Designation: D6573/D6573M – 01(Reapproved 2007)

Standard Specification for General Purpose Wirebound Shipping Boxes[1]

This standard is issued under the fixed designation D6573/D6573M; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

1. Scope

1.1 This specification covers the fabrication of new wirebound general purpose (GP) panelboard (hereafter referred to as wirebound boxes) shipping boxes intended for use as containers for domestic and overseas shipment of general materials and supplies, not exceeding 500 lb [226.8 kg] for class 1 domestic, 400 lb [181.4 kg] for Class 2 overseas shipments or 300 lb [136.0 kg] for Class 3 extreme distribution hazard conditions or military contingency purposes.

1.2 Wirebound box performance is dependent on its fabricated components; therefore, a variety of types, classes, styles, and treatments reflecting varied performance are specified. This specification does not cover wirebound box performance under all atmosphere, handling, shipping, and storage conditions. Wirebound boxes in compliance with Hazardous Material Modal Regulations or United States Code of Federal Regulations (CFRs) are found in the Supplementary Requirements.

1.3 The use of other construction methods or techniques are acceptable and shall be permitted, provided the resulting packaging systems are of equal or better performance than would result from the use of these specified materials and procedures. The appropriate Practice D4169 distribution cycle(s) can be used to develop comparative procedures and criteria.

1.4 *Units*—The values stated in inch-pound units are to be regarded as standard. The SI values given in brackets are mathematical. The values stated in each system are not exact equivalents; therefore, each system must be used independently of the other. Combining values from the two systems may result in non-conformance with the standard. See IEEE/ASTM SI 10 for conversion of units.

1.5 *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

A641/A641M Specification for Zinc–Coated (Galvanized) Carbon Steel Wire

A777 Specification for Galvanized Round Steel Tying Wire (Withdrawn 1995)[3]

D996 Terminology of Packaging and Distribution Environments

D1990 Practice for Establishing Allowable Properties for Visually-Graded Dimension Lumber from In-Grade Tests of Full-Size Specimens

D3953 Specification for Strapping, Flat Steel and Seals

D4169 Practice for Performance Testing of Shipping Containers and Systems

D6199 Practice for Quality of Wood Members of Containers and Pallets

D6254/D6254M Specification for Wirebound Pallet-Type Wood Boxes

F1667 Specification for Driven Fasteners: Nails, Spikes, and Staples

IEEE/ASTM SI 10 Standard for Use of the International System of Units (SI) (the Modern Metric System)

2.2 *Federal Specification:*

Fed-Std-123 Federal Standard Marking for Shipment (Civil Agencies)[4]

2.3 *Military Specification:*

MIL-HDBK-129 Department of Defense Handbook Military Marking[5]

2.4 *National Motor Freight Traffic Association Standard:*

National Motor Freight Classification[6]

[1] This specification is under the jurisdiction of ASTM Committee D10 on Packaging and is the direct responsibility of Subcommittee D10.12 on Shipping Containers, Crates, Pallets, Skids and Related Structures.

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[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from Superintendent of Documents, U.S. Government Printing Office, Washington, DC 20402.

[5] Available from Standardization Documents Order Desk, Bldg. 4, Section D, 700 Robbins Ave., Philadelphia, PA 19111–5094, Attn: NPODS.

[6] Available from the National Motor Freight Traffic Association, American Trucking Associations, 2200 Mill Road, Alexandria, VA 22314.

2.5 *APA—The Engineered Wood Association Standard:*
PS1-95 Construction and Industrial Plywood[7]

2.6 *ANSI Standard:*
ANSI/ASQC Q91–1987 Quality Systems-Model for Quality Assurance and Design/Development, Production, Installation, and Servicing[8]

3. Terminology

3.1 *Definitions*—General definitions for packaging and distribution environments are found in Terminology D996.

4. Classification

4.1 *Types:*

4.1.1 *Type 1*—Easy load, one interior container that supports the top, bottom, and sides of the outer wirebound shipping box.

4.1.2 *Type 2*—Average load, interior or intermediate containers that support and fill the voids of outer wirebound container.

4.1.3 *Type 3*—Difficult load, interior contents that require a high degree of protection. Interior contents will not support outer wirebound shipping container top, bottom, or sides.

4.2 *Classes:*

4.2.1 *Class 1*—Domestic shipments capable of passing Practice D4169, distribution Cycle 1 testing as a minimum, with no maritime shipment testing required.

4.2.2 *Class 2*—Overseas shipments capable of passing Practice D4169 distribution Cycles 1 with 15, 16, or 17 as applicable to the type of shipping container selected.

4.2.3 *Class 3*—Extreme Distribution hazards or military contingency operations the wirebound container will be capable of passing Practice D4169 distribution cycle 18 testing as a minimum requirement.

4.3 *Style (based on the method of closure, see Fig. 1[9]):*

4.3.1 *Style 1*—Twisted wire closure.

4.3.2 *Style 2*—Looped wire closure.

4.3.3 *Style 3*—Looped wire closure with wired ends.

4.4 *Treatment:*

4.4.1 *Grade A*—With preservative treatment.

4.4.2 *Grade B*—Without water preservative treatment.

5. Ordering Information

5.1 Purchasers should cite the following information in procurement and purchase order documents:

5.1.1 This specification title, ASTM number, and date.

5.1.2 Type of load, box type, class, style, and treatment, if specified, (see 4.1-4.4 and S2.1 respectively).

5.1.3 The material/product shall conform to the requirements stated in United States Customary Units of Specification IEEE/ASTM SI 10.

5.1.3.1 Inside box dimensions (see 7.1).

5.1.4 Intermediate cleats for special designs, their size and location. (see 7.3.1).

5.1.5 Weight of contents or load specified in lbs (kg).

5.1.6 Type of girth wire (see 7.7).

5.1.7 When palletization is required (see S3.1.4.3).

5.1.8 Marking required (see S4).

5.1.9 Exceptions to these specifications, if authorized.

5.1.10 When preservation treatment Grade A is required for class 2 or 3 boxes for overseas shipments (see 6.1.4).

5.1.11 When four-way entry skids are required and when 3½ by 4-in. [76 by 89 mm] built-up skids are required (see 7.13).

5.1.12 Purchasers should reference by paragraph number any supplemental requirements applicable to their purchase request (see S1.1).

6. Materials and Manufacture

6.1 *Materials*—It is encouraged that recycled material be used when practical. All recovered, recycled, or virgin materials used in the box manufacture shall meet the requirements of this specification and APA/EWA PSI-95.

6.1.1 *Lumber*—Lumber shall perform to Practice D6199, Class 2 requirements, for cleats (see 7.3, Group III) for skids see Specification D6254/D6254M. Properties of lumber are in accordance with Practice D1990

6.1.1.1 *Plywood Panel*—Requirements are found in APA PS1–95.

6.1.1.2 *Faceboards*—The material used for the faces of a box. Faceboards shall be as specified (see 7.2):

6.1.2 *Wires:*

6.1.2.1 *Binding Wire and Staple Wire*—Binding wire shall be low carbon annealed steel wire and have the properties listed in Table 1. Staple wire shall be hard tempered, low carbon steel wire, and have the properties listed in Table 1.

6.1.2.2 *Wire Coatings*—The surfaces of binding wire and staple wire for Class 2 and 3 boxes shall be galvanized. The surface of binding and staple wires for Class 1 boxes need not be galvanized. Galvanized coating shall be smooth and shall not flake or peel when tested in accordance with Specification A641/A641M.

6.1.3 *Fasteners:*

6.1.3.1 *Nails*—Nails shall be made of steel wire and shall conform to the requirements of Specification F1667. Nails will be clinched, cement-coated, or chemical etched to prevent premature withdrawal.

6.1.3.2 *Staples or Wire Stitches*—Staples or wire stitches shall be made of steel wire not less than 0.0625 in. [2 mm] and comply with Specification F1667.

6.1.4 *Wood Preservative, Water Repellent*—Water repellent preservative shall be composed of either a 2 % copper naphthenate, a 3 % zinc naphthenate, or a 1.8 % oxine copper (formerly referred to as copper-8-quinolinolate) solution.

7. Construction

7.1 *Dimensions*—Boxes shall be furnished having the dimensions as specified (see 5.1.3). Dimensions of boxes are measured between the inside surfaces of the faceboards, and calculated to the nearest ⅛ in. [3 mm], the preferred sequence

[7] Available from the APA, the Engineered Wood Association, 7011 S. 19th Street, P.O. Box 11700, Tacoma, WA 98411–0700.

[8] Available from the American National Standards Institute, 25 West 43rd St., New York, NY 10036.

[9] Dean, School of Military Packaging Technology, 360 Lanyard Rd., Building 360, Attn: ATSL-MP, Aberdeen Proving Ground, MD 21005–5282.

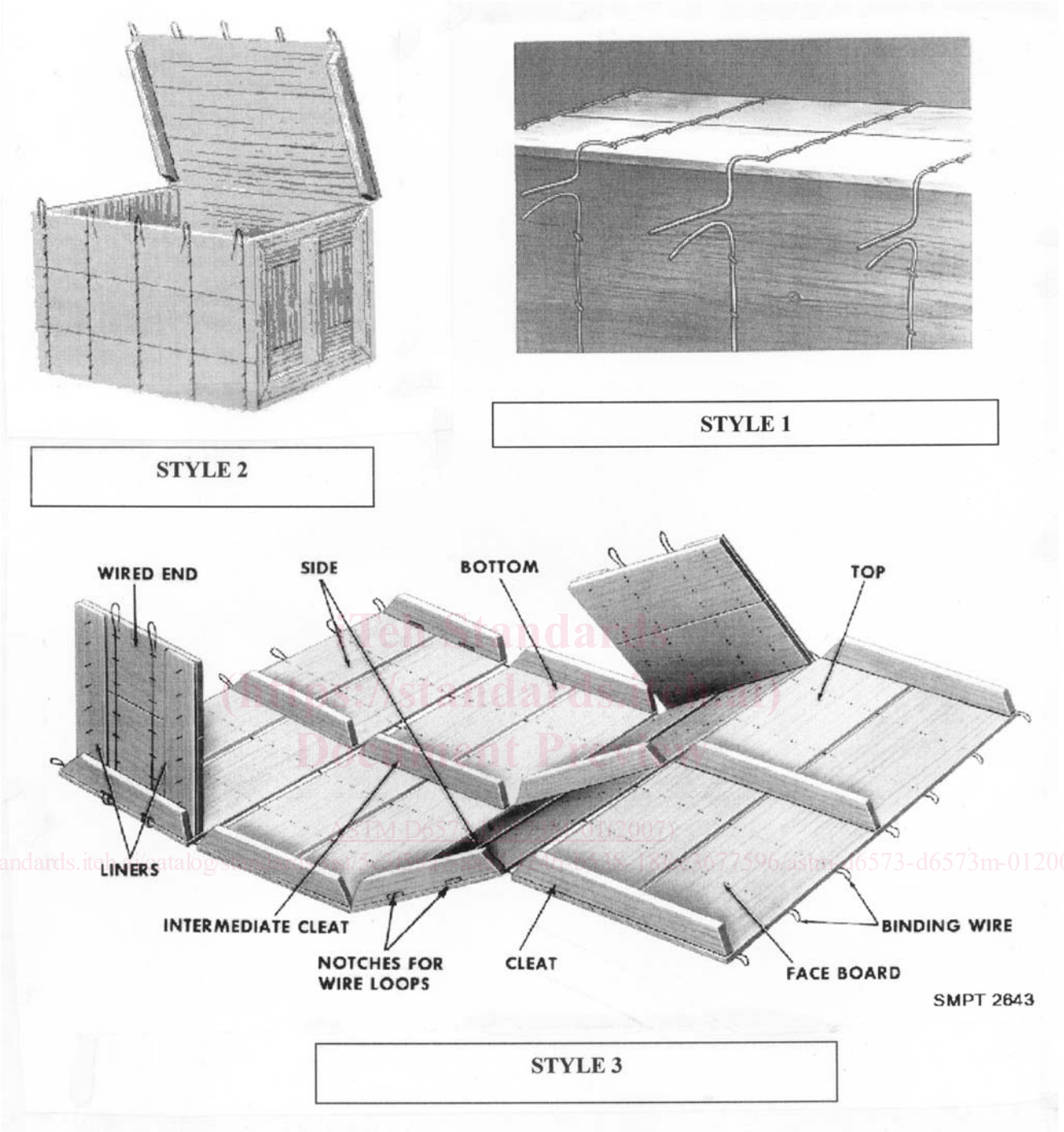


FIG. 1 Styles of Closures[9]

TABLE 1 Tensile Strength of Binding and Staple Wire

Type	K (psi)	MPa	Use
Twist binding	45–70	310–483	Twist closure
Medium binding	60–75	414–517	Groups 1, 2, 3 woods
Hard binding	70–85	483–586	Group 4 woods
Stapling wire	95–125	655–862	Group 1, 2, 3 woods
Stapling wire special	Up to 180	Up to 1241	Group 4 woods

length, width, and depth is used to communicate size in the purchase order or contract.

7.2 *Faceboards*—Faceboards are the sheathing boards on the top, bottom, sides and ends of a box. The thickness of the faceboard can be determined by selecting the appropriate information from Tables 2 and 3. Weight of box contents, type of load and the groups of wood based on box class determine the appropriate faceboard.

7.2.1 *Grain of Faceboards*—End faceboards for Styles 1 and 2 boxes shall be placed with the grain horizontal, except that when horizontal battens are used in end panels, the grain of the faceboards shall be vertical. End faceboards for Style 3

TABLE 2 Minimum Thickness of Faceboards

Weight of Contents in lbs [kg]		Group 1 Woods in Fractional in. [mm]		
Exceeding	Not Exceeding	Type 1 Load	Type 2 Load	Type 3 Load
Class I Boxes				
0	85 [38.5]	7/32 [6]	1/4 [6]	5/16 [8]
85 [38.5]	125 [56.7]	1/4 [6]	5/16 [8]	3/8 [10]
125 [56.7]	200 [90.7]	5/16 [8]	3/8 [10]	7/16 [11]
200 [90.7]	300 [136.1]	3/8 [10]	7/16 [11]	[A]
300 [136.1]	400 [181.4]	[A]	[A]	[A]
400 [181.4]	500 [226.8]	[A]	[A]	[A]
Class 2 Boxes				
0	85 [38.5]	5/16 [8]	3/8 [10]	[A]
85 [38.5]	125 [56.7]	3/8 [10]	3/8 [10]	[A]
125 [56.7]	200 [90.7]	[A]	[A]	[A]
200 [90.7]	300 [136.1]	[A]	[A]	[A]
300 [136.1]	400 [181.4]	[A]	[A]	[A]
Weight of Box Contents in lbs [kg]		Group I Woods Fractional, in. [mm]		
Class 3 Boxes Exceeding	Not Exceeding	Type 1 Load	Type 2 Load	Type 3 Load
0	85 [38.5]	3/8 [10]	3/8 [10]	[A]
85 [38.5]	125 [56.7]	[A]	[A]	[A]
125 [56.7]	200 [90.7]	[A]	[A]	[A]
200 [90.7]	500 [226.8]	[A]	[A]	[A]
Weight of Box Contents in lbs [kg]		Group 2 and 3 Woods in Fractional in. [mm]		
Class 1 Boxes Exceeding	Not Exceeding	Type 1 Load	Type 2 Load	Type 3 Load
0	85 [38.5]	1/7 [4]	1/8 [4]	3/16 [5]
85 [38.5]	125 [56.7]	1/8 [4]	3/16 [5]	7/32 [6]
125 [56.7]	200 [90.7]	3/16 [5]	7/32 [6]	1/4 [6]
200 [90.7]	300 [136.1]	7/32 [6]	7/32 [6]	1/4 [6]
300 [136.1]	400 [181.4]	1/4 [6]	1/4 [6]	5/16 [8]
400 [181.4]	500 [226.8]	5/16 [8]	5/16 [8]	3/8 [10]
Class 2 Boxes				
0	85 [38.5]	3/16 [5]	7/32 [6]	5/16 [8]
85 [38.5]	125 [56.7]	7/32 [6]	1/4 [6]	5/16 [8]
125 [56.7]	200 [90.7]	7/32 [6]	1/4 [6]	5/16 [8]
200 [90.7]	300 [136.1]	1/4 [6]	3/8 [10]	3/8 [10]
300 [136.1]	400 [181.4]	5/16 [8]	3/8 [10]	3/8 [10]
Class 3 Boxes				
0	85 [38.5]	1/4 [6]	1/4 [6]	5/16 [8]
85 [38.5]	125 [56.7]	1/4 [6]	5/16 [8]	5/16 [8]
125 [56.7]	200 [90.7]	1/4 [6]	5/16 [8]	3/8 [10]
200 [90.7]	500 [226.8]	5/16 [8]	3/8 [10]	3/8 [10]
Weight of Box Contents in lbs [kg]		Group 4 Woods in Fractional in. [mm]		
Class 1 Boxes Exceeding	Not Exceeding	Type 1 Load	Type 2 Load	Type 3 Load
0	85 [38.5]	1/7 [4]	1/7 [4]	1/8 [4]
85 [38.5]	125 [56.7]	1/7 [4]	1/8 [4]	3/16 [5]
125 [56.7]	200 [90.7]	1/8 [4]	3/16 [5]	7/32 [6]
200 [90.7]	300 [136.1]	3/16 [5]	7/32 [6]	1/4 [6]
300 [136.1]	400 [181.4]	7/32 [6]	1/4 [6]	5/16 [5]
400 [181.4]	500 [226.8]	1/4 [6]	1/4 [6]	5/16 [5]
Class 2 Boxes				
0	85 [38.5]	3/16 [5]	3/16 [5]	7/32 [6]
85 [38.5]	125 [56.7]	3/16 [5]	3/16 [5]	7/32 [6]
125 [56.7]	200 [90.7]	3/16 [5]	7/32 [6]	1/4 [6]
Weight of Box Contents in lbs [kg]		Group 4 Woods in Fractional in. [mm]		
Class 2 Boxes Exceeding	Not Exceeding	Type 1 Load	Type 2 Load	Type 3 Load
200 [90.7]	300 [136.1]	7/32 [6]	1/4 [6]	5/16 [5]
300 [136.1]	400 [181.4]	1/4 [6]	5/16 [5]	3/8 [10]
Class 3 Boxes				
0	85 [38.5]	1/4 [6]	1/4 [6]	1/4 [6]
85 [38.5]	125 [56.7]	1/4 [6]	1/4 [6]	5/16 [5]
125 [56.7]	200 [90.7]	1/4 [6]	1/4 [6]	5/16 [5]
200 [90.7]	500 [226.8]	1/4 [6]	5/16 [5]	3/8 [10]

[A] Group 1 woods are not permitted.

TABLE 3 Minimum Faceboard Requirements

Resawn faceboard thickness not less than 1/32 in. [1 mm] Less than specified in Table 2	Faceboard edge piece not less than 2-1/2 in. [63.5 mm] wide	Space between Faceboards not more than 1/4 in. [6 mm]
Faceboards no less than 2½ in. [63.5 mm] in width	One full piece of plywood thickness not less than 25 %	

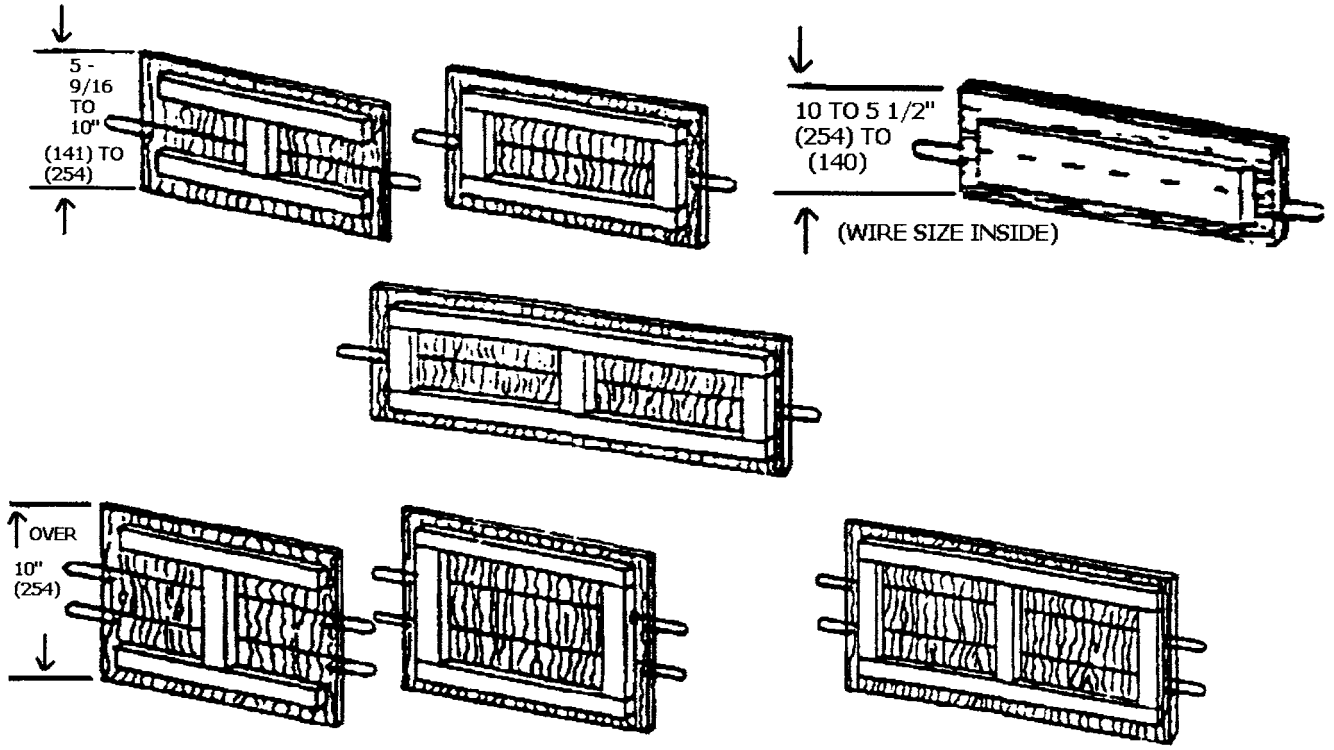
boxes shall be placed with the grain vertical. A line of staples shall be located approximately 1 in. [25 mm] from the parallel to each horizontal edge of the end faceboard (see 7.8). The direction of grain of the ply to which the end wire is stitched shall be vertical.

7.3 *Cleats*—Cleats are pieces of lumber which form the framework of the box and to which faceboards of the top, bottom, and sides are stapled. Cleats shall be made from wood specified in Practice D6199. The cleats shall be made of Group 2, 3, or 4 woods only. Each cleat shall be single piece of wood without joints. Cleats shall be made with mitered ends or with mortised and tenoned ends tongue- and groove. Dimensions shall be actual dimensions, 1 1/32 in. [9 mm]. Edge cleats of all styles of boxes shall be 13/16 in. [21 mm] wide and 7/8 in. [22 mm] in thickness for boxes having weight of contents up to 300 lb [136 kg]. Boxes having weight of contents from 300 to 500 lb [136 to 227 kg] edge cleats shall be 1 1/8 in. [29 mm] wide and 1 1/8 in. [29 mm] in thickness, except that HVB or HVBW end patterns are used (see Fig. 2), edge cleats shall be 13/16 in. [21 mm] wide and 7/8 in. [22 mm] in thickness.

7.3.1 *Intermediate Cleats*—Boxes for Types 2 and 3 loads, having greater between-cleat dimensions than specified in Table 4, shall be reinforced with one or more rows of intermediate cleats, except as below. Rows of intermediate cleats are not required on boxes for Type 1 loads. The distance between adjacent rows of cleats shall not exceed the distance indicated in Table 5. In special designs for Types 2 and 3 loads, where required, size and location of intermediate cleats shall be specified (see 5.1.4) If the use of intermediate cleats may be omitted but the thickness of faceboards shall be increased to the thickness specified for the between cleat dimension indicated in Table 5.

7.3.2 *Cleat Sizes*—Unless otherwise specified in the contract or purchase order (see 5.1.9), any of the sizes of cleats shown in Table 6 shall be used for intermediate rows. No part of any intermediate cleat shall be more than 1/32 in. [1 mm] less than the dimension shown in Table 6, for dimensions exceeding 13/16 in. [21 mm] or 1/16 in. [2 mm] less than the dimensions exceeding 13/16 in. [21 mm].

7.4 *Battens*—A batten is a wooden board to which the end faceboard is nailed or stapled. A batten is a reinforcement used only on the ends of the wirebound container. Battens shall be attached to the outside face of the end faceboard and may be positioned horizontal, vertical, or both horizontal and vertical. Battens made for Group 1 woods shall be not less than 1 3/4 in. [45 mm] wide and those made from Groups 2, 3, and 4 woods shall be not less than 1 3/8 in. [35 mm] wide. Battens shall be the same thickness as the cleats on the boxes. No part of a batten shall be more than 1/32 in. [1 mm] less than the specified thickness nor more than 1/16 in. [2 mm] less than the specified width.



	Maximum Spacing of Vertical Battens in inches (mm)		
	Class 1	Class 2	Class 3
Type 1 Load	18 [457]	15 [381]	12 [305]
Type 2 Load	16 [406]	13 [330]	10 [254]
Type 3 Load	14 [356]	11 [279]	7 [178]

NOTE 1—Wires may be placed on either side of face material.

FIG. 2 End Panel Arrangements for Style 3 Boxes Horizontal and Vertical Battens with Wires HVBW View (see 7.12.4)

TABLE 4 Tensile Strength of Binding and Staple Wire

Type	K (psi)	MPa	Use
Twist binding	45–70	310–483	Twist closure
Medium binding	60–75	414–517	Groups 1, 2, 3 woods
Hard binding	70–85	483–586	Group 4 woods
Stapling wire	95–125	655–862	Group 1, 2, 3 woods
Stapling wire special	Up to 180	Up to 1241	Group 4 woods

TABLE 5 Maximum Distance Between Adjacent Rows of Cleats

Thickness of faceboards in fractional in. [mm][A]	Type 2 Load [Average]			Type 3 Load [Difficult]		
in. [mm]	Group 1 Woods, in. [mm]	Groups 2 and 3 Woods, in. [mm]	Group 4 Woods, in. [mm]	Group 1 Woods, in. [mm]	Group 2 and 3 Wood in. [mm]	Group 4 Woods in. [mm]
Class 1 Boxes						
1/8 [4]	—	32 [813]	36 [914]	—	—	24 [610]
7/32 [6]	—	40 [1016]	44 [1118]	—	28 [711]	32 [813]
1/4 [6]	32 [813]	44 [1118]	48 [1219]	—	32 [813]	36 [914]
5/16 [8]	36 [914]	48 [1219]	48 [1219]	24 [610]	36 [914]	40 [1016]
3/8 [10]	36 [914]	48 [1219]	48 [1219]	24 [610]	40 [1016]	40 [1016]
Class 2 and 3 Boxes						
7/32 [6]	—	28 [711]	32 [813]	—	—	20 [508]
1/4 [6]	—	32 [813]	36 [914]	—	20 [508]	24 [610]
5/16 [8]	—	36 [914]	40 [1016]	—	24 [610]	28 [711]
3/8 [10]	32 [813]	40 [1016]	44 [1118]	—	28 [711]	32 [813]

[A] When intermediate cleats are not desired (see 7.3.1). For Type 1 loads, intermediate cleats are not required.

7.5 *Liners*—A liner is a thin wooden board stapled to the end to reinforce the end face board. The grain of the liner shall be at right angles to the grain of the end face board. Liners for Styles 1 and 2 boxes shall always be vertical; liners for Style 3 boxes shall always be horizontal. When liners are attached to the edges of ends, the liners shall be not less than 1 3/16 in. [30 mm] wide. For Style 3 boxes more than 14 in. [356 mm] in depth, or having vertical battens, the liners shall be not less than 2 7/8 in. [73 mm] wide. The thickness of the liner shall be not less than the thickness of the end board, except that it need not exceed 1/4 in. [6 mm], when the thickness of the end face board exceeds 1/4 in. [6 mm]. Each edge and intermediate liner shall be fastened to the end face board by staples. Liners which are 2 7/8 in. [73 mm] wide shall have two rows of staples.

7.6 *Ends*—Ends are composed of faceboards to which liners, battens, or both are attached forming a subassembly.

7.6.1 *Ends for Styles 1 and 2 Boxes*—Battens shall be required on the ends of Styles 1 and 2 boxes, except that vertical liners are permitted in lieu of battens under the conditions specified in (see Section 7.11.2). The number and arrangement of battens or liners depend on the class of box, type of load, dimensions, and weight of contents. Vertical liners shall be required on ends made from sawed boards when

TABLE 6 Sizes of Intermediate Cleats

Width, in. [mm]	Thickness, in. [mm]
2¾ [70]	⅜ [10]
2¼ [57]	½ [13]
1¾ [45]	⅝ [16]
1¼ [32]	¾ [19]
13/16 [21]	13/16 [21]

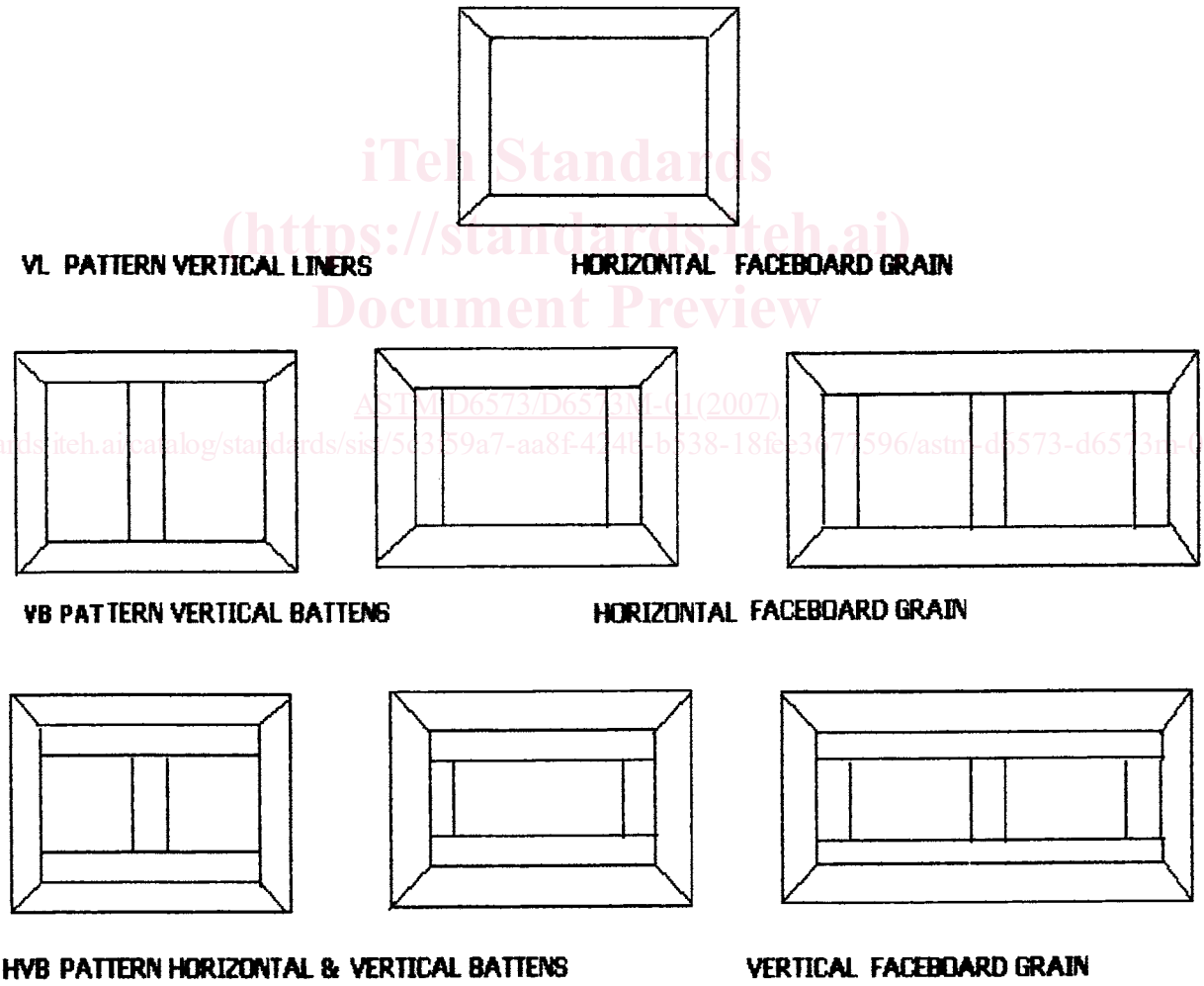
battens are not used. When ends are made from one-piece plywood, no liner are required. Standard arrangements of battened ends and lined ends for Styles 1 and 2 boxes are shown in Fig. 3.

7.6.2 *Ends for Style 3 Boxes*—Ends of Style 3 boxes shall have liners, battens, or both. The number and arrangement of battens, liners, and end-wires depend on the class of box, type of load, dimensions, and weight of contents. When ends shall be made from one-piece plywood, liners are not required. Standard arrangements of battens on the ends of Style 3 boxes are shown in Fig. 4.

7.7 *Wires*—Each girth wire shall be continuous around the girth of the box. Whenever practicable, all girth wires shall be spaced uniformly, except that when rows of intermediate cleats are used, a girth wire shall be placed over each row of cleats. On the ends of Style 3 boxes, each wire shall be continuous across the end. These wires should be generally stapled to the outside face of the end or may be stapled to the inside face if it is more practical to do so. Stapling shall be as specified (see 7.8). Splicing or welding of a binding wire during manufacture is acceptable. The number and gage of girth wires shall conform to the requirements of Table 7 for the weight of contents and inside length of box specified.

7.7.1 *Wire Gage*—The gage of end wires on Style 3 boxes shall conform to the requirements of Table 8 for the weight of contents and class of box specified.

7.7.2 *Girthwise Wire Closure for Box Styles*—The length of girth wires for twisted and looped wire fasteners on Styles 1 and 2 boxes shall be such as to make satisfactory closure. The length of looped wire on the ends of Style 3 boxes shall be such



	Maximum Spacing of Vertical Battens		
in. [mm]	Class 1	Class 2	Class 3
Type 1 Load	15 [381]	12 [305]	12 [305]
Type 2 Load	13 [330]	10 [254]	10 [254]
Type 3 Load	11 [2793]	7 [178]	7 [178]

FIG. 3 End Panel Arrangements for Styles 1 & 2 Boxes (see 7.11.1-7.11.3)