

PPP-B-591B  
April 23, 1971  

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SUPERSEDING  
Fed. Spec. PPP-B-591A  
March 26, 1963

FEDERAL SPECIFICATION

BOXES, SHIPPING, FIBERBOARD, WOOD-CLEATED

This specification was approved by the Commissioner, Federal Supply Service, General Services Administration, for the use of all Federal agencies.

1. SCOPE AND CLASSIFICATION

1.1 Scope. This specification covers the requirements for new wood-cleated fiberboard boxes for shipment of supplies and material (see 6.1).

1.2 Classification.

1.2.1 Classes and styles. Wood-cleated fiberboard boxes shall be furnished in the following classes and styles, as specified (see 6.3):

Class I, domestic (see figure 1 and 6.1.1)

Style A	Style G
Style B	Style H
Style C	Style I
Style D	Style J
Style E	Style K
Style F	

Class II, weather-resistant (see figure 1 and 6.1.2)

Style A  
Style B

2. APPLICABLE DOCUMENTS

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

FSC 8115

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Federal Specifications:

- FF-F-133 - Fasteners, Wood Joint, Corrugated (Saw Edge).
- FF-N-105 - Nails, Wire; and Staples.
- PPP-F-320 - Fiberboard, Corrugated and Solid, Sheet Stock (Container Grade) and Cut Shapes.

Federal Standard:

Fed. Std. No. 123 - Marking for Domestic Shipment (Civil Agencies)

(Activities outside the Federal Government may obtain copies of Federal Specifications, Standards, and Handbooks as outlined under General Information in the Index of Federal Specifications and Standards and at the prices indicated in the Index. The Index, which includes cumulative monthly supplements as issued, is for sale on a subscription basis by the Superintendent of Documents, U. S. Government Printing Office, Washington, DC, 20402.

(Single copies of this specification and other Federal Specifications required by activities outside the Federal Government for bidding purposes are available without charge from Business Service Centers at the General Services Administration Regional Offices in Boston, New York, Washington, D. C., Atlanta, Chicago, Kansas City, MO, Fort Worth, Denver, San Francisco, Los Angeles, and Seattle, WA.

(Federal Government activities may obtain copies of Federal Specifications, Standards, and Handbooks and the Index of Federal Specifications and Standards from established distribution points in their agencies.)

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 suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following 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:

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National Motor Freight Traffic Association, Incorporated, Agent:

## National Motor Freight Classification.

(Application for copies should be addressed to the National Motor Freight Traffic Association, Inc., Agent, 1616 P Street N.W., Washington, DC 20036.)

Uniform Classification Committee, Agent:

## Uniform Freight Classification.

(Application for copies should be addressed to the Uniform Classification Committee, Tariff Publishing Officer, Room 202 Union Station, 516 W. Jackson Blvd. Chicago, IL 60606.)

## 3. REQUIREMENTS

## 3.1 Materials.

3.1.1 Lumber for cleats. Lumber for cleats used in the fabrication of fiberboard boxes shall conform to class 2 of MIL-STD-731.

3.1.2 Fiberboard (for class I, domestic box). The fiberboard shall conform to the requirements of PPP-F-320, type SF, class-domestic, or type CF, class-domestic, variety SW (double-faced), B or C flute, respectively, and table I.

TABLE I. Requirements for fiberboard for class I, domestic box

Weight of contents of box	PPP-F-320 material requirements (see 3.1.2)	
	Type CF (double-faced) class-domestic grade	Type SF (solid fiberboard) class-domestic grade
<u>Exceeding</u> Pounds	<u>Not exceeding</u> Pounds	
0	75	200
75	150	275
150	225	300
225	300	350
300	400	400
		200
		275
		300
		350
		375

3.1.3 Fiberboard (for class II, weather-resistant box). The fiberboard shall conform to PPP-F-320, type SF, class weather-resistant, grade V3s or V4s, with weight and dimensional limitations as specified in table II.

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TABLE II. Requirements for fiberboard for class II, weather-resistant box

Weight of contents of box	Style of box	Dimensional limitations, maximum			PPP-F-320 material requirements, type SF (see 3.1.3) grade
		Length	Width	Depth	
<u>Not exceeding</u>					
Pounds		Feet	Feet	Feet	
200	A or B	4	3	3	V3s or V4s

3.1.4 Fastenings. Nails and staples shall be steel and shall conform to the applicable requirements of FF-N-105.

3.1.5 Corrugated fasteners. Corrugated fasteners shall conform to FF-F-133.

3.2 Requirements for parts.

3.2.1 Edge cleats.

3.2.1.1 Number. The number of edge cleats used in the fabrication of panels and boxes shall be as shown on figure 1 for each style.

3.2.1.2 Size (for class I, domestic). The thickness and width of each cleat shall conform to the requirements of table III for the style and weight of contents specified in the contract or order. Each cleat shall be a single unjointed piece.

3.2.1.3 Size (for class II, weather-resistant). The thickness and width of each cleat shall conform to the requirements of table IV. Each cleat shall be a single unjointed piece. The filler edge cleats on top and bottom panels, except on top only when box is provided with skids, shall be either the same length as the distance between the through edge cleats or approximately 1/4 inch shorter. When the filler cleats are the same length as the distance between through edge cleats, each end shall be either cut at an angle or notched to provide a drainage area (see fig. 2 and 3).

TABLE III. Size of cleats for class I, domestic box

Style of box	Weight of contents of box		Minimum size of cleats (see 3.2.1.2)		
			Thickness		Width
	Exceeding Pounds	Not exceeding Pounds	Groups I and II woods Inch	Groups III and IV woods Inch	All wood groups, groups, inclu- sive 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

### 3.2.2 Intermediate cleats.

3.2.2.1 Spacing (for class I, domestic). When one or both dimensions of the panel of a box, measured between the inside edges of edge cleats (unframed area), exceeds 24 inches, one or more intermediate cleats of the same size as the edge cleats shall be applied perpendicular to the greater of the two dimensions between edge cleats. The distance between edge cleats and intermediate cleats, or between intermediate cleats applied perpendicular to the greater of two dimensions of the face of the box, shall not exceed 24 inches. When both dimensions of a panel of a box measured between the inside edges of the edge cleats exceed 24 inches and are approximately the same dimensions (within 2-inches); the intermediate cleats shall be applied perpendicular to the horizontal edge cleats. The distance between the vertical edge cleats and the intermediate cleats or between the intermediate cleats applied perpendicular to the horizontal edge cleats shall not exceed 24 inches.

3.2.2.2 Spacing (for class II, weather-resistant). Cleats shall be the same as specified in 3.2.2.1 except that spacing shall not exceed 20 inches. The drainage of intermediate cleats shall be as specified for filler edge cleats (see 3.2.1.3).

3.2.2.3 Additional cleats. Any panel of the box having a load concentrated near the center of the unframed area shall be reinforced with one additional cleat of the same size as the edge cleat (see 6.3).

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3.2.3 Fiberboard.

3.2.3.1 One and two piece panels. The fiberboard in each panel of the box may be of one continuous piece or two pieces at the option of the contractor. The joint between the two pieces of fiberboard shall be a butt joint.

3.2.3.1.1 Butt joint. The adjacent edge of the two pieces of fiberboard shall be butted at the mid-width of a joint cleat. The thickness of each joint cleat shall be the same as the edge cleats and the width shall be not less than twice the required width of an edge cleat. The length of each joint cleat shall be not less than the distance between edge cleats minus 1/8 inch. The fastening pattern shall conform to the requirements for fabrication of panels (see 3.3), except that when nails are used, there shall be two rows in each piece of fiberboard at the butt joint. When staples are used, there shall be one row in each piece of fiberboard at the butt joint.

TABLE IV. Size of cleats for class II, weather-resistant box

Style of box	Weight of contents of box		Minimum size of cleats, for all wood groups (see 3.2.1.3)	
	Exceeding Pounds	Not exceeding Pounds	Thickness Inch	Width Inch
A or B	0	200	3/4	1-3/4

## 3.3 Fabrication of panels.

3.3.1 Construction (for class I, domestic). For each panel of the box, the fiberboard shall be fastened to the cleats by nails, staples, or glue, at the option of the contractor. Each nail or staple shall be driven through the fiberboard, into and through the cleat, and be clinched. When nails are employed, they shall be staggered in two parallel rows, the rows spaced not less than 3/8-inch apart and the distance between a row of nails and the edge of a cleat shall be not less than 3/8-inch. The spacing of the nails shall not exceed 3 inches (nails not more than 6 inches apart on a row). When staples are employed, the spacing of staples lengthwise of the cleat shall not exceed 3 inches and they shall be staggered where possible. The distance between staples and the edge of a cleat shall be not less than 3/8-inch. When glue is employed, the fiberboard and cleats shall be firmly glued together over the entire surface in contact so that when tested in accordance with 4.3.2 fiberboard, or a layer of fiberboard, shall remain in contact with not less than 75 percent of the contact area of the cleats. If the fiberboard is fastened by glue only, the bond or joint shall be water-resistant.

3.3.2 Construction (for class II, weather-resistant). For each panel of the box the fiberboard shall be fastened to the cleats either by nails or staples at the option of the contractor. Each nail or staple shall be driven through the fiberboard, into and through the cleat, and be clinched. Nails, when used, shall be staggered in two parallel rows, the rows spaced not less than 3/8-inch apart and the distance between a row of nails and the edge of a cleat shall be not less than 3/8-inch. The spacing of nails lengthwise of the cleat shall not exceed 3 inches (nails not more than 6 inches apart in each row). Staples, when used, shall be spaced lengthwise of the cleat not to exceed 3 inches and shall be staggered where possible. The distance between staples and the edge of a cleat shall be not less than 3/8-inch.

3.3.3 Nails for fastening fiberboard to cleats (for class I domestic). For loads up to and including 150 pounds, for all styles of boxes, nails shall be not less than 0.072 inch in diameter (15 gage) and for loads of 151 pounds and over, nails shall be not less than 0.080 inch in diameter (14 gage). The head of the nail shall be not less than 7/32 inch in diameter. The length of each nail shall be not less than the sum of the thickness of the fiberboard and the cleat, plus 1/8 inch.

3.3.4 Nails for fastening fiberboard to cleats (for class II, weather-resistant). Nails shall be the same as specified in 3.3.3 except that nails shall be not less than 0.080 inch in diameter (14 gage).

3.3.5 Staples for fastening fiberboard to cleats (for class I domestic and class II weather-resistant). Each staple used for fastening fiberboard to cleats shall be made from steel wire not less than 0.0625 inch (16 gage), or from flat wire of at least the same area in cross section. The crown of the staple shall be not less than 1/2 inch and the length of the legs shall be not less than the sum of the thickness of the fiberboard and the cleat plus 1/8 inch.

3.3.6 Fastening butt joints of cleats. Unless otherwise specified (see 6.3), the butt joint formed by two adjacent edge cleats on a panel, or by an intermediate cleat and an edge cleat, shall be reinforced by joining them with a staple. Alternatively for class I boxes, a corrugated fastener may be used.

3.3.6.1 Staples for fastening butt joints of cleats. Each staple used for fastening cleats at butt joints shall be made from steel wire not less than 0.072 inch in diameter (15 gage) or from flat wire of at least the same area in cross section. The crown of the staple shall be not less than one inch and the length of the legs shall be not less than the sum of the thickness of the fiberboard and the cleat plus 1/8 inch. Staples shall be driven through the fiberboard, into and through the cleats and clinched.

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3.3.6.2 Corrugated fasteners for fastening butt joints of cleats. Each corrugated fastener shall comply with requirements of 3.1.5. The depth of the fasteners shall be not less than 5/8 inch.

3.4 Fabrication of box.

3.4.1 Style. Each box shall be in agreement with figure 1 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. Panels of styles B, D, E, and G shall be joined with interlocking three-way corners in accordance with figure 3.

3.4.2 Nails for fastening adjacent cleated panels for class domestic. Nails for fastening the fiberboard and edge cleats of a panel to the edge cleat of an adjacent panel shall be cement coated or chemically etched (see 6.4). Nails may be coolers, sinkers, or box nails, at the option of the contractor.

3.4.2.1 Size of nail (for class domestic). Nails shall conform to the requirements of table V.

TABLE V. Sizes of assembly nails for fastening together adjacent cleated panels (for class 1, domestic)

Thickness of cleats Inches	Size of nail for cleats		
	Groups I and II woods Penny	Groups III woods Penny	Group IV woods Penny
9/16 or 5/8	6	6	5
11/16 or 25/32	7	7	6
13/16 or 1	8	7	7

NOTE: If nail size specified causes splitting, the next smaller size nail shall be used and the spacing shall be decreased 1/2 inch.

3.4.2.2 Spacing of nails for domestic type. The spacing of nails shall conform to the requirements of table VI.



TABLE VI. Spacing of nails for fastening adjacent cleated panels  
(for class I, domestic)

Weight of contents of box		Spacing, maximum (see 3.4.2.2)
Exceeding Pounds	Not exceeding Pounds	
0	75	6
75	150	5
150	300	4
300	400	3

3.4.3 Size and spacing of nails (for class II, weather-resistant). Nails fastening the fiberboard and cleat of one face to the cleat of an adjacent face shall be 8 penny for groups I and II woods, and 7 penny for groups III and IV woods. The nails shall be spaced not more than 4 inches apart. Nails shall be cement-coated or chemically etched, and shall be sinkers or coolers, except for group I woods in which box nails shall also be permitted. When box nails are used, maximum spacing shall be 3-1/2 inches. If nail size specified causes splitting, the next smaller size nail shall be used and spacing shall be decreased 1/2 inch.

3.4.4 Fastening ends of cleats (for class I, 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.

3.4.5 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.

3.4.6 Dimensions. Boxes shall be furnished having the dimensions specified (see 6.3). 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  $\pm 1/8$  inch shall be permitted in the dimensions.

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3.5 Skids. Unless otherwise specified (see 6.3), boxes having a gross weight of more than 200 pounds, or when the length and width dimensions are 48 inches by 24 inches or over and the gross weight is 100 pounds or over, shall be provided with a minimum of two skids. The skids shall be a minimum of 2-1/2 inches high and 3-1/2 inches wide and may be fabricated from more than one piece of lumber to make up the required height. The skids shall be placed parallel to and extend the full width of the box, and shall be set not less than 2-1/2 nor more than 4 inches in from each end. The distance between skids, measured between the inside edges, shall not exceed 48 inches. Filler cleats and internal members of the same thickness as the end cleats of the bottom panel and not less than the width of the skids shall be provided, with filler cleats positioned between each skid and the bottom panel of the box, and internal members positioned on the bottom panel directly over filler cleats. Additional skids, as required shall be positioned so as to divide the area between the end skids into units of equal lengths. When boltholes are provided in the item, additional skids as needed, shall be located so as to enable the item to be bolted to the skids.

The nails shall be driven through the internal members, bottom panel, the filler cleats, and the skids. Nails shall conform to type II, style 13 of FF-N-105, and of such length as to penetrate a minimum of 3/4 the skid thickness and 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 in from the edge of the skid, and the nailing pattern shall begin and end approximately 1-1/2 inches in from the end of each skid. When 4-way fork entry is required, skids may be placed lengthwise, flush with the container sides and be cut to accommodate forks and slings for handling. Each skid shall be notched, as applicable, to provide clearance for either girthwise or longitudinal strapping.

3.6 Container manufacturer's identification. Each container of all classes and styles shall be marked with the specification number, box class and style, container manufacturer's name and address, maximum weight of contents, and type of load (as applicable). All marking shall be placed in a lower corner of one side panel in letters approximately 5/16 inch high, except that "specification numbers" shall be in letters approximately 3/4 inch high. Arrangement of these markings shall be in accordance with the following pattern as closely as possible:

Federal Specification PPP-B-591  
 Box manufacturer's name  
 Plant location  
 Maximum content weight - Pounds  
 Box class and style  
 For domestic and overseas use  
 Fiberboard, type, class, variety, and grade  
 Type of load

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3.7 Closure, and strapping of filled boxes. When this specification is referenced as a requirement for the shipping of an item or items in a contract or specification, the requirements of the appendix shall be a mandatory part of this specification.

3.8 Workmanship. All parts and boxes shall conform to the quality and grade of product established by this specification. The fiberboard shall be cut square and at no point shall the edge of the fiberboard extend more than 1/16 inch over or 1/4 inch under the cleated panel assembly. No portion of a fastener shall protrude above the surface of fiberboard or cleat, nor shall they be over-driven more than 1/32 inch, and shall not be visibly deformed, except at the points where they are clinched.

#### 4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Inspection. Sampling for inspection shall be performed in accordance with MIL-STD-105, except where otherwise indicated hereinafter.

4.2.1 Component and material inspection. In accordance with 4.1, components and materials shall be inspected and tested in accordance with all the requirements of referenced specifications, drawings, and standards unless otherwise excluded, amended, modified, or qualified in this specification or applicable purchase document.

##### 4.2.2 Inspection of the end item.

4.2.2.1 Examination of the end item. Examination of the end item shall be made in accordance with the classification of defects, inspection levels and acceptable quality levels (AQLs) set forth below. The lot for the purpose of determining the sample size in accordance with MIL-STD-105, for examinations in 4.2.2.1.1 and 4.2.2.1.2 shall be expressed as units of boxes. For examination in 4.2.2.1.3 the lot shall be expressed as units of assembled boxes together with bundles of tops or bundles of knockdown boxes as applicable.

4.2.2.1.1 Examination of the end item for defects in material, construction, appearance and workmanship. The sample unit for this examination shall be one assembled box, including cover, or one knock-down box, as applicable.

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ExamineDefect

## Material

Any material or component not type, grade or species specified

## Wooden cleats

Any cleat not a single piece of wood  
Intermediate cleats (when required) missing or not applied perpendicular to the greater of the dimensions between edge cleats  
Intermediate cleats not the same size as edge cleats (except where used over butt jointed, 2 piece fiberboard panel)

## Fiberboard

Torn, punctured; scuff extending through 1 ply; slight scuff covering an area greater than 3 square inches; split in more than 1 ply of solid fiberboard; split extending through corrugation medium; split in face of corrugated board extending over 1/2 inch; ply separation more than 1/4 inch from the edge of material  
More than 2 pieces of fiberboard used for any panel  
Fiberboard extends more than 1/16 inch beyond the cleated panel assembly at any point (check visually, measure if in doubt)  
Fiberboard smaller than the dimensions of the cleated panel assembly by more than 1/4 inch in any direction (check visually, measure if in doubt)  
Warped, creased or wrinkled

When two pieces of fiberboard are used for face of the panel

Joint between the two pieces not a butt joint  
Not butted at the midwidth (within 1/2 inch) of the joint cleat  
Space between the two pieces of fiberboard more than 1/8 inch

Fastenings of fiberboard to cleats of panel

Not fastened by means of glue (for domestic type only), nails or staples  
Each nail or staple does not pass completely through  
Any nail or staple not well clinched  
Nails (when used) not staggered in two parallel rows  
Any nail missing  
Staples (when used) not staggered where possible  
Any staple missing  
Fiberboard and cleats not firmly glued, as applicable

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<u>Examine</u>	<u>Defect</u>
Fastening of butt joint of cleats (i.e. butt joint formed by adjacent edge cleats or by an intermediate cleat and an edge cleat)	Not reinforced by means of a staple or corrugated fastener Corrugated fastener less than 5/8 inch deep
Fabrication of box	Not style specified Not rigidly assembled Visibly out of square Wrong construction or assembly Fasteners other than nails used for fastening the fiberboard and edge cleats of a panel to the edge cleats of an adjacent panel Nails not cement coated or chemically etched Any nail missing Nails exceed maximum spacing allowed
Fastening ends of cleats (domestic type)	A nail does not pass through each end of overlapping through cleat into cleat of adjacent panel (when only 1 nail is required) Less than 2 nails pass through each end of overlapping through cleat into cleat of adjacent panel (when 2 nails are required)
Fastening of uncleated edges of panels (styles C to K inclusive)	Not fastened by means of nails Fiberboard not fastened to cleat of adjacent panel Each nail does not pass completely through the fiberboard into the cleat
Nails	Any nail cracked, rusted, malformed or otherwise shows indication of weakness not compensated for by an additional nail Head or point of nail protrudes beyond surface of cleat or fiberboard; any point extending through fiberboard not clinched flush or below surface of fiberboard; clinching (when required) less than 1/8 inch Nail overdriven by more than 1/32 inch

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<u>Examine</u>	<u>Defect</u>
Staples (when used)	Any staples cracked, rusted, malformed (except where clinched) or otherwise shows indication of weakness not compensated for by an additional staple Staple overdriven by more than 1/32 inch
Corrugated fasteners	Any fastener cracked, rusted, malformed or otherwise shows indication of weakness not compensated for by additional fastener

4.2.2.1.2 Examination of the end item for dimensional defects. The sample unit for this examination shall be one assembled box including corner, or one knocked-down box, as applicable. When the end product is knocked-down box, at least five unassembled boxes shall be assembled for the purpose of determining overall inside dimensions.

<u>Examine</u>	<u>Defect</u>
Cleats (each edge and intermediate cleat)	
Thickness (class domestic) (check 3 points in cleat)	Less than specified at any point
Width (class domestic) (check 3 points)	Less than specified at any point
Thickness (check 3 points) (class weather-resistant)	Less than specified at any point
Spacing between inside edges of cleats	More than 24 inches (domestic type) More than 20 inches (overseas type)

NOTE: See 3.2.2 for exceptions to these defects.

#### Joint Cleat

Thickness (check 3 points) (class domestic)	Less than specified thickness at any point
Thickness (check 3 points) (class weather-resistant)	Less than specified at any point

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<u>Examine</u>	<u>Defect</u>
<b>Joint cleat (cont'd)</b>	
Width	Less than twice the required width for edge cleat at any point
Length	Less than the distance between edge cleats by more than 1/8 inch
Fastenings of fiberboard to cleats of panels (class domestic and weather-resistant)	
<b>Nails:</b>	
Distance between staggered rows of nails	Less than 3/8 inch
Distance between each row of nails and edge of cleat	Less than 3/8 inch
Distance between nails	More than 3 inches apart (Nails in same row more than 6 inches apart)
Diameter of heads of nails	Less than 7/32 inch
<b>Staples:</b>	
Lengthwise distance between staples	More than 3 inches
Distance between staples and edge of cleat	Less than 3/8 inch
Length of crown of staple	Less than 1/2 inch
Length of crown of staple for fastening butt joint of cleat	Less than 1 inch

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<u>Examine</u>	<u>Defect</u>
Nails used for fastening adjacent cleated panels	
Spacing between nails (domestic type)	More than distance specified in table VI
Spacing between nails (overseas type)	More than 4 inches, or 3-1/2 inches when box nails are used
Nails used for fastening fiberboard along each uncleated edge to cleat of adjacent panel (styles C to K inclusive)	
Spacing	More than 3 inches apart
Diameter of nail heads	Less than 1/4 inch
Dimensions of boxes (LxWxD)	Any dimension varies by more than $\pm 1/8$ inch from specified dimension

4.2.2.1.3 Examination of preparation for delivery. The sample unit for this examination shall be one box including one bundle or crate of covers, or one bundle or crate of knocked-down boxes, as applicable.

<u>Examine</u>	<u>Defect</u>
Marking of bundles or crates	Marking omitted, incomplete, incorrect, illegible; of improper size, location, sequence or method of application

4.2.2.1.4 Inspection levels and acceptable quality levels for examinations. The inspection levels and acceptable quality levels (AQLs) expressed as defects per 100 units shall be as follows:

<u>Examination paragraph</u>	<u>Inspection level</u>	<u>AQL</u>
4.2.2.1.1	I	6.5
4.2.2.1.2	S-3	2.5
4.2.2.1.3	S-2	9.5



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#### 4.3 Test methods.

4.3.1 Dimensions. Suitable measuring instruments such as micrometer calipers, rules and tapes shall be used to determine the dimensions of boxes and parts of boxes.

4.3.2 Water resistance of glued joints (for domestic type) (see 3.3.1). 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.

#### 5. PREPARATION FOR DELIVERY

5.1 Level C packaging. Wood cleated fiberboard boxes shall be packed KD or set-up as specified (see 6.2) to afford adequate protection against damage during shipment from the supply source to the first receiving activity. The supplier may use his standard practice when it meets this requirement.

5.2 Level C packing. Wood cleated fiberboard boxes shall be packed in a manner to insure carrier acceptance and safe delivery at destination at the lowest transportation rate for such supplies. Shipment shall be in accordance with Uniform Freight Classification or National Motor Freight Classification, as applicable.

#### 5.3 Marking.

5.3.1 Civil agencies. Shipment shall be marked in accordance with FED-STD-123.

5.3.2 Military requirements. In addition to any special marking required by the contract, or order, shipments shall be marked in accordance with MIL-STD-129.

#### 6. NOTES

6.1 Intended use. Wood cleated fiberboard boxes covered by this specification are intended for use in packing types 1 and 2 loads only. Type 3 load should not be packed unless converted to type 1 or 2 load by suitable interior packing (see 6.2).

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6.1.1 Class domestic. The class domestic boxes covered by this specification are intended for normal use when the additional strength of the class weather-resistant box is not required. The selection of the style of box depends largely on the nature and weight of the commodity and how it is to be supported. Styles B, D, E, and C, shown on figure 1, have 3-way corners and are all satisfactory if the boxes are not to be opened for inspection and reclosed. If the boxes are to be opened and reclosed, styles A and K would, in general, be preferable. The full-cleated styles A and B are the strongest and most suitable for heavy commodities if the weight may be applied over the entire area of any faces.

6.1.2 Class weather-resistant. The class weather-resistant boxes are primarily used for shipment to offshore and overseas destinations where a high degree of water resistance is required. For overseas shipment, only styles A and B should be used.

6.2 Types of load. Type of load determines weight and size limitations applicable. For shipment of material and supplies, the type of load falls in one of the following categories:

6.2.1 Type 1 - easy load. Contents are articles of moderate density packed in one inner container which completely fills the outer shipping container. The contents, through the medium of an inner container, are fully in contact with and thereby support all the faces of the outer shipping container.

Example: Canned and boxed articles which are prepacked in fiberboard box that completely fills the outer shipping container.

6.2.1.1 Contents are articles of sufficient strength to withstand the forces encountered in transportation and handling. The shipping container merely protects the contents from being scratched or otherwise marred. In this instance, the contents are fully in contact with and support all the faces of the outer container.

Example: Chest or kit for tools or boxes for sturdy instruments.

6.2.2 Type 2 - average load. Contents are moderately concentrated articles which may either be packed directly into the outer shipping container or subjected to an intermediate stage of packing, such as wrapping or packing in a chipboard or fiberboard container or protected by other types of suitable interior packing. The contents or interior packing provide support for all the faces of the shipping container.

Example: Goods in metal cans which are not packed in an inner container, bottles individually cushioned, hardware in cartons.

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6.2.3 Type 3 - difficult load. Contents are highly concentrated articles which require high degree of protection, or do not support the shipping container.

Example: Wrenches, long bolts and rods which exert highly concentrated forces on faces of shipping container. Rivets, forgings and bulk hardware which are packed loosely and according to no definite pattern and apply force on all faces of the shipping container; fragile articles and delicate instruments which require special protection; valves, fittings and machine parts which do not completely fill the shipping container.

6.3 Ordering data. Purchasers should select the preferred options permitted herein, and include the following information in procurement documents:

- (a) Title, number and date of this specification.
- (b) Class and style of box required (see 1.2.1 and 6.1).
- (c) Weight of contents.
- (d) Inside dimensions specified in inches to the nearest sixteenth of an inch in order of: length by width by depth (see 3.4.6).
- (e) Whether additional cleats are required (see 3.2.2.3).
- (f) When butt joints of cleats shall not be reinforced (see 3.3.6).
- (g) When skids are not required (see 3.5).
- (h) Whether boxes are to be shipped KD or set-up (see 5.1).

6.4 Chemically etched nails. The following procedure is suggested for chemically etching nails:

- a. Prepare a 10 percent solution (by weight) of commercial monoammonium phosphate in water. Do not use metal container for preparing or storing solution. Keep solution near room temperature (about 68° F.).
- b. Immerse nails in solution for about 7 hours, stirring occasionally. Five gallons of solution is sufficient to etch about 100 pounds of nails.
- c. At the end of the etching period, remove the nails and rinse with water.
- d. Air dry the nails to prevent rusting.

6.5 Interchangeability and supersession data. The corresponding class designations of PPP-B-591a which supersedes PPP-B-591 are as follows:

PPP-B-591a	PPP-B-591
Class I, domestic	Domestic type
Class II, weather-resistant	Overseas type

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APPENDIX

CLOSURE AND STRAPPING OF BOXES, SHIPPING,  
FIBERBOARD, WOOD CLEATED

10. SCOPE

10.1 This appendix covers requirements for closure, strapping, and the applicable specifications for closing and strapping fiberboard, wood-cleated boxes, and inspection of closure of filled boxes.

20. APPLICABLE SPECIFICATIONS

20.1 The following Federal Specifications, of the issue in effect on date of invitation for bids, form a part of this appendix.

- QQ-S-781 - Steel Strapping, Flat.
- QQ-S-790 - Steel Strapping, Round, (Bare and Zinc-Coated).

30. CLOSING OF BOXES

30.1 Boxes shall be closed by nailing as specified in 3.4 with the size and spacing of nails specified in table V, table VI, and 3.4.3, as applicable.

30.2 When specified, class I, domestic boxes of all applicable styles, shall be strapped in conformance with this appendix. Unless otherwise specified class II, weather-resistant boxes, styles A and B, shall be strapped in conformance with this appendix.

40. REQUIREMENTS

40.1 General. Strapping materials required herein shall be furnished by the box packer. Strapping shall be applied just prior to shipment where practicable. Flat metal strapping shall be either type I, class A or class B, or type III, class B, of QQ-S-781. Round wire strapping shall be either class A or B, zinc coated (galvanized) in conformance with QQ-S-790. The size of strapping shall be as defined in tables I-a, II-a, and III-a.

40.2 Tensile strength of joint. The strength of the joint shall be at least 75 percent of the tensile strength of the flat or round-wire strapping. The strength of joints shall be computed from the average tensile strength of three specimens of joined straps and three specimens of strapping. The specimens may be convenient length (18 inches). Each joint specimen shall be prepared by joining two pieces of strapping with the joint made in the usual way under tension. The joint shall be near the middle of the specimen. A standard tensile testing machine shall be used to determine the strength of each specimen.

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40.3 Tightness. All straps shall be applied perpendicular to the edge of the box over which they pass and shall be applied only over cleats. The straps shall be drawn tight so as to sink into the wood at the edges.

40.4 Staples. 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. The diameter of the staples shall be not less than 0.080 inch diameter (No. 14 gage) in accordance with FF-N-105 or of equivalent cross sectional area. The length of staple shall be approximately 3/4 inch. When driven over flat strap, the staples 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.

40.5 Number of straps. Two straps shall be applied lengthwise to the box on the edge cleats over the ends, top and bottom for styles A, B, F and K. Two straps shall be applied lengthwise to the box on the edge cleat over the ends and sides for styles C, E, H, I and J. When intermediate cleats are required, an additional strap shall be located over each intermediate cleat. In applying straps, care must be exercised so that straps do not pass over voids between cleats and thus become susceptible to snagging. Two straps shall be applied lengthwise to styles D and G, with filler cleats used to eliminate the strapping passing over voids.

TABLE I-a. Diameter of round wire

Weight of contents		2 or more wires	
Exceeding	Not exceeding	100,000 pounds per square inch tensile strength	140,000 pounds per square inch tensile strength
Pounds	Pounds	Inch	Inch
--	70	0.0720 (15 gage)	0.0720 (15 gage)
70	125	0.0800 (14 gage)	0.0720 (15 gage)
125	200	0.0915 (13 gage)	0.0800 (14 gage)
200	400	0.0915 (13 gage)	0.0915 (13 gage)

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TABLE II-a. Sizes of flat metal bands

Weight of contents		2 or more bands Inch
Exceeding Pounds	Not exceeding Pounds	
--	125	3/8 by 0.020
125	200	1/2 by 0.020
200	400	5/8 by 0.020

TABLE III-a. Size of type III, twist-tied flat metal strapping

Weight of contents		2 or more straps Inch
Exceeding Pounds	Not exceeding Pounds	
--	70	0.138 by 0.025
70	125	0.140 by 0.031
125	200	0.140 by 0.038
200	400	0.150 by 0.050

## 50. INSPECTION

50.1 Boxes shall be inspected to determine compliance with closure and strapping requirements of this appendix. Sampling shall be conducted in accordance with the provisions of MIL-STD-105.

50.1.1 Inspection for closure and strapping. Classification of defects shall be as specified in table IV-a. Sample units for this examination shall be one complete box. A lot shall be expressed as terms of boxes. The inspection level shall be S-3 of MIL-STD-105, with an acceptable quality level of 4.0 defects per 100 units for major defects and 10.0 defects per 100 units for total defects.

TABLE IV-a. Examination for closure and strapping

Examine	Defect	Major	Minor
Strapping	Missing	X	
	Not type or size specified		X
	Not perpendicular to edge of box		X

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TABLE IV-a. Examination for closure and strapping (cont'd)

Examine	Defect	Major	Minor
Strapping (cont'd)	Not applied over cleat		X
	Not drawn tightly		X
	Not stapled as specified		X
	Torn or cut	X	
	Weak point (check manually)	X	

50.2 Testing. Testing of tensile strength of scaled joint of strapping shall be performed as specified in 40.2 with no evidence of failure.

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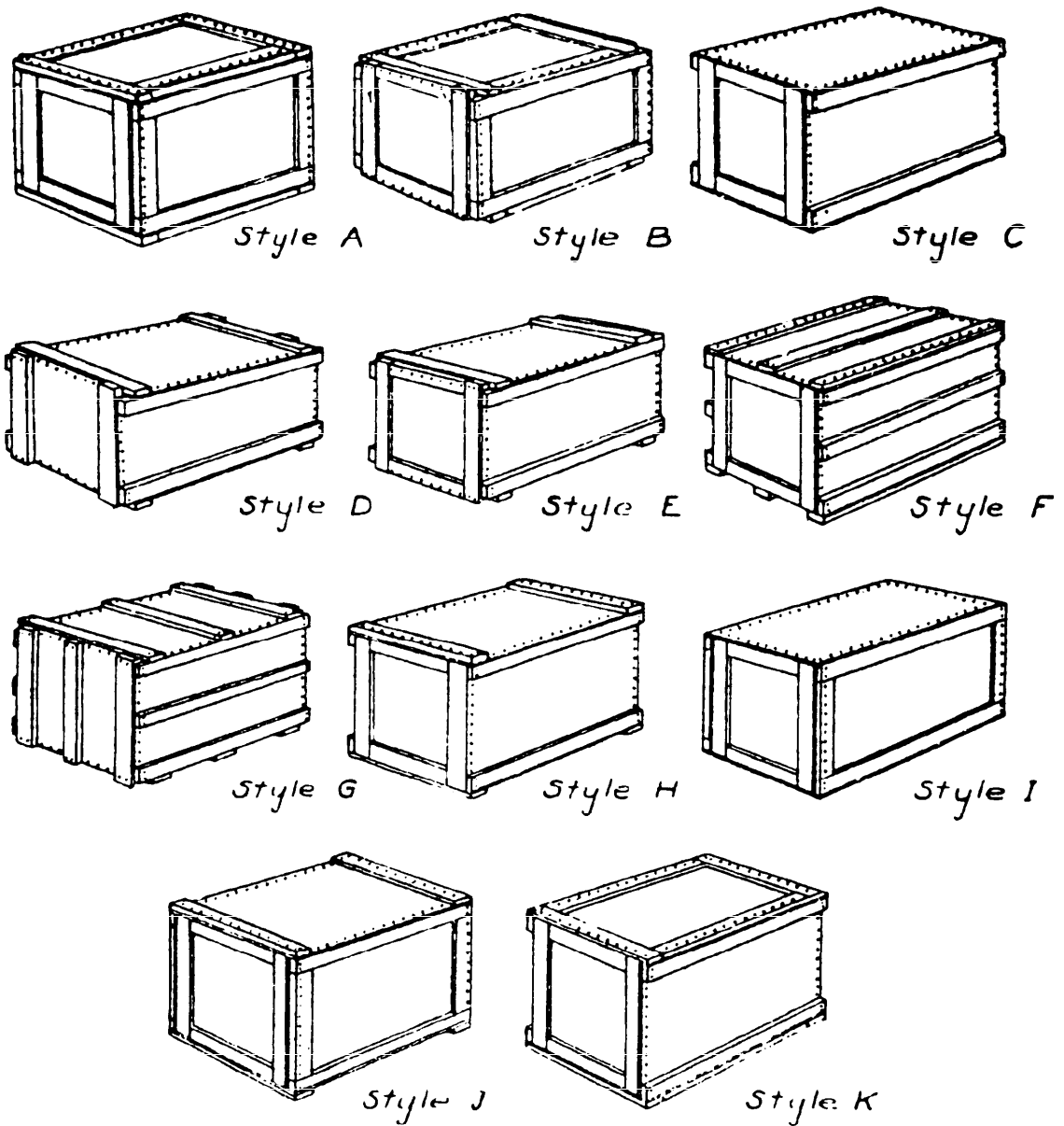
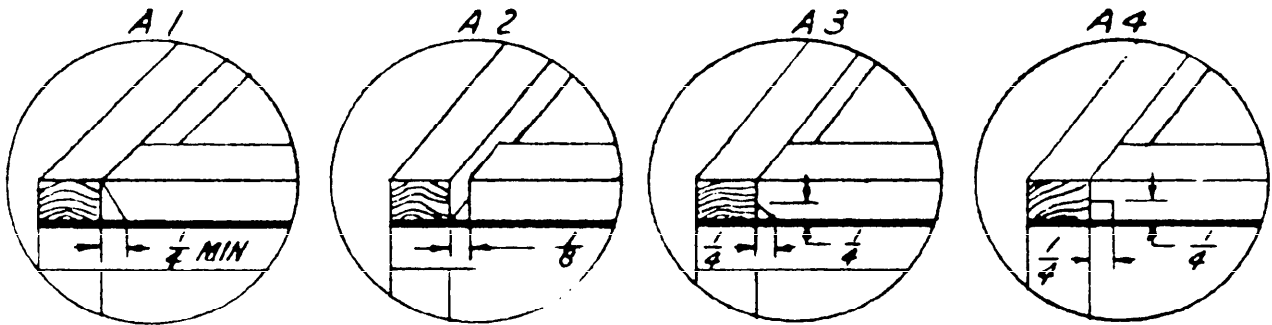


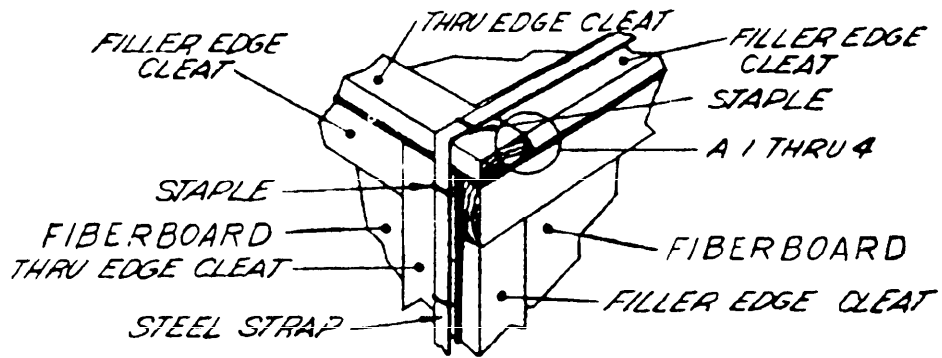
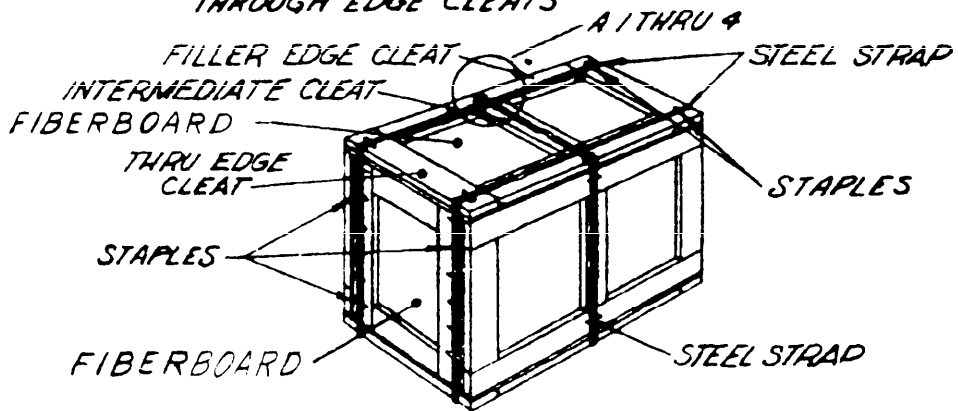
Figure 1.- Styles of cleated fiberboard boxes.



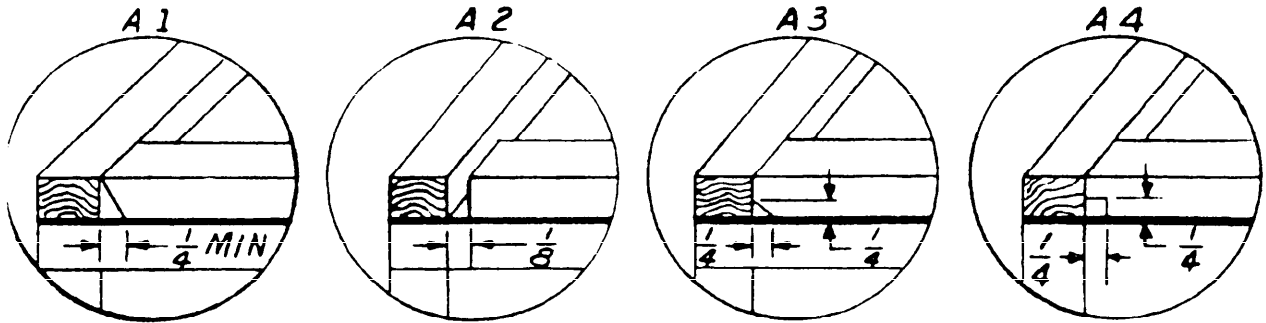
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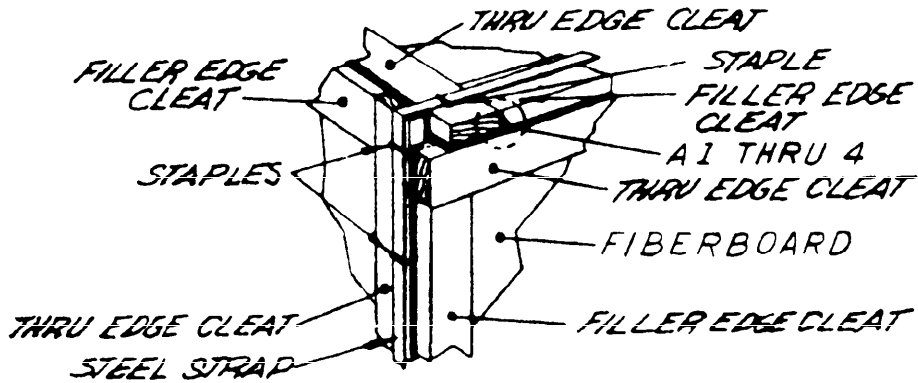
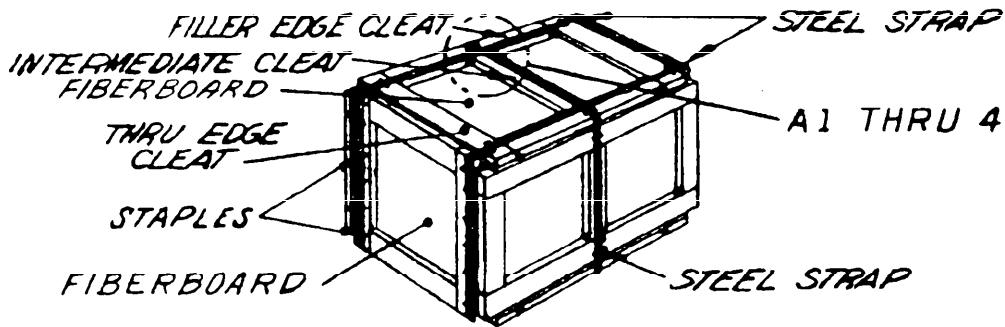
A- ENDS OF FILLER AND INTERMEDIATE CLEATS AND RELATION TO THROUGH EDGE CLEATS



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



CLASS II  
FIGURE 3. STYLE B BOX

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MILITARY CUSTODIANS:

Army - GL  
Navy - SA  
Air Force - 69

Review activities:

Army - EL, WC, AV, SM  
Air Force - 71

User activities:

Army - MU, AT  
Navy - MC, MS, AS, OS

Preparing activity:

Army - GL

CIVIL AGENCY INTEREST:

ACR  
COM  
DC  
CSA(ISS)  
HFW  
JUS  
VA

Project No. 3115-0171

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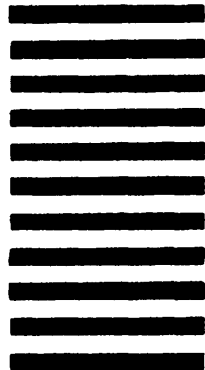
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