail protrudes through the last edge cleat or splits cleat, then the next smaller size penny nail shall be used.

2/ For type of load (see 6.3).

3.3.1.1 Staples, wire stitches, single leg, or other fasteners. When staples, wire stitches, single leg, or other fasteners are used in the assembly of the box, the fasteners shall be tested in accordance with 4.4.1.

3.3.1.2 Fastening ends of cleats (for class 1, domestic). Not less than one nail shall pass through each end of each overlapping through cleat and into the side of the appropriate cleat on the adjacent panel. If the weight of the contents of the box exceeds 150 pounds and the cleats are not less than 1-7/8 inches in width, not less than two nails shall pass through each end of each overlapping through cleat and into the side of the appropriate cleat on the adjacent panel, when cleats are group I or II woods; when cleats are group III or IV woods, one nail only shall be used.

3.3.1.3 Fastening uncleated edges of panel. For boxes of styles c to K, inclusive, the fiberboard along each uncleated edge shall be fastened to the cleat on the adjacent panel by nails passing through the fiberboard and into the cleat. Nails shall be not less than 1 inch long. The spacing of nails shall not exceed 3 inches. The head of the nail shall be not less than 1/4 inch in diameter.

3.3.2 Dimensions. Boxes shall be furnished having the dimensions specified (see 6.2). For the purpose of this specification, dimensions of a box shall be given in the sequence of length, width, depth. The first two dimensions shall be the open face of the box. Unless otherwise specified, dimensions of boxes shall be the inside measurements. A tolerance of +1/8 inch shall be permitted in the dimensions.

3.4 Skids. Lumber for skids shall be as specified in 3.1.2. Unless otherwise specified (see 6.2), each box intended for use with loads having a gross weight in excess of 200 pounds or when the box gross weight exceeds

100 pounds and both the length and width dimensions exceed 48 inches by 24 inches respectively, then each box shall be provided with a minimum of two skids. Additional skids shall be provided when the distance between skids, measured between the inside edges exceeds 48 inches. Additional skids, as required, shall be positioned so as to divide the area between the end skids into units of equal space. When bolt holes are provided in an end item or equipment, additional skids, if required, shall be located so as to enable the item to be bolted to the skids. The skids or built up skids and rubbing strips shall be a minimum of 2-1/2 inches high and 3-1/2 inches wide. The skids shall be placed parallel to and extend the full width of the box, (the shortest dimension of the bottom of the box) and shall be set not less than 2-1/2 inches or more than 1/6 the box length from each end. When skids only are used, when specified (see 6.2), a bevel of 45° (+5°) will be applied to the 3/4 inch portion of the skid ends. When rubbing strips are used in conjunction with skids, the skid ends will not be beveled and the rubbing strips will be set back from the ends of the skids a distance of 2-1/2 to 4 inches to allow for sling placement. When 4-way fork entry is required (see 6.2), skids shall be nominal 4x4, placed lengthwise not less than 1-1/2 inches nor more than 2-1/2 inches from the container sides and cut out a minimum of 2 inches in depth and of such width as to accommodate forks and slings for handling. When specified (see 6.2), 4-way fork entry shall be accomplished with built-up skids and rubbing strips having minimum dimensions of 3-1/2 inches in width and 4 inches in height with the cutouts being not less than 1-1/2 inches in depth. When skids are used, strapping is required. Each skid shall be notched sufficiently to provide clearance for strapping. Filler cleats of the same thickness as the end or side cleats of the bottom panel and not less than the width of the skids shall be provided between each skid and the bottom panel of the shipping container. Filler cleats shall not be required for style I boxes. The skids shall be secured to the box by nails conforming to type II, style 18 of FF-N-105, and of such length as to penetrate a minimum of 3/4 the skid thickness. These nails shall not protrude through the bottom surface of the skid. The nails shall be arranged in two rows in a staggered pattern, with spacing between nails in each row to be not more than 6 inches. Each row of nails shall be approximately 1/2 inch from the edge of the skid, and the nailing pattern shall begin and end approximately 1-1/2 inches from the end of each skid and shall not be nailed through the strap notch. In addition to the weight requirements specified herein, boxes having a width over 40 inches and fitted with rubbing strip skids shall be provided with additional cleats attached to the underside of the box (see figure 11). The added cleats are provided to prevent damage to the floor panel by the tynes of the fork lift.

3.5 Container manufacturer's identification. Unless otherwise specified (see 6.2), each panelboard box shall be marked with the specification number, box type, class, style, box manufacturer's name and address, maximum weight of contents, and type of load. All markings shall be limited to an area of 24 square inches and shall be placed in a low corner of a side panel in

letters approximately 5/16 inch high, except that the box specification number shall be in letters approximately 3/4 inch high. These markings shall be arranged in the following pattern as closely as possible:

Fed. spec. PPP-B-576
Box type, class and style
Box manufacturer's name and address
Maximum weight of contents (lbs.)
Type of load
Mod (When required, to designate that the box is in accordance with the specification requirements except for modification authorized in the contract or order.)

3.5.1 Preservative identification. The letters "PA" shall be annotated on all class 2 boxes subjected to the PQ56 (copper-8-quinolinolate) preservative treatment in accordance with 3.7. The letters "PB" shall be annotated on all class 2 boxes subjected to the M-3ARD W550 (zinc naphthenate emulsifiable) preservative treatment in accordance with 3.7.

3.6 Assembly, closure, and strapping of filled boxes. Where this specification is referenced as a requirement for the shipping of an item or items in a contract, order or specification, the requirements of the appendix shall be a mandatory part of this specification.

3.7 Water-repellent treatment. When specified (see 1.2.4 and 6.2) boxes shall have wood cleats treated with a water-repellent preservative specified in 3.1.4 applied either by immersion or spray. The preservative shall be dry to touch prior to assembling cleats to the panelboard or painting of the cleats. There shall be evidence of discoloration of the wood cleats when tested in 4.4.2.

3.8 Fire Retardant. When specified (see 1.2.4, 6.2 and 6.5) boxes shall be constructed of wood treated in accordance with MIL-L-19140.

3.9 Workmanship. No portion of the bearing surface of a fastener shall protrude above the surface of the panel board or cleat, nor shall it be overdriven more than 1/32 inch below the surface of the panelboard. Fasteners shall not be visibly deformed except where they are clinched. The panelboard shall be cut square and at no point shall the edge of the panel-board extend more than 1/16 inch over or 1/4 inch under the panel size as determined by the cleat assembly. The boxes shall conform to the quality of product established by this specification and the occurrence of defects shall not exceed the applicable acceptable quality levels.

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 requirement:, specified herein, unless disapproved Ly 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 in 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 manufacturing operations, is an acceptable practice u> 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.

4.1.2 Responsibility for dimensional requirements. Unless otherwise specified in the contract or purchase order, the contractor is responsible for ensuring that all specified dimensions have been net. When dimensions cannot be examined on the end item, inspection shall be made at any point, or at all points in the manufacturing process necessary to ensure compliance with all dimensional requirements.

4.2 Quality conformance inspection. Unless otherwise specified, sampling for inspection shall be performed in accordance with MIL-STD-105.

4.2,1 Component and material examination. In accordance with 4.1, components and materials shall be examined in accordance with all the requirements of referenced documents unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

4.2.1.1 Fastener testing. Fasteners furnished in accordance with 3.1.3.4 shall be tested as specified in 4.4.1.

4.2.1.2 Type III box, class 1 (domestic) glue bond testing. Panels glued In accordance with 3.2.1 shall be tested as specified in 4.4.1.2.1.

4.3 End item examination.

4.3.1 End item visual examination. The boxes shall be examined for the defects listed in table IX. The lot size shall be expressed in units of boxes of the same type, class, style, grade, (when applicable), and size offered for inspection at one time. The sample unit shall be one box and its top. The inspection level shall be S-4, and the acceptable quality level (AQL), expressed in terms of defects per hundred units, shall be 4.0 for major defects and 10.0 for total (major and minor combined) defects.

TABLE IX. End item visual defects

Category		Defect
Major	Minor	
101	201	<p>Panels</p> <p>Material not as specified for type box Panel up to and including 48-inch width by 72-inch length made up of more than one piece of panelboard and panelboard joints are in line in adjacent panels</p> <p>NOTE: Panels which exceed either of the above dimensions may be of one or two pieces and lap or butt joined</p>
	202	Lap joint of two-piece panel less than three inches and either piece greater than applicable thickness
102		Two piece top panel on style I and J box.
103	203	Lap joint not secured as specified
104		Fastenings not parallel
105		Fastening spacings more than specified
106		Butt joint of two-piece panel not secured with wood cleat centered over joint
107		Cleat not fastened to each piece of panel as required in 3.2.3 for fabrication of panels
108	204	Joint cleat for domestic type box or for overseas type box, as applicable, not as specified in 3.2.2.2.2
109	205	Panel not cut square
110		Edge extends over or under size (3.9)
111	206	Construction of panel
112		Cleat not properly positioned
113		Cleat not sufficient length
		Intermediate or additional cleat missing where required in 3.2.2.1 and 3.2.2.2
		Assembly not in true alignment
		Staple or other fastener not fully and securely driven through adjoining members, as specified
		Staple leg or other fastener point not completely clinched 1/32 or 1/8 inch, as applicable
		Protrusion of fastener joint (shiner) through side of cleat

TABLE IX. End item visual defects (cont'd)

Category		Defect	
Major	Minor		
114	Construction of panel (cont'd)	Fastener does not pass through panelboard and cleat or cleat and panelboard as applicable.	
115		Bearing surface of staple crown or nail head overdriven in excess of 1/32 inch or 10 percent of panelboard thickness, which ever is greater.	
116		Top panels for unnailed closure style A or B boxes not modified as specified.	
117	Box	Not type, class, style and grade box specified.	
		207	Spacing between metal fasteners in excess of maximum length specified
		208	Fasteners positioned lengthwise of cleats not staggered where possible to form two parallel rows.
		209	Less than 3/8 inch between nearest edge of fastener and edge of cleat
118		Unnailed closure style A or B box closed by means other than flat steel strapping.	
119	Skids	Skids not as specified or placed as specified.	
120		Floor supports missing on boxes over 40 inches wide	
121	Material	Fasteners not type and size specified; not cement coated, acid etched, or mechanically deformed, as applicable	
122		Panelboard less than specified thickness and not square	
123		Cleats less than specified width and thickness, missing or misplaced.	
124		Manufac- turer's	Omitted; incomplete; incorrect; illegible; of improper size or location.
125		identifica- tion	Water repellent preservative treatment missing when required
126			Preservative marking missing

4.3.2 Packaging examination. The fully packaged end items shall be examined for the defects listed below. The lot size shall be expressed in units of shipping containers. The sample unit shall be one shipping container fully packaged. The inspection level shall be S-2 and the AQL expressed in terms of defects per hundred units, shall be 2.5.

<u>Examine</u>	<u>Defect</u>
Marking (exterior and interior)	Quitted; incorrect; illegible; of improper size, location, sequence, or method of application.
Materials	Any component missing, damaged, or not as specified.
Workmanship	Inadequate application of components, such as: incomplete sealing or closure, Improper taping, loose strapping, or inadequate stapling. Bulged or distorted container.
Content	Number per container is more or less than required.

4.4 Methods of inspection.

4.4.1 Component tests for fasteners.

4.4.1.1 General. The tests in 4.4.1.2, and 4.4.1.3 are intended to indicate the relative performance of various types of fasteners when used in the fabrication of wood cleated panel boxes. Since these tests are comparative in nature, the appropriate cement coated nail designated in 3.1.3.1 and of size specified for the purpose in table VII, VIII and DC must be tested concurrently with the alternate fasteners being considered to replace it. Five test specimens are required for each variety of fastener to be evaluated. Unless otherwise specified herein, these specimens shall be prepared from the same thickness and group of wood as will be employed in fabricating the boxes and the width of the representative cleat sections of the test specimen shall be the same as that specified for the container in which the fasteners are planned to be used. No test specimen shall contain split members. Nails and other fastenings shall be driven so that neither the head nor the point will project above the surface of the wood (except for the purpose of clinching where required). Specimens shall be cut and fabricated so that only side-grain nailing results. Each of the tests shall be performed on a compression tester equipped with an autographic recorder for producing force-deflection curves. The test fixtures for holding the test specimen, as illustrated in figures 7 and 10, shall be designed so that the applied force is perpendicular to the plane of the test member in contact with the loading block. Also, the test fixtures and loading blocks shall be dimensioned to provide clearances sufficient to prevent direct contact of the test specimen with the platens of the compression tester at any time during

test prior to failure. The platen speed shall be 0.4 inch per minute + 0.1 inch per minute, failure is denoted by the complete separation of one member from another in the specimen and shall be recorded in terms of the energy required to produce this separation. The required "energy-to-failure" value for each test specimen shall be determined by measuring the area under the force-deflection curve from the point of initial loading to the failure point. The average "energy-to-failure" values obtained with the nails and with the other fasteners shall be calculated and this data used to determine the total number of fasteners required. The total number of fasteners shall be not less than the total number of nails that would be required. When additional fasteners are required, the increase should be limited to the number which can be used without causing splitting of the wood members of the box during assembly,

4.4.1.2 Test of fasteners for securing cleats to panelboard panels. The test specimen shall consist of two sections of representative cleat stock measuring 14 inches in length, each secured with a test fastener as shown in figure 6, to the opposite edges of a representative container panel board panel section measuring 6 by 12 inches. The two fasteners used to assemble the specimen shall be located as shown in figure 6 and shall be clinched not less than 1/8 inch. The test specimens shall be mounted in a test fixture such as illustrated in figure 7. The test fixture rests on the lower platen of the compression tester and the compression load is applied to the wood loading block which transmits the applied force to the specimen member representing the container end section. The loading block dimensions shall be such that the block covers the entire area of the specimen member it is in contact with except for a 1/4-inch clearance between the sides of the block and the adjacent cleat members. Testing of the specimen shall be performed as described in 4.4.1.1.

4.4.1.2.1 (Type III boxes) water resistance of glued joints (for class 1 domestic) (see 3.2.1). If the fiberboard is fastened to the cleats by glue only, the water resistance of the glue shall be determined by loss of adhesion when exposed to water. Samples of the panels shall be made watertight at the corners only where the cleats join, by applying a suitable material such as molten wax or paraffin. The panel, cleats up, shall be filled with water at room temperature to 1/16 inch of the upper surfaces of the cleats. This water level shall be maintained for not less than 24 hours. Each cleat in succession shall be torn from the fiberboard by hand, using the fingers. The portion of fiberboard remaining in contact with the cleat shall cover not less than 75 percent of the area of the cleat.

4.4.1.3 Test of fasteners for container assembly.

4.4.1.3.1 lateral resistance test. The test specimen shall consist of two sections of representative cleat stock, measuring 2-1/4 by 10 inches, each secured with one test fastener as shown in figure 8 to the opposite edges of a representative container panel section measuring 6 by 6 inches. The total

of two test fasteners used to assemble the specimen shall be located as shown in figure 8. The specimen test fixture and the testing procedure shall be as described in 4.4.1.1.

4.4.1.3.2 Direct withdrawal resistance test. The test specimen shall consist of a section of representative cleat stock, measuring 3 by 10 inches, secured with three test fasteners as shown in figure 9, to a representative container panel section measuring 5 by 6 inches. The fasteners used to assemble the specimen shall be located as shown in figure 9. The test specimens shall be mounted in a test fixture such as illustrated in figure 10. The test fixture rests on the lower platen of the compression tester and the compression load is applied to the wood loading block which transmits the applied force to the member representing the container panel section. The loading block dimensions are such that the block covers the entire area of the specimen member it is in contact with except for a 1/4-inch clearance between the side walls of the slot in the wood loading block and the adjacent parallel surfaces of the test specimen. The depth of the slot should be great enough to prevent contact of the loading block with the portion of the test specimen within the slot at any time during testing. Testing of the specimen shall be performed as described in 4.4.1.1.

4.4.2 End item testing. The completely assembled boxes shall be tested for preservative treatment. The lot size shall be expressed in terms of completely assembled boxes. The sample size shall be one completely assembled box. The inspection level shall be S-4. The assembled box shall be placed on either end with top open. Any failure to meet the color requirements specified in 4.4.2.1 and 4.4.2.2 shall be cause for rejection of the lot.

4.4.2.1 PQ 56 (copper-8-quinolinolate) preservative test. Two drops of a formulation containing 10 parts, by weight, of sodium diethyl-dithiocarbamate trihydrate (see 6.4.3) and 90 parts, by weight, of distilled water shall be applied to the wood surface. An immediate dark brown coloration and the spreading of drops shall indicate the presence of PQ 56 treatment. An alternate method is to spray, over the dried wood surface, a solution of dissolved 0.5 grains chrome azurol S concentrate (see 6.4.4) and 5.0 grams of sodium acetate in 80 mL of distilled water, and diluted further to 500 mL total distilled water. A deep blue color reveals the presence of copper (from copper-8-quinolinolate).

4.4.2.2 M-GARD W 550 (zinc naphthenate emulsifiable) preservative test. Prepare daily a solution of 0.1 gram of dissolved dithizone (diphenylthiocarbazone) (see 6.4.5) in 100 mL of chloroform and spray evenly over dried wood. A pink color indicates the presence of zinc. (NOTE: The pink color fades with light.) An alternate method is to prepare a mixture of 10 mL each of three stock solutions and pour them into an atomizer (sprayer). The first stock solution is comprised of 1 gram of potassium ferricyanide dissolved in 100 mL of distilled water. The second solution is made of

1 gram of soluble starch in about 5 mL of distilled water which is added to 100 mL of distilled water and boiled for one minute with constant stirring, and then cooled. (NOTE: This solution is subject to biodegradation and should not be used longer than three days.) Spray the mixture evenly over the dried wood surface. The solution will cause the treated wood to turn a deep blue immediately/ and the untreated part will retain its original color.

5. PREPARATION FOR DELIVERY

5.1 Packing. Packing shall be level C, or commercial as specified (see 6.2).

5.1.1 Level C. Boxes are to be shipped completely assembled (except for tops) or knocked down as specified (see 6.2). The tops for boxes shipped completely assembled, and panels of like sizes for boxes shipped knocked down shall be bundled boxed or crated in quantities that permit easy loading and handling. Boxes shall be packed in a manner to ensure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies.

5.1.2 Commercial packing. Boxes shall be packed in accordance with ASTM D 3951.

5.2 Marking. In addition to any special marking required by the contract, shipments shall be marked in accordance with FED-STD-123, ASTM D 3951 or MIL-STD-129, as applicable.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. Boxes covered by this specification are intended to be used for domestic and overseas shipment of general materials and supplies. Styles A and B are fully cleated and are stronger than styles I and J. Style A lends itself to ease in assembly and opening. Style B, with its 3-way corner construction, has greater strength than style A but is more difficult to assemble and open. Styles I and J provide greater water shedding ability than style A or B. The unnailed closure option for style A or B is intended for use where shiners may damage contents or when reuse of the box is an important consideration. Types I and III boxes are normally used by all Military services and type II boxes are presently used by the Air Force.

6.1.1 Class 1 domestic boxes. Class 1 domestic boxes are for domestic shipments and for off-shore and overseas shipments contemplating protected storage and commercial type handling.

6.1.2 Class 2 overseas boxes. Class 2 overseas boxes are for overseas shipments and handling in military supply systems, subject to repeated rehandling and unprotected storage, and which may also be subject to extreme climatic hazards and temperature and humidity conditions such as have been experienced in combat operations in tropical rain forests (e.g., Southeast Asia).

6.1.3 Shipments of subsistence and clothing. Shipments of subsistence or clothing shall not be made in boxes fabricated from toxic-treated wood or panel board.

6.1.4 Shipments of exceptional commodities. For shipments of exceptional commodities, contracting agencies may require better boxes than those specified herein. Where the nature of the contents are classified as explosive or dangerous, the container must conform to the specifications prescribed in the Department of Transportation Regulations Governing Transportation of Explosive and other Dangerous Articles. (The Interstate Commerce Commission Regulations apply to such articles as explosives, flammable and corrosive liquids, compressed gases, flammable solids, oxidizing materials, poisons, etc.)

6.2 Acquisition requirements. Acquisition documents should specify the following:

- a. Title, number, and date of this specification.
- b. Type class style and treatment of box required (see 1.2.1, 1.2.2 and 1.2.3).
- c. When style 1A top panel closure is unnailed (see 1.2.3).
- d. Weight of contents (see tables I, II, III, IV, V, and VI).
- e. Quality classification of cleat lumber required (see 3.1.2).
- f. Lumber used for fabrication of skids (see 3.1.2).
- g. Intermediate cleat requirements for class 1 domestic, and class 2 overseas styles I and J (see 3.2.2.1).
- h. When skids are not required for boxes with gross weights of 200 pounds or 100 pounds with dimensions of 48 by 24 inches or more (see 3.4).
- i. When beveling of skids is required (see 3.4).
- j. When four-way entry skids are required and when 3-1/2 by 4 inch built up skids are required (see 3.4).
- k. When container manufacturer's identification is not required (see 3.5).
- l. Dimensions of box (see 3.3.2).
- m. When preservation is required (see 1.2.4, 3.7 and 6.5).
- n. Applicable level of packing (see 5.1).
- o. Whether boxes are to be shipped assembled or knocked-down (see 5.1.1).
- p. When class 1 domestic boxes require strapping (see 10.1).

- q. When SEAL joint specimens *ARE* required prior *to strapping* operations (see 40.1.2.2).
- r. When class 3 or 4 fire retardant boxes are required (see 1,2.2 and 3.8).

6.3 Type of load (see 3.2.2 and tables I and IX). The construction of a class 2 overseas cleated panelboard box is determined by the weight of contents and type of load. Load types are defined as type I, easy load; type II, average load; and type III, difficult load; as described under "Load type" in ASTM D 996.

6.4 Solution information,

6.4.1 PQ 56 (copper--8-quinolate), Product may be obtained from ISK Biotech, Industrial Biosides Division, 6075 Poplar Avenue, Suite 306, Memphis, IN 38119 or equivalent manufacturer.

6.4.2 M-GARD W 550 (zinc naphenate emulsifiable). Product may be obtained from CMS, Inc., 2301 Scranton Road, Cleveland, OH 44113 or equivalent manufacturer.

6.4.3 Sodium diethyldithiocarbamate trihydrate. Product may be obtained from J.T. Baker, Inc., 222 Red School Lane, Phillipsburg, NJ 08865 or equivalent manufacturer.

6.4.4 Chrome azurol S. Product may be obtained from Eastman Fine Chemical, Laboratory & Research Products, Building 701, Rochester, NY 14652-3512 or equivalent manufacturer.

6.4.5 Dithizone (diphenylthiocarbazon). Product may be obtained from Mallinckrodt, Inc./Mallinckrodt Specialty Chemical Co., Science Products Division, 675 Mc Donnell Blvd., P.O. Box 5840, St. Louis, MO 63134 or equivalent manufacturer.

6.5 Fire retardant boxes (class 3 and class 4). Fire retardant boxes are intended to reduce the risks and hazards of fire aboard ships and warehouses and to improve readiness by reducing losses due to fire destruction in compliance with the Navy Passive Fire Protection Program and other services programs.

6.6 Illustration information. Figures 1 through 10 are not drawings and should be treated as informational illustrations.

6.7 Subject term (key word) listing.

Box
Wood
Cleated

PPP-B-576C

Panel
Shipping container
Nails
Staples

6.8 Changes from previous issue. Asterisks (or vertical lines) are not used in this revision to identify changes with respect to the previous issue due to the extensiveness of the changes.

MILITARY INTERESTS:

Custodians

Army - GL
Navy - SA
Air Force - 69

Review Activities

Army - AV, EA, SM Air Force - 99

User Activities

Army - AR
Navy - MS, AS, SH

CIVIL AGENCY COORDINATING ACTIVITIES:

GSA - FSS

PREPARING ACTIVITY:

Army - GL

Project 8115-0532

BOXES, WOOD-CLEATED PANELBOARD

10. SCOPE

10.1 Scope. This appendix covers requirements for steel strapping and inspection for the application of strapping to boxes, wood-cleated panelboard. When specified (see 6.2), class 1 domestic boxes shall be strapped in conformance with this appendix. Unless otherwise specified (see 6.2), class 2 overseas boxes shall be strapped in conformance with this appendix specification and the references cited herein, 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,

20. APPLICABLE DOCUMENTS

20.1 The following specification, of the issues in effect on date of invitation for bids or request for proposal, form a part of this appendix to the extent specified herein.

Federal Standard:

FED-SID-101 - Test Procedures for Packaging Materials

Other Publications

American Society for Testing and Materials

D 3953 - Specification for Strapping, Flat Steel and Seals

30. REQUIREMENTS

30.1 General. Strapping required herein shall be performed when the box is packed for shipment. Strapping materials shall be furnished by the box packer, and shall be either round wire strapping as specified in tables XI, XII and XIII or flat metal strapping conforming to class 1, type I, III or IV, finish A or B of ASTM D 3953. The round wire shall be galvanized.

30.2 Size of strapping. The diameter of round-wire strapping shall be as given in table XI and size of flat strapping shall be as given in tables XII or XIII as applicable.

TABLE X. Diameter of round wire

Weight of contents (Pounds)	Diameter of wire when different numbers of wire are used (Inch and Gage)			
	2 wires		3 or more wires	
	100,000 pounds per square inch tensile strength	140,000 pounds per square inch tensile strength	100,000 pounds per square inch tensile strength	140,000 pounds per square inch tensile strength
Up thru 70	0.0720 (15 ga)	0.0720 (15 ga)	0.0720 (15 ga)	0.0720 (15 ga)
71 thru 125	0.0800 (14 ga)	0.0720 (15 ga)	0.0800 (14 ga)	0.0720 (15 ga)
126 thru 175	0.0915 (13 ga)	0.0800 (14 ga)	0.0915 (13 ga)	0.0800 (14 ga)
176 thru 250	0.0915 (13 ga)	0.0915 (13 ga)	0.0915 (13 ga)	0.0915 (13 ga)
251 thru 400			0.0915 (13 ga)	0.0915 (13 ga)
401 thru 1000			0.1055 (12 ga)	0.0990 (12-1 ga)

TABLE XI. Sizes of flat metal bands

Weight of contents (Pounds)	Dimensions of flat metal bands when different numbers of bands are used (Inch)	
	2 bands	3 or more bands
Up thru 70	3/8 by 0.020	3/8 by 0.020
71 thru 125	3/8 by 0.020	3/8 by 0.020
125 thru 175	1/2 by 0.020	1/2 by 0.020
176 thru 250	5/8 by 0.020	5/8 by 0.020
251 thru 400		3/4 by 0.020
401 thru 1000		3/4 by 0.023

TABLE XII. Sizes of type III, twist-tied flat metal strapping

Weight of contents not exceeding (Pounds)	Dimensions when different numbers of bands are used (Inch)	
	2 straps	3 or more straps
70	0.140 by 0.031	0.138 by 0.025

30.3 Tensile strength. The strength of the seal joint shall be not less than 75 percent of the tensile strength of the flat or round wire, strapping, as applicable, when tested as specified in 40.2.

30.4 Tightness. The straps shall be drawn tight so as to sink into the wood at the edges. Unless otherwise specified herein, straps or wires shall be stapled to the cleats at a distance not to exceed 4 inches from the edge or face of the box with cement-coated or chemically etched staples, spaced at intervals of approximately 6 inches. Strapping on the bottom of the box shall not be stapled. Strapping applied over filler edge cleats of the top panel of the box shall not be stapled. One staple shall be applied over each strap into the through edge cleats on the top panel of the box. Staples shall be not less than 0.080 inch in diameter (No. 14 gage), in accordance with FF-N-105 or the equivalent cross - section area, unless machine driven, in which case the staple shall be not less than 0.0475 inch in diameter (No. 18 gage). The length of staple shall be approximately 3/4 inch. When driven over flat strap, the staple shall be approximately 1/8 inch wider than the flat metal bands. Staples shall be driven so as not to damage the strapping. Staples shall be applied just prior to shipment where practicable.

30.3 Location and number of straps. All straps shall be applied perpendicular to the edge of the box and be positioned only over the cleats of the applicable style of box. Two straps shall be applied lengthwise to the box on the edge cleats over the ends, top and bottom for styles A and B. Two straps shall be applied lengthwise (horizontally) to the box on the edge cleats over the ends and sides for styles I and J. When intermediate cleats are required on the sides, top, or bottom a girth-wise strap shall be located over each intermediate cleat and shall be positioned on top of the longitudinal straps. When an intermediate cleat is required on an end panel, strapping shall not be required over this intermediate end cleat. In applying straps, care must be exercised so that straps do not pass over voids between cleats and thus become susceptible to snagging. Alternatively, each lengthwise and girthwise strap may be replaced by three corner flat straps each 8 inches long and secured to the container by three staples on each leg pneumatically driven through the strap into the cleats. The flat strapping shall be the same width, thickness, type, finish and grade as specified in 30.1 and table XII. Alternatively, the strapping may be the nail on type. Corner straps (nail on) shall not be used on unnailed closure boxes (such as style A1).

40. INSPECTION

40.1 Box inspection. Boxes shall be inspected to determine compliance with closure and strapping requirements of this appendix. Sampling shall be performed in accordance with MIL-STD-105.

40.1.1 Inspection for closure and strapping. Classification of defects shall be as specified in table XIV. The lot size shall be expressed in units of boxes, The sample unit shall be one complete box. The inspection level shall be S-3 and the AQL, expressed in terms of defects per hundred units, shall be 4.0.

TABLE XIII. Examination for closure and strapping

Category	Examine	Defect
<u>Major</u>		
101	Strapping (flat	Not size specified (see tables XI, XII
	or round, as	and XIII
102	applicable)	Not applied as specified
103		Missing strap
104		Loose strap
105		Torn or cut strap
106	Staples	More than 4 inches from edge of box
107		Less than size specified
108		Not spaced as specified

40.1.2 Testing of seal joint

40.1.2.1 Unless otherwise specified in 40.1.2.2, three separate joint specimens shall be taken from sample containers of each lot of strapped boxes submitted for inspection in 40.1.1 and tested *aa* specified in 40.2. If the seal strength of one or more of the three specimens are less than the requirements of 30.3 it shall be cause for rejection of the lot.

40.1.2.2 When specified (see 6.2), three separate joint specimens shall be made prior to the commencement of the strapping of containers and each time a different reel of strapping, strapping tools or kinds of seals are used and submitted for test as specified in 40.2. If the seal joint strength of one or more of the three specimens is less than the requirements of 30.3 it shall be cause for rejection of the lot.

40.2 Tensile strength test of seal joint. The seal joint shall be tested in accordance with Method 2044 of FED-STD-101.

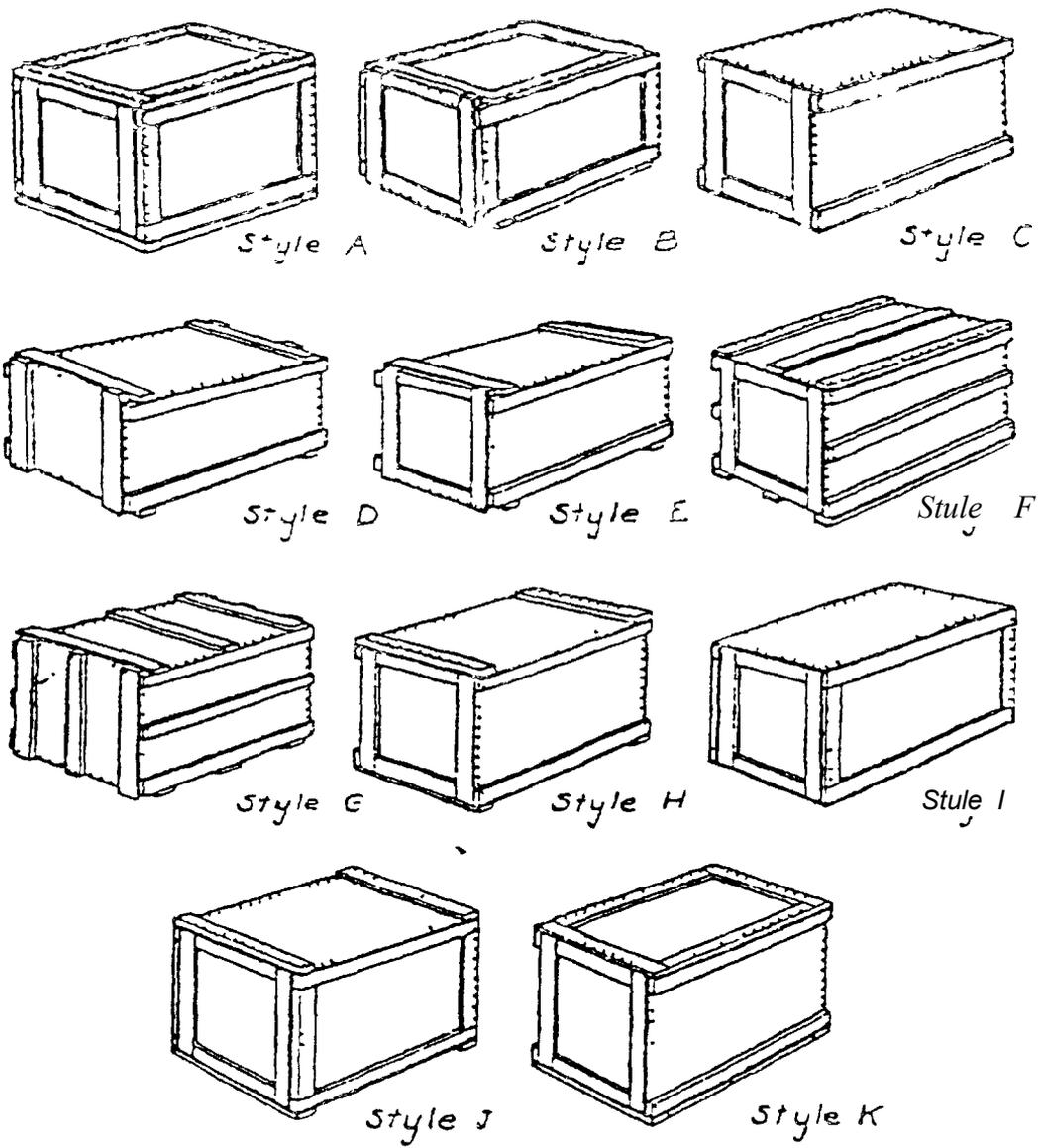
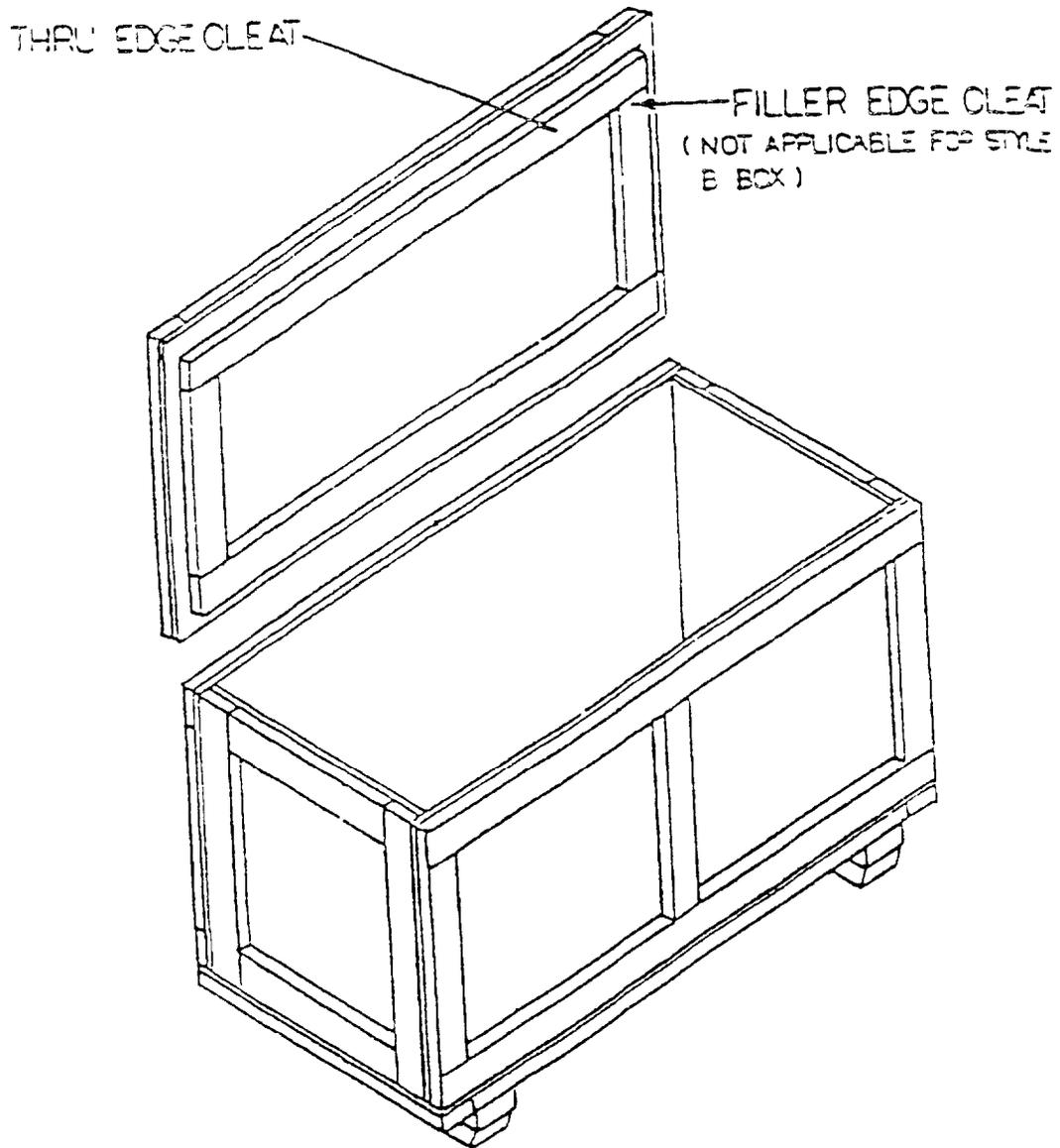


Figure 1— Styles of cleated panel board boxes



TOP PANEL MODIFICATION OF UNNAILED CLOSURE,
STYLE A1, BOX FIGURE 1-A

SYMBOL IDENTIFICATION

- *R- TWO NAILS REQUIRED IF CLEATS ARE 2 1/2" OR MORE IN WIDTH (SEE 3.3.1)
- *D- MIN DIST BETWEEN FASTENER AND END OF CLEAT TO BE NOT LESS THAN 3/4 INCH NOR MORE THAN 1 INCH
- *S- BOX ASSEMBLY NAIL SPACING (SEE TABLES I AND II)
- *W- CLEAT WIDTH (SEE TABLES II AND III)

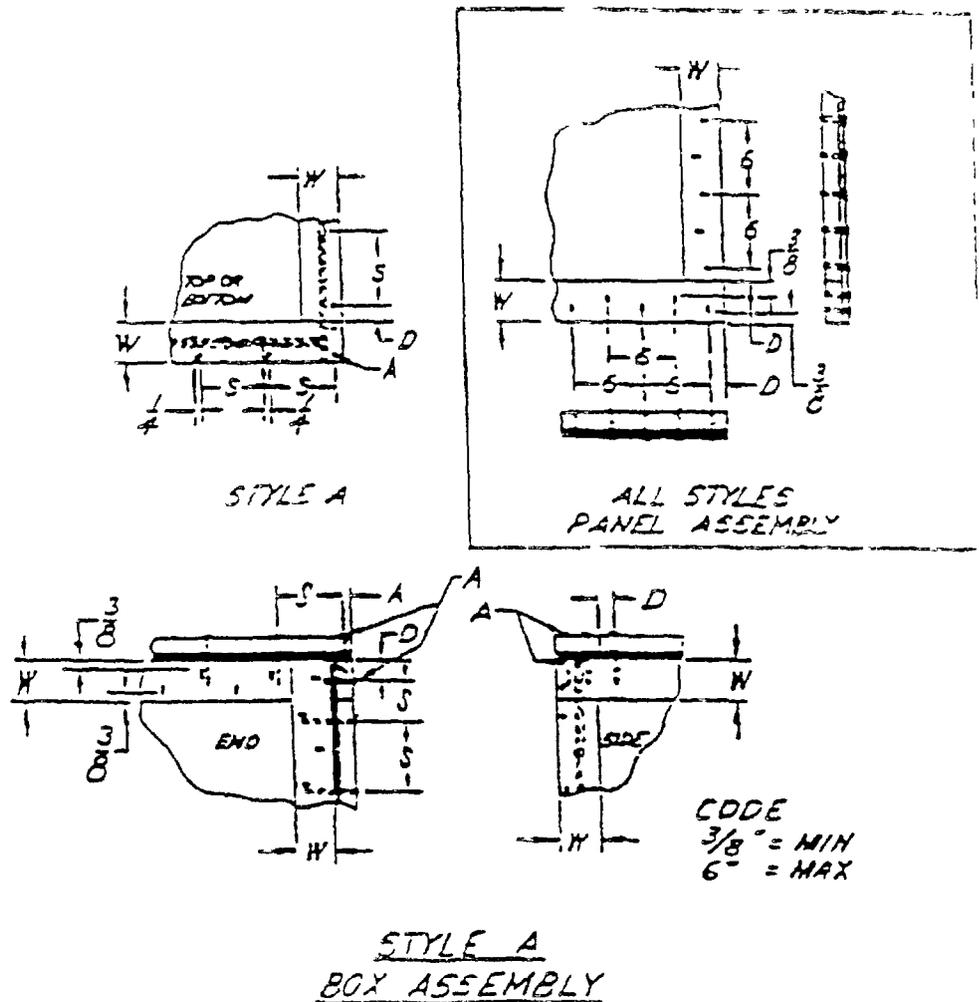


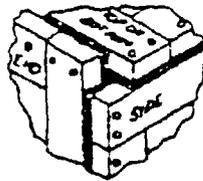
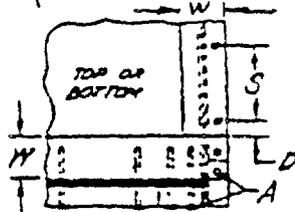
FIG 2 - NAILING CHART

PANEL ASSEMBLY - NAILS, STAPLES, OR OTHER TYPES OF FASTENERS MAY BE EMPLOYED AT THE OPTION OF THE SUPPLIER (SEE 3.2) FASTENERS SHALL BE STAGGERED IN TWO PARALLEL ROWS AS SHOWN.

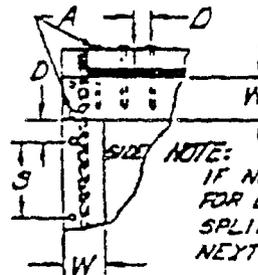
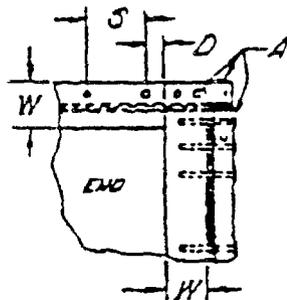
BOX ASSEMBLY - S AND D MAY BE VARIED ENOUGH TO PREVENT NAILS FROM STRIKING PANEL ASSEMBLY NAILS OR TO PREVENT NAILS FROM BEING DRIVEN INTO CRACKS

SYMBOL IDENTIFICATION

- "N" - TWO NAILS REQUIRED IF CLEATS ARE 2 1/4" OR MORE IN WIDTH (SEE 3.2.1)
- "D" - MIN. DIST. BETWEEN FASTENER AND END OF CLEAT TO BE NOT LESS THAN 3/4 INCH NOR MORE THAN 1 INCH
- "S" - BOX ASSEMBLY NAIL SPACING (SEE TABLES I AND VI)
- "W" - CLEAT WIDTH (SEE TABLES II AND III)



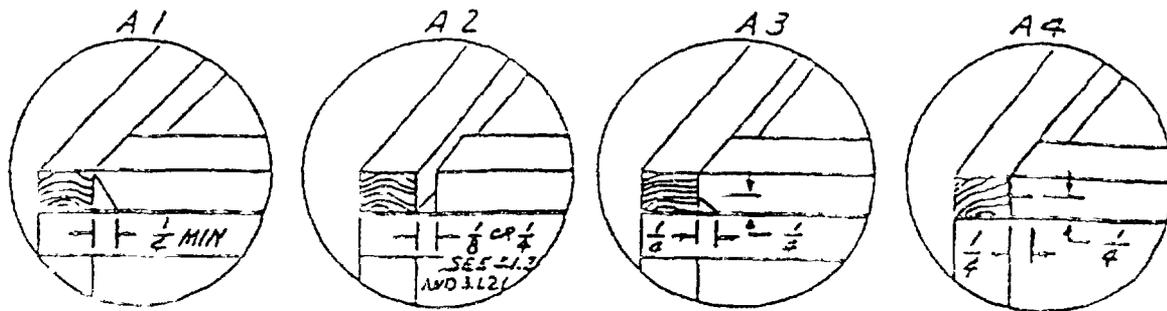
DETAIL OF BOX CORNER
STYLE B BOX



NOTE:
IF NAIL SIZE SPECIFIED
FOR BOX ASSEMBLY
SPLITS CLEAT USE
NEXT SMALLER SIZE

STYLE B
BOX ASSEMBLY

FIG. 3 - NAILING CHART



A-ENDS OF FILLER AND INTERMEDIATE CLEATS AND RELATION TO THROUGH EDGE CLEATS

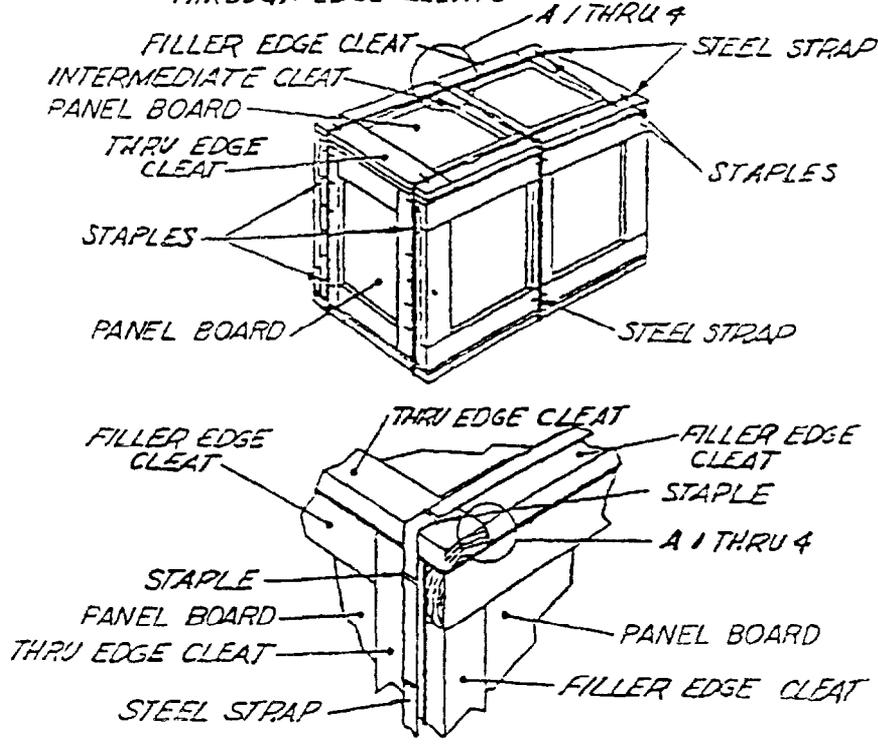


FIG 4 - STYLE A

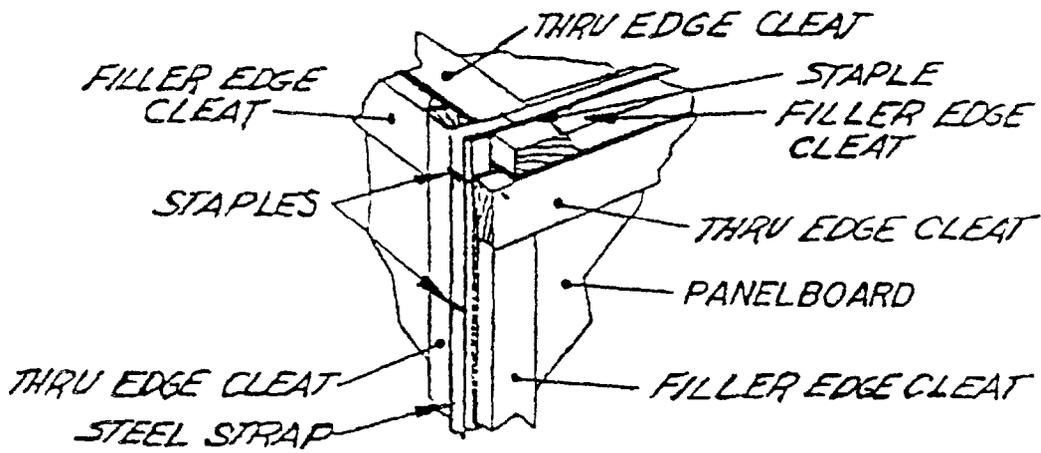
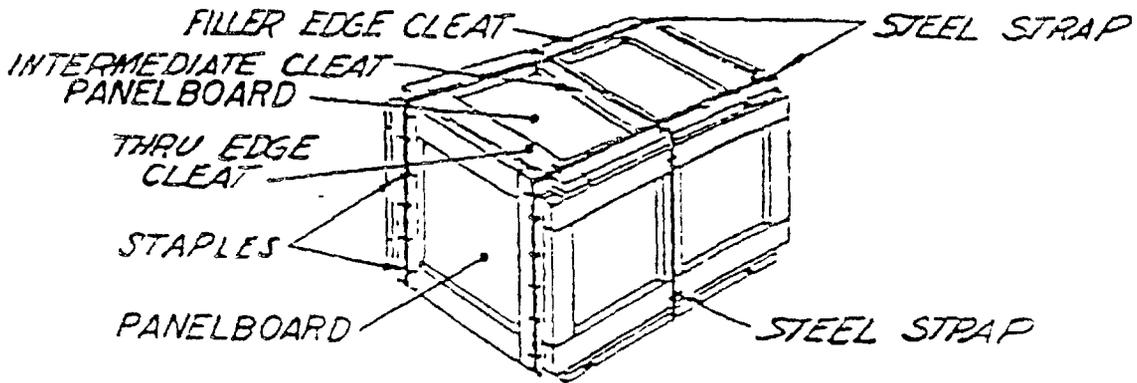
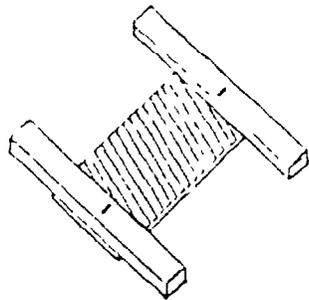
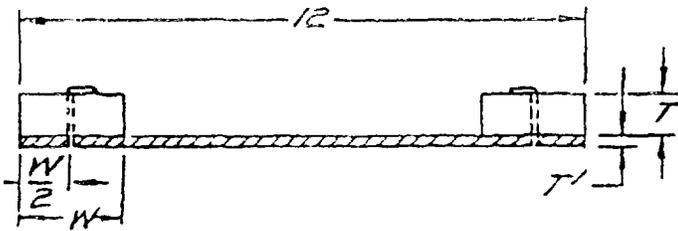


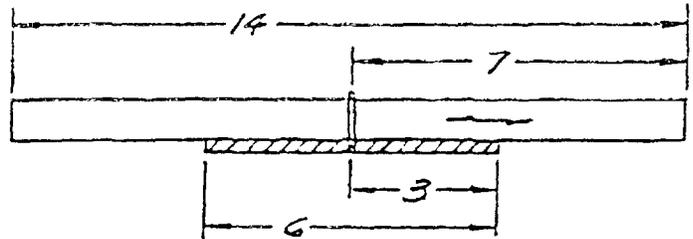
FIG 5- STYLE B



W - CLEAT WIDTH
 T - CLEAT THICKNESS
 T' - PANELBOARD THICKNESS
 - DIRECTION OF GRAIN



FRONT VIEW



SIDE VIEW

FIGURE 6 TEST SPECIMEN FOR DIRECT WITHDRAWAL RESISTANCE TEST (FOR PANEL ASSEMBLY)

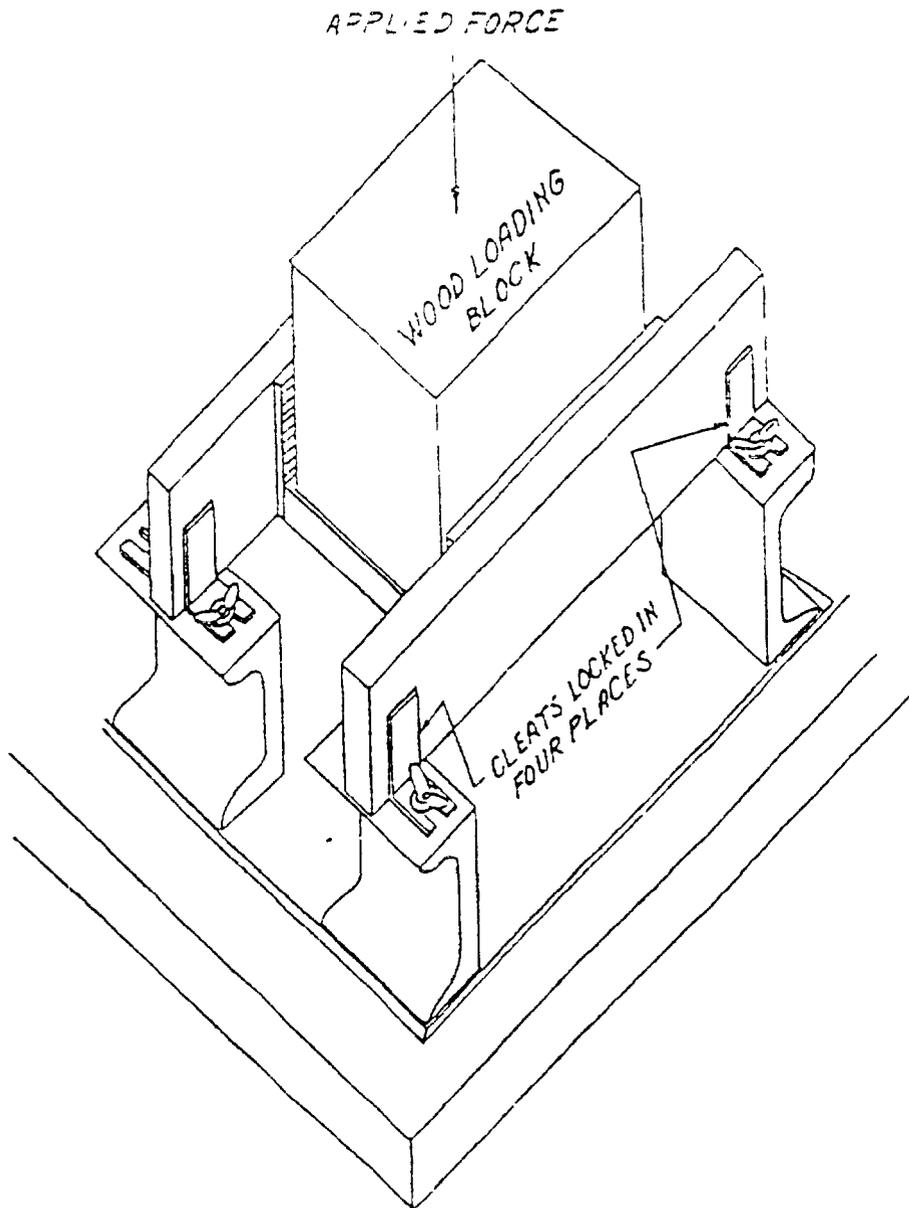


FIGURE 7 TEST FIXTURE
FOR DIRECT WITHDRAWAL RESISTANCE TEST (FOR PANEL ASSEMBLY)
AND LATERAL RESISTANCE TEST (FOR CONTAINER ASSEMBLY)

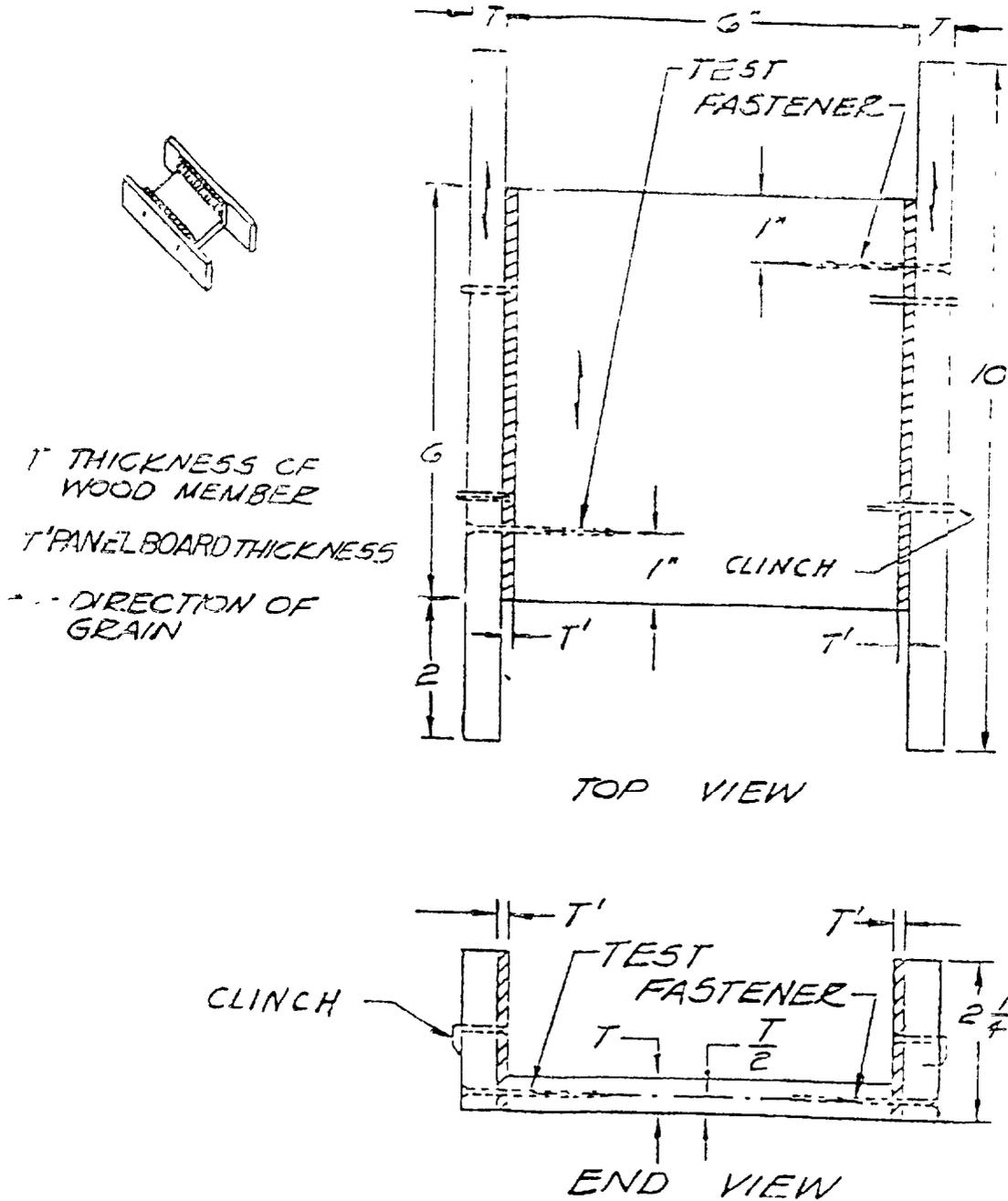


FIGURE 8 TEST SPECIMEN FOR LATERAL RESISTANCE TEST (FOR CONTAINER ASSEMBLY)

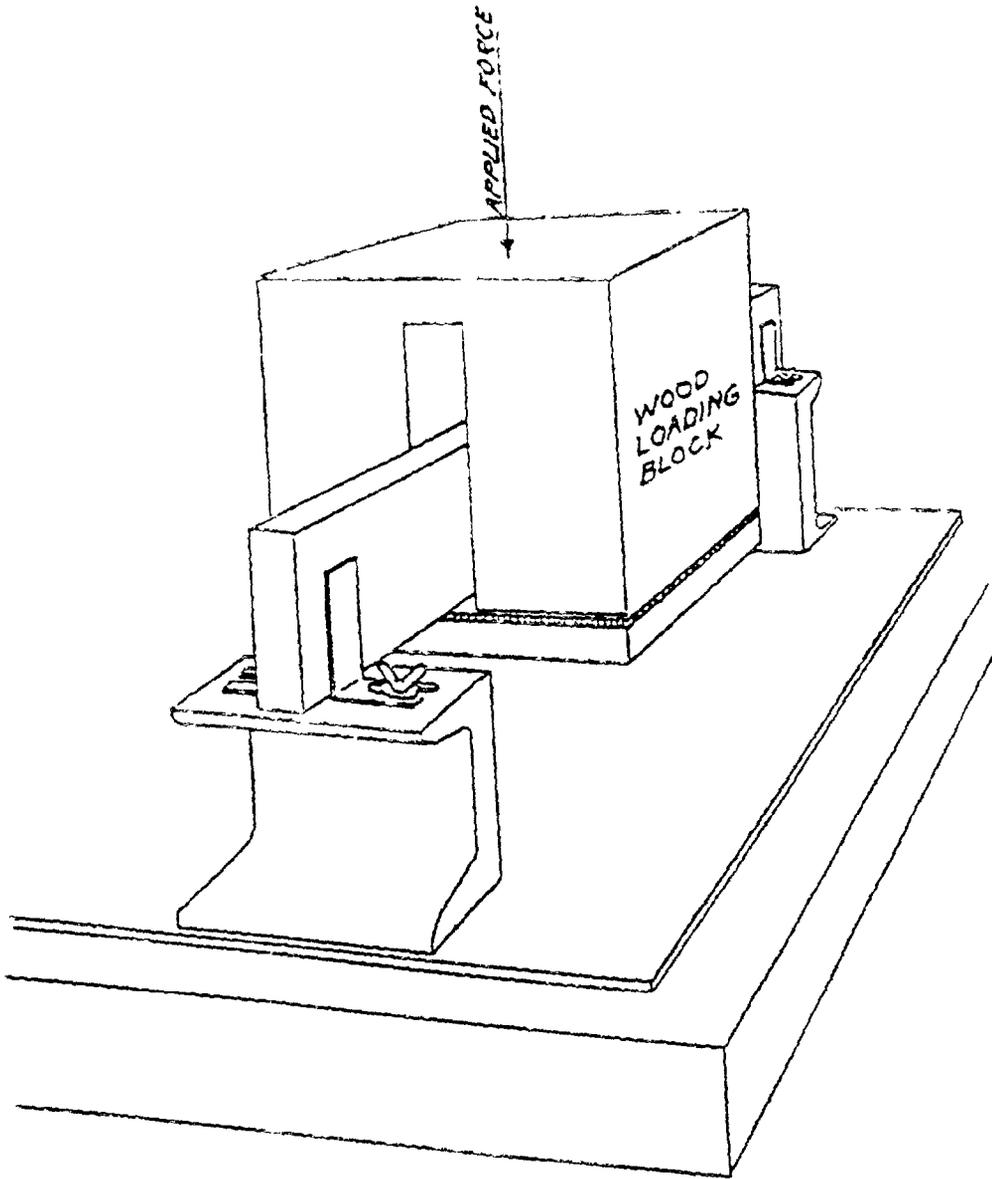
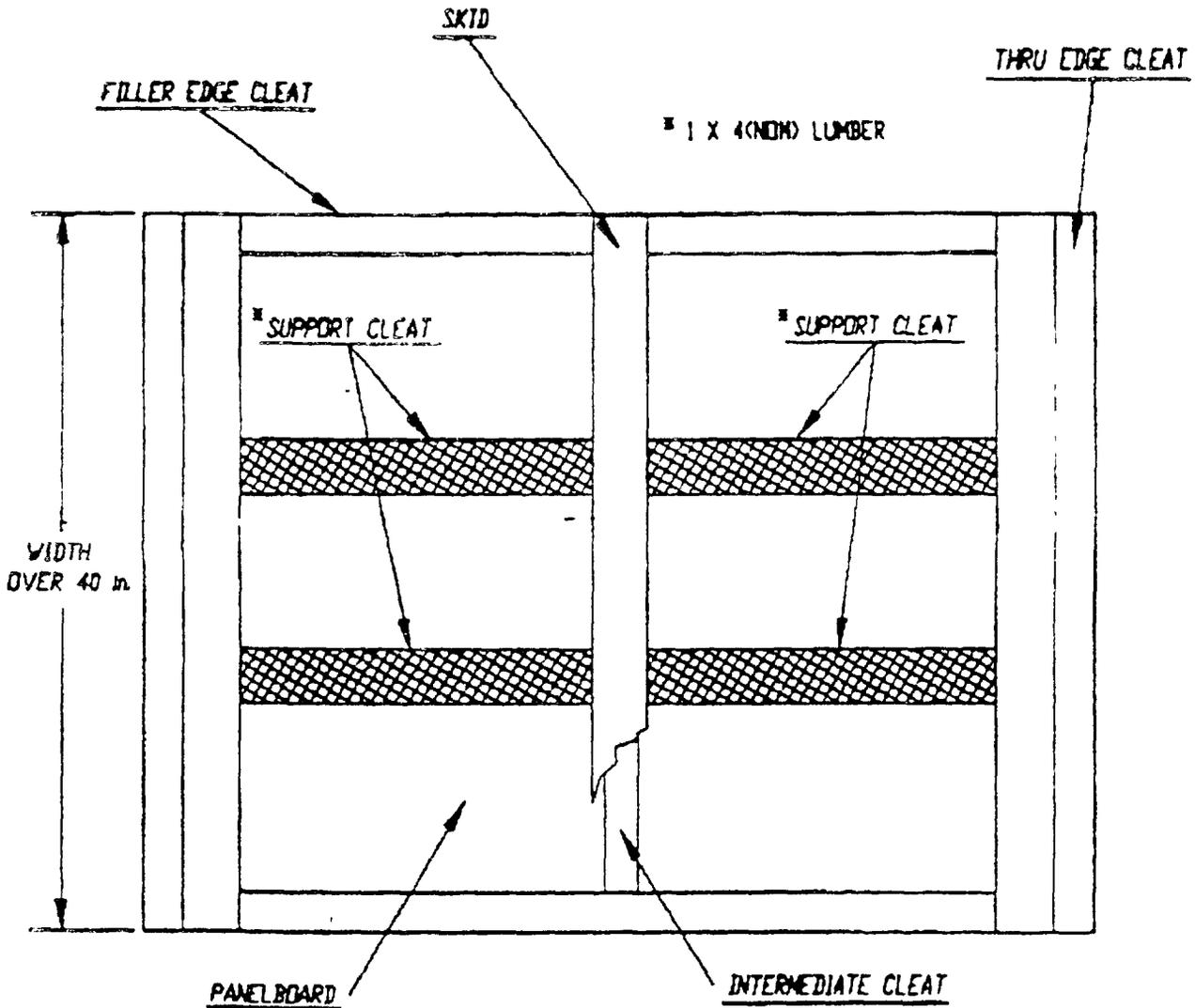


FIGURE 10 TEST FIXTURE
FOR DIRECT WITHDRAWAL RESISTANCE
TEST (FOR CONTAINER ASSEMBLY)



CONTAINER BOTTOM VIEW

FIGURE 11 SUPPORT CLEATS

USE SUPPORT CLEATS TO PREVENT FORK-LIFT TINE DAMAGE TO FLOOR PANEL WHEN CONTAINER WIDTH IS OVER 40 INCHES OLD, AND RUBBING STRIPS/SKIDS ARE REQUIRED.

LOCATE THE SUPPORT CLEATS EQUAL DISTANCE BETWEEN FILLER EDGE CLEATS

STANDARDIZATION DOCUMENT IMPROVEMENT PROPOSAL

INSTRUCTIONS

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RECOMMEND A CHANGE	1. DOCUMENT NUMBER PPP-B-576C	2. DOCUMENT DATE (YYMMDD) 1992 December 22
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3. DOCUMENT TITLE
BOXES, WOOD-CLEATED PANELBOARD

4. NATURE OF CHANGE (Identify paragraph number and include proposed rewrite, if possible. Attach extra sheets as needed.)

5. REASON FOR RECOMMENDATION

SUBMITTER		6. ORGANIZATION
a. NAME (Last, First, Middle Initial)		b. TELEPHONE (Include Area Code)
c. ADDRESS (Include Zip Code)		(1) Commercial
		(2) AUTOVON
		(PPP applicable)
		7. DATE SUBMITTED (YYMMDD)

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U.S. Army Natick RD&E Center	(1) Commercial 508-651-4501	256-4501
ADDRESS (Include Zip Code) Commander, U.S. Army Natick RD&E Center ATTN: SATNC-WYP Natick, MA 01760-5018	IF YOU DO NOT RECEIVE A REPLY WITHIN 45 DAYS, CONTACT: Defense Quality and Standardisation Office 5203 Leesburg Pike, Suite 1403, Falls Church, VA 22041-3466 Telephone (703) 756-2340 AUTOVON 289-2340	

