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National Institute of Standards and Technology  
(formerly National Bureau of Standards-NBS)

**Commercial Standard CS35-61  
Plywood (Hardwood and Eastern Red Cedar)**

Commercial Standard CS35-61, Plywood (Hardwood and Eastern Red Cedar) was superseded by Product Standard PS51-71, Hardwood and Decorative Plywood, and withdrawn by the U.S. Department of Commerce on March 21, 1983.

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The following standard was used to replace PS51-71, ANSI/HPMA HP 1983, Standard for Harwood and Decorative Plywood.

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Commercial Standard **CS35-61**

# Hardwood Plywood

# WITHDRAWN

A recorded  
voluntary standard of the  
trade published by  
the U.S. Department  
of Commerce



## **U.S. DEPARTMENT OF COMMERCE**

### **BUSINESS AND DEFENSE SERVICES ADMINISTRATION**

#### **OFFICE OF TECHNICAL SERVICES**

##### **Commodity Standards Division**

#### **EFFECTIVE DATE**

Having met all procedural requirements of the Commodity Standards Division, including approval by the acceptors hereinafter listed, this Commercial Standard was issued by the United States Department of Commerce, effective March 31, 1961.

LUTHER H. HODGES, *Secretary.*

#### **COMMERCIAL STANDARDS**

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The adoption and use of a Commercial Standard is voluntary. However, when reference to a Commercial Standard is made in contracts, labels, invoices, or advertising literature, the provisions of the standard are enforceable through usual legal channels as a part of the sales contract.

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Under a similar procedure the Commodity Standards Division cooperates with industries in the establishment of Simplified Practice Recommendations. Their purpose is to eliminate avoidable waste through the establishment of standards of practice for sizes, dimensions, varieties, or other characteristics of specific products; to simplify packaging practices; and to establish simplified methods of performing specific tasks.

# Hardwood Plywood

[Effective March 31, 1961]

## 1. PURPOSE AND DEFINITION

1.1 These Commercial Standard rules are established to provide a basis of common understanding in the hardwood plywood industry. Hardwood plywood is made of plies of wood or composition material, the face ply of which is generally a veneer from a broad-leaf species commonly called hardwoods. General adoption and use of this standard will facilitate procurement of the proper type and grade of plywood for its varied uses. Architects, engineers, contractors, and industrial users will be able to specify their needs from nationally recognized types and grades, and a better understanding should result between buyer and seller.

## 2. SCOPE

2.1 This standard provides minimum specifications for four types of hardwood plywood, based on the water resistance and durability of the bond, in five standard grades (Premium 1, Good 1, 2, 3, 4) and one specialty grade. It covers tests, densities, standard thicknesses, widths and lengths, tolerances, workmanship, inspection, grade marking and certification, method of ordering, and nomenclature and definitions.

## 3. GENERAL REQUIREMENTS

3.1 **Workmanship.**—All plywood sold as of Commercial Standard quality shall be manufactured well and free from characteristics and defects not specifically permitted in the rules for the various grades.

## 4. DETAIL REQUIREMENTS

4.1 There are many factors entering into the manufacture of the different types of hardwood plywood, but since the use of the plywood is definitely determined by the construction and the adhesive used, four standard types of hardwood plywood have been established as set forth in table 1.

4.2 The specifications given in table 1 establish minimum requirements for each type of plywood; therefore, the majority of the panels manufactured as of Commercial Standard quality will exceed these specifications.

### 4.3 Types of hardwood plywood.

4.3.1 **Technical—fully waterproof bond.**—The construction of this type is designed to provide approximately equal tension and compression strength in the two directions of length and width. The bond shall withstand full weather and water exposure and shall be unaffected by micro-organisms. The bond shall be of such quality that specimens shall withstand the dry-shear and cyclic-boil tests described in paragraphs 5.4.1 and 5.4.2.

4.3.2 **Type I (Ext.)—fully waterproof bond.**—The bond shall withstand full weather exposure and shall be unaffected by micro-organisms. The bond shall be of such quality that specimens shall withstand the dry-shear and cyclic-boil tests described in paragraphs 5.4.1 and 5.4.2.

4.3.3 **Type II (Int.)—water resistant bond.**—The bond shall retain practically all of its strength when occasionally subjected to a thorough wetting and drying. The bond shall be of such quality that specimens shall withstand an average of 10

TABLE 1.—Types of hardwood plywood

Limiting factors	Technical	Type I	Type II	Type III
Bond.....	Fully waterproof.....	Fully waterproof.....	Water-resistant.....	Moisture resistant.....
Species or density of veneer.....	Specify.....	Specify.....	Specify.....	Specify.....
Grade of faces or face and back.....	do.....	do.....	do.....	Do.....
Grade of inner plies.....	2 under 1..... 3 under 2.....	2 or 3.....	2 or 3 <sup>1</sup> .....	2 or 3 <sup>1</sup> .....
Grade of lumber core.....	None.....	Specify.....	Specify.....	Specify.....
Grade of Softwood Veneer Core.....	None.....	Specify.....	Specify.....	Specify.....
Particle Board Core.....	None.....	Specify.....	Specify.....	Specify.....
Edge joints.....	No tape.....	No tape.....	Tape.....	Tape.....
Maximum veneer thickness, in inches:				
High density.....	1/2.....	1/2.....	Not specified.....	Not specified.....
Medium density.....	1/4.....	3/4.....	do.....	Do.....
Low density.....	1/8.....	1/4.....	do.....	Do.....
Percentage of wood in face direction.....	40 to 60.....	Not specified.....	do.....	Do.....
Sanding.....	Specify.....	Specify.....	Specify.....	Specify.....
Tests.....	(a) Dry shear..... (b) Cyclic boil.....	(a) Dry shear..... (b) Cyclic boil.....	Cold soak (15 cycles).....	Cold soak (2 cycles).....

<sup>1</sup> Grade 2 or 3, where 1/8-in. or thicker faces are used, will permit Grade 4 or better inner plies.

cycles when subjected to the 15-cycle cold-soak test as described in paragraph 5.5.

**4.3.4 Type III (Int.)—moisture-resistant bond.**—The bond shall retain practically all of its strength when occasionally subjected to moisture. The bond shall be of such quality that specimens shall withstand the cold-soak 2-cycle test described in paragraph 5.6.

**4.4 Densities.**—Veneers are classified by density as follows:<sup>1</sup>

**High density:**

Ash, commercial white  
Beech, American  
Birch, yellow, sweet  
Elm, rock  
Maple, black (hard)  
Maple, sugar (hard)  
Oak, commercial red  
Oak, commercial white  
Oak, Oregon  
Pecan, commercial  
Rosewood  
Teak

**Medium density:**

Ash, black  
Avodire  
Bay  
Bubinga  
Cedar, Eastern red  
Cherry, black  
Cypress  
Elm, American (white, red, or gray)  
Gum, black  
Gum, sweet  
Hackberry  
Lauan (Philippine mahogany)  
Limba  
Madrone, Pacific  
Magnolia  
Mahogany, African  
Mahogany, Honduras  
Maple, red (soft)  
Maple, silver (soft)  
Paldao  
Primavera  
Sapele  
Sycamore  
Tupelo, water  
Walnut, American

**Low density:**

Aspen  
Basswood, American  
Cativo  
Cedar, Western red  
Celba  
Chestnut, American  
Cottonwood, Eastern  
Cottonwood, Black  
Pine, white and Ponderosa  
Poplar, yellow  
Willow, black

**4.4.1** In determining density of softwoods for inner plies or of hardwoods not mentioned in the preceding list, use a specific gravity of 0.56 and above for high density, 0.41 up to and including 0.55 for medium density, and 0.40 and lower for low density. These are to be based on the oven-dry weight of the wood and the volume at 12% moisture content.

<sup>1</sup> Other grades of red and white lauan (Philippine Mahogany) and of black cottonwood (Western Poplar) are covered in Western Softwood Plywood Commercial Standard C8122-60.

**4.5 Moisture content.**—Moisture content of panels when specified is applicable at time of shipment from the mill.

**4.6 Grade of faces, backs, and inner plies.**—The grade designates the quality of the face, back or inner plies; and in grade (1) faces (see table 2) it also designates the matching of veneer unless otherwise specified under the species.

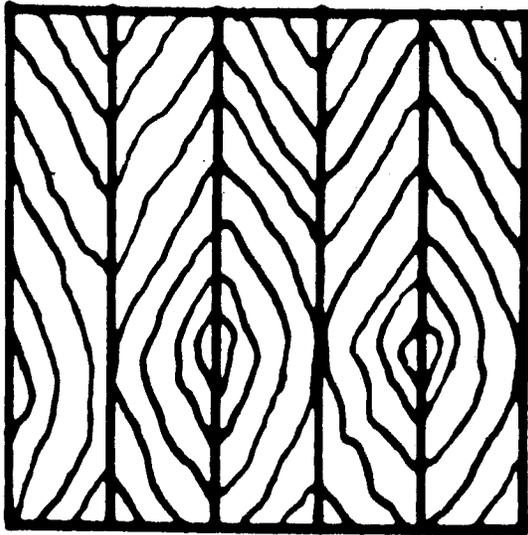
**4.7 Grade descriptions for all species.**—Refer to tables 2, 3, and 4 for special characteristics.

**4.7.1 Premium grade (1).**—The face shall be of the species of hardwood specified and each face shall be made of tight and smoothly cut veneers. When the face consists of more than one piece, the joints shall be tight and approximately parallel to the vertical edge and matched as outlined in table 2. The inherent natural characteristics and the types of matching which will be permitted for each species and the defects which will not be permitted, are listed in table 2. Veneers not covered in table 2 can contain a few small burls, occasional pin knots, slight color streaks or spots and inconspicuous small patches. Unusual characteristics of a given species will be permitted. Knots (other than pin knots), wormholes, splits, shake, doze, and other forms of decay shall not be permitted.

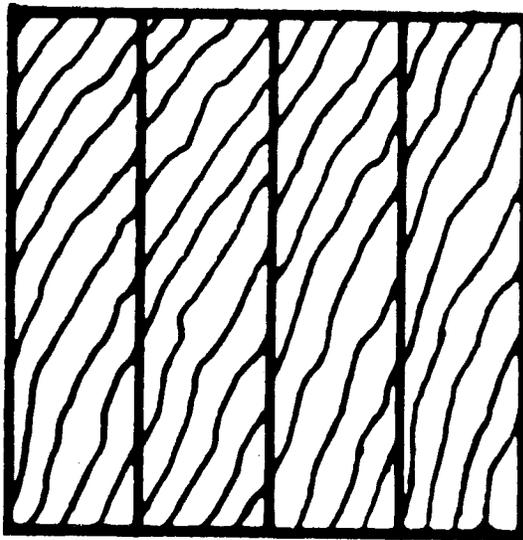
**4.7.2 Good grade (1)—(for natural finish).**—The face shall be made of tight, smoothly cut veneer containing the natural character markings inherent in the species. When the face consists of more than one piece, the joints shall be tight and approximately parallel to the vertical edge. The piece need not be matched for color or grain, but sharp contrasts (see par. 4.7.2.1 for definition) will not be permitted. A few small burls, occasional pin knots, slight color streaks or spots, and inconspicuous small patches shall be permitted. Knots (other than pin knots), wormholes, splits, shake, doze, and other forms of decay shall not be permitted. The inherent natural characteristics which will be permitted for each species, and the defects which will not be permitted are listed in table 3.

**4.7.2.1 Sharp contrasts.**—For purposes of this standard, this term means that veneer of lighter than average color should not be joined at the edges with veneer of darker than average color, and that two adjacent pieces of veneer should not be widely dissimilar in grain, figure, and natural character markings.

**4.7.3 Sound grade (2)—(for smooth paint surfaces).**—The face shall be free from open defects to provide a sound, smooth surface. The veneer is not matched for grain or color. It may contain mineral streaks, stain, discoloration, patches, sapwood, sound tight knots up to 3/4 inch in average diameter, and sound smooth burls up to 1 inch in average diameter. Rough-cut veneer, brashness, splits, shake, doze, or other forms of decay are not permitted. A summary of the inherent natural characteristics which will be per-



Book Matching



Slip Matching

FIGURE 1. Face Matching

mitted, and the defects which will not be permitted are listed in table 4.

**4.7.4 Utility grade (3).**—This grade shall permit discoloration, stain, mineral streaks, patches, tight knots, tight burls, knotholes up to  $\frac{3}{4}$  inch in diameter, wormholes, splits or open joints not exceeding  $\frac{3}{16}$  inch and not extending half the length of the panel, cross breaks, not greater in length than that of the permissible knotholes, and small areas of rough grain. A summary of the inherent natural characteristics which will be permitted, and the defects which will not be permitted are listed in table 4.

**4.7.5 Backing grade (4).**—The species of veneer may be at the option of the manufacturer. Knotholes not greater than 2 inches in maximum diameter and no group of knotholes in any 12-inch square exceeding 4 inches in diameter shall be permitted. Splits 1 inch wide at widest point may be one-fourth panel length; those not more than  $\frac{1}{2}$  inch wide at widest point may be one-half panel length; those not more than  $\frac{1}{4}$  inch wide may be

full panel length. Mineral streaks, stain and discoloration, shims, plugs, patches, filler, knots, burls, worm holes, borer holes, and other characteristics are permitted, provided they do not seriously impair the strength or serviceability of the panel for the use for which they were manufactured. A summary of the inherent natural characteristics which will be permitted and the defects which will not be permitted are listed in table 4.

**4.7.6 Specialty grade (SP).**—This grade includes plywood that does not conform to any of the above grades, such as architectural plywood, matched-grain panels for special uses, and special veneer selections. The grade description and characteristics shall be agreed upon by buyer and seller.

**4.8 Grade of lumber core.**—In all grades the maximum width of the core strips shall be such that warping tendencies are minimized, and the width shall be based on the density of the species,<sup>2</sup> straightness of grain, and arrangement of the strips to properly balance stresses. Unless otherwise specified, the species of the lumber used shall be mill option but mixing of species in a core will not be permitted, and all edge joints must be tightly bonded. Under all grades and edge types, tightly jointed glued finger joints will be considered as full length strips. The grades listed designate the core quality and banding requirements as follows:

**4.8.1 Clear with full length strips.**—Discolorations shall be permitted but the strips shall otherwise be clear of defects which would not properly shape or mold. Wood patches or plugs shall not be used, but wood filler will be permitted.

**4.8.2 Sound with full length strips.**—Discolorations and sound knots shall be permitted. Small open defects if securely patched or plugged with wood or wood filler shall be permitted.

**4.8.3 Regular.**—Sound core strips of random lengths with tight end joints, discoloration and sound knots shall be permitted. Small open defects if securely patched or plugged with wood or wood filler shall be permitted.

**4.8.4 Clear edge.**—A core of "Regular" grade with full length edge strips  $1\frac{1}{2}$  inch or wider. All edges clear of defects to permit shaping or molding to a depth of  $1\frac{1}{2}$  inch on all edges.

**4.8.5 Banded core.**—Species, width, and number of bands as designated by purchaser. All bands clear for shaping. Core stock between bands to be "Regular" grade unless specified by purchaser. Banded cores may be specified as follows:

Any designated wood:

B1E	Banded one end.
B2E	Banded two ends.
B1S	Banded one side.
B2S	Banded two sides.
B2E1S	Banded two ends and one side.
B2S1E	Banded two sides and one end.
B4	Banded two sides and two ends.

<sup>2</sup>The following maximum widths of strips are recommended. High density  $2\frac{1}{2}$  in., medium density 3 in., and low density 4 in.

TABLE 2.—Summary of characteristics and defects permitted in Grade 1 (premium) veneer

Characteristics and defects	Rotary cut ash, basswood, elm, sycamore	Rotary cut birch					Plain sliced cherry	Rotary cut gum, tupelo, bay and magnolia			Quarter sliced gum	Quarter sliced limba	Plain sliced mahogany
		Natural	Selected for white	Selected for red	Uniform light	Uniform dark		Natural	Selected for white	Selected for red			
Sapwood	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	No	No
Heartwood	Yes	Yes	No	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Color streaks or spots	Yes	Yes	Slight	Yes	Slight	Yes	Yes	Yes	Slight	Yes	Yes	Slight	Slight
Color variation	Yes	Yes	Slight	Yes	Slight	Yes	Yes	Yes	Slight	Yes	Yes	Slight	Slight
Mineral streaks	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight
Small burls	Yes	Yes	Few	Few	Few	Few	Yes	Yes	Yes	Yes	Few	Few	Few
Occasional pin knots	Yes	Yes	Yes	Yes	Few	Few	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inconspicuous patches	Small	Small	Small	Small	Yes	Yes	Small	Small	Small	Small	Small	Small	Small
Knots (other than pin knots)	No	No	No	No	No	No	No	No	No	No	No	No	No
Worm holes	No	No	No	No	No	No	No	No	No	No	No	No	No
Open splits or joints	No	No	No	No	No	No	No	No	No	No	No	No	No
Shake or doze	No	No	No	No	No	No	No	No	No	No	No	No	No
Rough cut	No	No	No	No	No	No	No	No	No	No	No	No	No
Gum spots							Small						
Cross bars <sup>1</sup>													
Type of matching	Book <sup>1</sup> or slipped <sup>2</sup>	Book <sup>1</sup>	Book <sup>1</sup>	Book <sup>1</sup>	Book <sup>1</sup> or slipped <sup>2</sup>	Book <sup>1</sup> or slipped <sup>2</sup>	Book <sup>1</sup>	( <sup>3</sup> )	( <sup>3</sup> )	( <sup>3</sup> )	Book <sup>1</sup> or slipped <sup>2</sup>	Book <sup>1</sup>	Book <sup>1</sup>

Quarter sliced mahogany	Rotary cut maple, sliced maple		Red oak and white oak			Walnut		Lauan (Philippine mahogany)		Rotary cut catio
	Natural	Selected for white	Rotary cut	Half round plain sliced	Rift sliced	Half round plain sliced	Quarter sliced	Rotary cut	Quarter sliced	
Sapwood	No	Yes	Yes	Yes	No	No	No	No	No	No
Heartwood	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Color streaks or spots	Slight	Yes	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight
Color variation	Slight	Yes	Slight	Yes	Slight	Slight	Slight	Slight	Slight	Slight
Mineral streaks	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight	Slight
Small burls	Few	Yes	Few	Yes	Yes	Few	Yes	Yes	Yes	Few
Occasional pin knots	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Inconspicuous patches	Small	Small	Small	Small	Small	Small	Small	Small	Small	Small
Knots (other than pin knots)	No	No	No	No	No	No	No	No	No	No
Worm holes	No	No	No	No	No	No	No	No	No	No
Open splits or joints	No	No	No	No	No	No	No	No	No	No
Shake or doze	No	No	No	No	No	No	No	No	No	No
Rough cut	No	No	No	No	No	No	No	No	No	No
Gum spots										
Cross bars <sup>1</sup>	Few						Few			Few
Type of matching	Book <sup>1</sup>	Book <sup>1</sup>	Book <sup>1</sup> or slipped <sup>2</sup>	( <sup>3</sup> )	Book <sup>1</sup> or slipped <sup>2</sup>	Book <sup>1</sup> or slipped <sup>2</sup>	Book <sup>1</sup>	Book <sup>1</sup> or slipped <sup>2</sup>	( <sup>3</sup> )	Book <sup>1</sup>

<sup>1</sup> Book matched. Matched for color and grain at joints.  
<sup>2</sup> Slip matched. Must be matched in sequence with tight side out.  
<sup>3</sup> Matched at the joints for color with tight side out.  
<sup>4</sup> Sharp contrast will not be permitted (see par. 4.7.2.1 for definition).

4.8.6 **Mitred bands.**—Mitred bands, or any construction requiring bands other than those described in paragraph 4.8.5 are to be considered special banded cores, and complete details should appear in the specifications.

4.9 **Edge joints.**

4.9.1 In Technical type and in Type I, no tape shall be permitted in the glue line.

4.9.2 In Types II and III, tape is permitted, however, tape on faces and backs must be exposed.

4.10 **Constructions.**

4.10.1 **Lumber core construction.**—In general, this is a five-ply construction with the grain of the strips of the lumber core running in the same direction as the outer plies, and with the grain direction of the crossbands at right angles to the outer plies.

4.10.2 **Particle board and wood composition board construction.**—Plywood made of these core constructions is generally of three- or five-ply. The grain of all plies, except the core which has

no specific grain direction, shall be at right angles to the grain of the adjacent plies.<sup>3</sup>

4.10.3 **Hardwoods on softwoods.**—This includes standard veneer constructions, except that combinations of hardwood and softwood veneers are used. The plies must conform to the applicable plywood standard: CS35-61, Hardwood Plywood; CS45-60, Douglas Fir Plywood; CS122-60, Western Softwood Plywood; or CS157-56, Pine Plywood. (See table 5.) All face and back veneers less than 1/16 inch thickness shall be crossbanded by B or better core veneers. All face and back veneer 1/16 inch and thicker shall be crossbanded by C or better core veneers.

4.10.4 **Maximum thickness of veneer (all-veneer construction).**—This is governed by the type of plywood desired and the density of the individual ply. Table 6 specifies the maximum

<sup>3</sup> Particle boards for plywood cores should be conditioned to approximate equilibrium with the same relative humidities as those desirable for lumber cores before the gluing on of veneers.

TABLE 3.—Summary of characteristics and defects permitted in Grade 1 (Good) veneer

Defects	SPECIES										
	Bass-wood, sycamore, ash and elm (rotary cut)	Birch (rotary cut)	Cativo	Cherry	Gum, tupelo, Magnolia, bay, and poplar (rotary cut)		Gum, red (quarter sliced)	Lauan Philippine mahogany	Limba	Mahogany (rotary cut)	Mahogany (plain sliced or flat cut)
					Unselected for color	Selected for color					
Knots, other than pin knots.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Occasional pin knots.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....
Small burls.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....
Doze.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Mineral streaks.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....
Discolorations.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....	Do.....
Wormholes.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Splits or open joints.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Cross breaks.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Patches (small).....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....
Sapwood.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	No.....	No.....	No.....
Shake.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
	Mahogany (quarter sliced)	Maple (rotary cut)	Oak, red and white (rotary cut)	Oak, red and white (half round and plain sliced or flat cut)	Oak, white (quarter sliced or sawn and comb-grain sliced or sawn)	Walnut (rotary cut)	Walnut (half round and plain sliced or flat cut)	Walnut (quarter sliced)			
Knots, other than pin knots.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Occasional pin knots.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....
Small burls.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....
Doze.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Mineral streaks.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....	Slight.....
Discolorations.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....	do.....	Do.....
Cross bars.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	Few, small.
Wormholes.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Splits or open joints.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Cross breaks.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Patches (small).....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....	Yes.....
Broken flake.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....
Sapwood.....	No.....	Yes.....	Yes.....	No.....	No.....	Yes.....	No.....	No.....	No.....	No.....	No.....
Shake.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....	No.....

TABLE 4.—Summary of characteristics and defects permitted in Grades 2, 3, and 4 veneers

Defects	Grade 2 Sound <sup>1</sup>	Grade 3 Utility <sup>1</sup>	Grade 4 Backing <sup>1</sup>
Sound tight knots.....	Max. diam. 3/4 in.	Yes.....	Yes.
Sound tight burls.....	Max. diam. 1 in.	Yes.....	Yes.
Mineral streaks.....	Yes.....	Yes.....	Yes.
Discolorations.....	Yes.....	Yes.....	Yes.
Knotholes.....	No.....	Max. diam. 3/4 in.	Max. diam. 2 in. Sum of diam. 4 in. in any 12-in. square.
Wormholes.....	Filled or patched.	Yes.....	Yes.
Splits or open joints.....	do.....	Yes; 3/8 in. for one-half length of panel.	1 in. for one-fourth length of panel; 1/2 in. for one-half length of panel; 3/4 in. for full length of panel.
Cross breaks.....	No.....	Max. 3/4 in. in length.	Yes.
Patches.....	Yes.....	Yes.....	Yes.
Sapwood.....	Yes.....	Yes.....	Yes.
Gum spots.....	Yes.....	Yes.....	Yes.
Bark pockets.....	No.....	Yes.....	Yes.
Brashness, shake, doze, and decay.....	No.....	No.....	No.
Stain.....	Yes.....	Yes.....	Yes.
Rough cut.....	No.....	Small area.....	Yes.
Laps.....	No.....	No.....	No.

<sup>1</sup> Defects permitted in Grades 1 shall be allowed in this grade. (See table 2 and 3.)

thickness of veneer permitted in the four types of Commercial Standard hardwood plywood to insure a balanced construction.

TABLE 5.—Softwood construction inner plies

Hardwood plywood face grades	Softwood crossbands <sup>1</sup>	Other inner plies <sup>1</sup>
Premium.....	C <sup>2</sup>	C.
Good.....	C <sup>2</sup>	C.
Sound.....	C <sup>2</sup>	C.

<sup>1</sup> CS45-60, CS122-60, or CS157-56.

<sup>2</sup> B Grade if face veneers are less than 3/16 inch before sanding.

**4.10.5 Percentage of veneer in face direction.**—For the Technical type, the total thickness of veneers running in the same direction as the face is limited to 40 to 60 percent of the total panel thickness. This factor helps to govern the stiffness and stability of the panel. For the other three types there are no limits as to the total thickness of veneers running in the same direction as the face.

**4.10.6 Number of plies.**—This is dependent upon the density and maximum thickness of each

TABLE 6.—Maximum thickness of veneer

Density	Technical type	Type I	Type II	Type III
High.....	in. 1/2	in. 3/4	Not specified.....	Not specified.
Medium.....	1/10	3/16	do.....	Do.
Low.....	3/8	1/4	do.....	Do.

veneer, the percentage of veneer in the face direction, and the stiffness and stability desired.

4.10.7 **Standard construction.**—In general, plywood shall be constructed with an odd number of plies. All interior plies, except the core or center ply, shall occur in pairs, and the two plies of each pair shall be of the same species, thickness, and direction of grain, but placed on opposite sides of the core. The grain of all plies shall be at right angles to the grain of the adjacent plies and to the ends or edges of the panel. Construction other than the above is considered special construction.

The manner in which plywood is constructed is illustrated in figure 2.

4.11 **Sanding.**—The type of sanding required and number of surfaces to be sanded shall be specified by the purchaser.

4.11.1 **No sanding.**—Surfaces need not be sanded nor tape removed.

4.11.2 **Rough sanding.**—Sanding hit-and-miss. Tape removal is not required.

4.11.3 **Regular sanding.**—Surfaces shall be sanded clean and free of tape. Sander streaks are not considered defects.

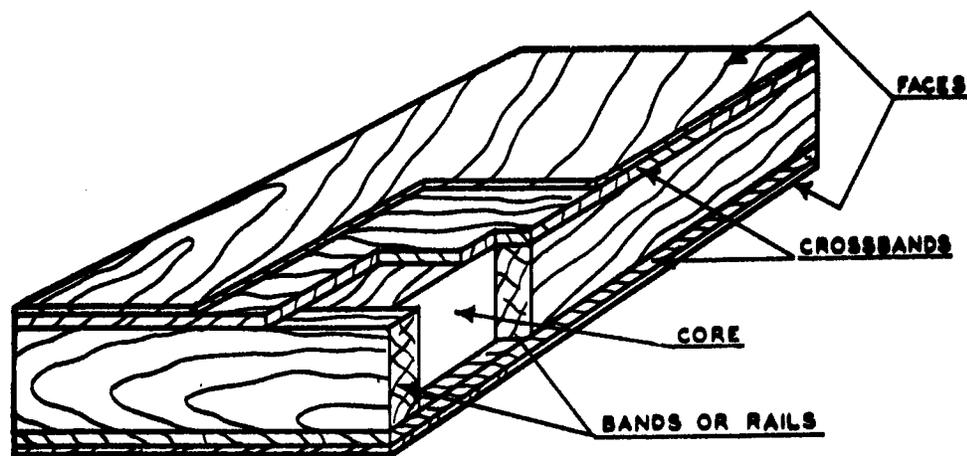
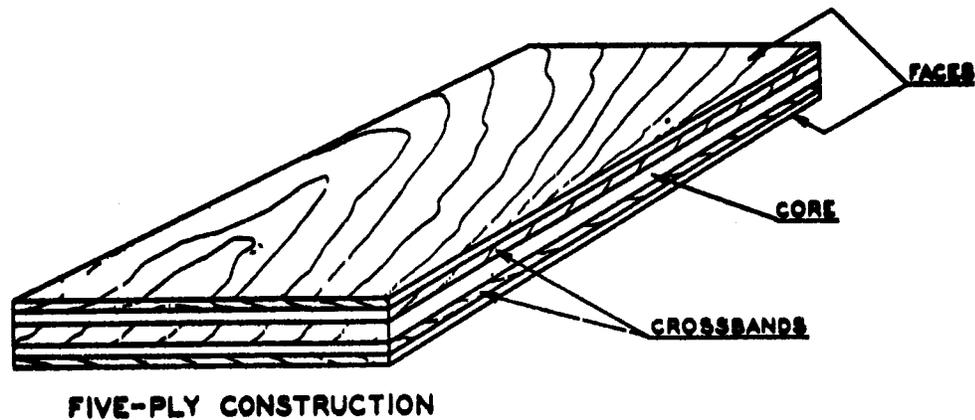
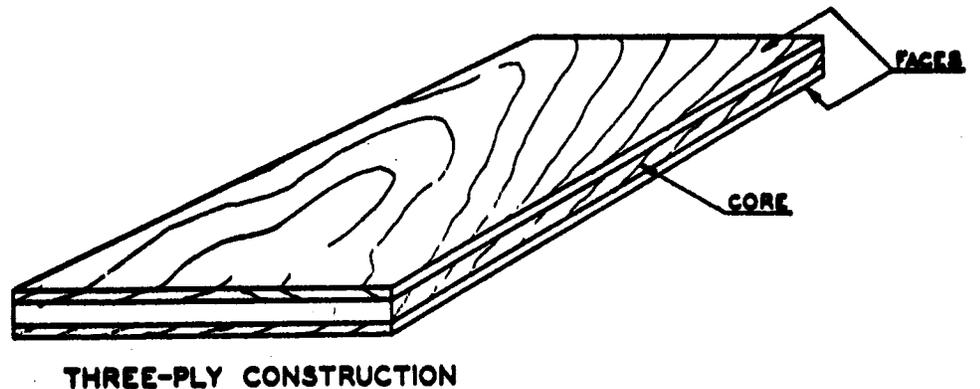


FIGURE 2. Plywood construction.

4.11.4 **Polish sanding.**—Surfaces shall be clean and smoothly sanded, except for removal of handling marks or effects of exposure to moisture. In no case is the plywood to be considered as ready for painter's finish.

## 5. TESTS<sup>4</sup>

5.1 The manufacturer shall, at the purchaser's request, certify that the panels furnished on the purchaser's order were manufactured by using materials and practices known to produce plywood to meet the standards. If, in lieu of the certification, the purchaser required that tests be made, the appropriate standard procedure, as given in paragraphs 5.2 to 5.7, shall be used.

5.2 **Sampling.**—Ten panels shall be randomly selected from the lot. For the purpose of sampling, a "lot" is considered to be a shipment. Three test pieces shall be cut from each panel selected. For shear tests these test pieces shall be of sufficient size to provide 10 test specimens, five for dry shear tests and five for cyclic-boil tests. For cold-soak delamination tests, the test pieces shall be 6 inches by 6 inches. Purchaser must accept the panels from which test pieces are taken, unless the specified tests prove them defective.

5.3 **Shear test.**—Shear tests shall be conducted on specimens of the form shown in figure 3. The ends of the specimen shall be gripped in jaws of the type shown in figure 4, and the load applied at the rate of 600 to 1,000 pounds a minute. Plywood consisting of more than three plies shall be stripped of all except any three selected plies, and then prepared as shown in figure 3. In plywood with face plies thicker than  $\frac{1}{20}$  inch, the shear area shall be 1 square inch, as shown in figure 3, specimen A. Specimens of plywood with face plies  $\frac{1}{20}$  inch or less in thickness shall be of the form shown in figure 3, specimen B, in which the shear area shall be reduced, without changing the width of the specimen, to  $\frac{1}{2}$  square inch. Test machine loads obtained from specimens of  $\frac{1}{2}$  square inch shear area shall be multiplied by 2, to convert to pounds per square inch, then reduced

by 10 percent before comparing with the requirements set forth in table 7. For shear tests on lumber core plywood, the core shall be cut away to about  $\frac{1}{10}$  inch in thickness.

5.4 **Tests for fully waterproof bond (fo Technical type and type I (Ext.)—Plywood).**

5.4.1 **Dry shear test.**—Five specimens of the form shown in figure 3 shall be cut from each of the three test pieces for each sample panel. The specimens shall be subjected to a dry shear test. Minimum and average wood failure, based on the average strength of the specimens, shall meet the requirements of table 7. If the number of plies exceeds three, the outer pairs of glue lines and innermost glue lines shall be tested with separate sets of test pieces.

5.4.2 **Cyclic-boil test.**—Five specimens of the form shown in figure 3 shall be cut from each of the three test pieces from each sample panel, and the shear specimens shall be boiled in water for 4 hours and then dried for 20 hours at a temperature of 145° F. ( $\pm 5^\circ$  F.). They shall then be boiled again for 4 hours, cooled in water, and then subjected while wet to the shear test described in paragraph 5.3. Specimens shall meet the requirements of table 7. There shall be no separation of the plies at the glue line. If the number of plies exceeds three, the outer pairs of glue lines and innermost glue lines shall be tested with separate sets of test pieces.

5.4.3 **Hardwood veneer on softwoods** in addition to passing the requirements of table 7, shall be tested under the provisions of paragraphs 5.3. and 5.3.3 of CS45-60, or CS122-60, and paragraphs 7.3.1 and 7.3.2 of CS157-56. The result

TABLE 7.—Percentage of wood failure

Average shear strength <sup>1</sup>	Minimum wood failure <sup>2</sup>	Average wood failure <sup>2</sup>
<i>lb./sq. in.</i>	<i>Percent</i>	<i>Percent</i>
Under 250.....	25	50
250 to 350.....	10	30
Above 350.....	10	15

<sup>4</sup> These tests shall be made when requested by the purchaser.

<sup>1</sup> These values are based on the area of the adhesive joint.

<sup>2</sup> These values are based on the wood area of the fractured surface.

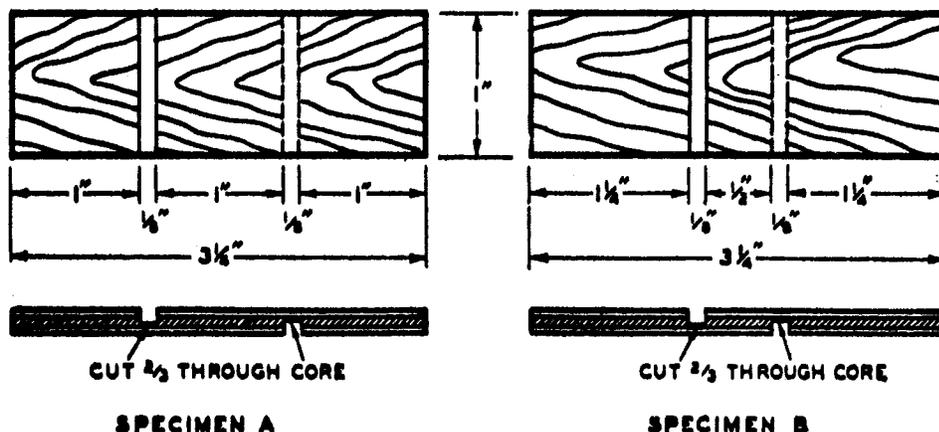


FIGURE 3. Plywood bond shear-test specimens.

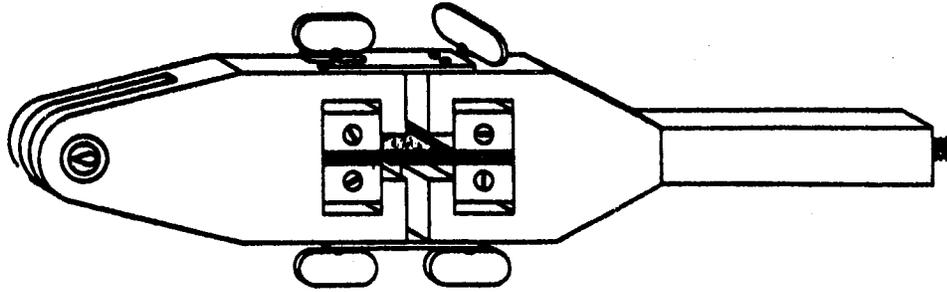


FIGURE 4. Testing jaws.

shall be interpreted under paragraph 5.4.2 of CS45-60 or CS122-60, and under paragraph 7.4.2 of CS157-56.

**5.5 Test for water-resistant bond (for Type II Int.) plywood) (cold-soak for delamination).**—One specimen, 6 inches by 6 inches, from each test piece from each sample panel shall be submerged in water at room temperature for 4 hours, and then dried at a temperature between 70° and 80° F. for 20 hours. The cycle shall be repeated until all specimens fail or until 15 cycles have been completed. A specimen fails when visible delamination between two layers of veneer is greater than 2 inches in continuous length and over  $\frac{1}{8}$  inch in depth at any point. When this test is applied to lumber core plywood, the lumber should be cut away to a depth of 1 inch on all four edges, leaving only enough lumber core, in this stress relieved section, to produce an approximate balance with the face ply. Delamination due to tape at joint of inner plies or defects permitted by the grade shall be disregarded.

**5.6 Test for moisture resistant bond (for Type III (Int.) plywood).**—Same as for Type II (Int.) plywood except that only two cycles are required.

**5.7 Particleboard and wood composition board cores.**—Cores of these materials shall meet the requirements given in the Commercial Standard for Mat-Formed Wood Particleboard (interior use), CS236-61, or revisions thereof.

#### 5.8 Interpretation of tests.

**5.8.1 Shear test.**—A panel shall be classified as defective if the average wood failure for either the 15 dry shear tests or the 15-cyclic-boil tests fails to meet the criteria of table 7. If, among the 10 panels selected, no defectives are found, the lot shall be accepted. If more than two defective panels are found, the lot shall be rejected. If one or two defectives are found, an additional set of 10 panels shall be taken. If the number of defectives in the combined sample is then found to be less than three, the lot shall be accepted; if it is three or more, the lot shall be rejected.

**5.8.2 Delamination test (for Type II (Int.) plywood).**—A panel shall be classified as defective if the average number of cycles passed by the three test pieces is less than 10. If among the 10 panels selected no defectives are found, the lot shall be accepted. If more than two defective panels are

found, the lot shall be rejected. If one or two are defective, an additional set of 10 panels shall be taken. If the number of defectives in the combined sample is then found to be less than three, the lot shall be accepted; if it is three or more, the lot shall be rejected.

**5.8.3 Delamination test (for Type III (Int.) plywood).**—The minimum test requirements apply to each of the test pieces, and if there is a failure on more than one test piece for any panel, that panel shall be classified as defective. If among the 10 panels selected no defectives are found, the lot shall be accepted. If more than two defective panels are found, the lot shall be rejected. If one or two are defective, an additional set of 10 panels shall be taken. If the number of defectives in the combined sample is found to be less than three, the lot shall be accepted; if it is three or more, the lot shall be rejected.

## 6. STANDARD SIZES AND THICKNESSES

6.1 The standard sizes and thicknesses of finished hardwood plywood shall be:

(a) *Widths:* 16, 24, 32, 36, and 48 inches  
Tolerance  $\pm \frac{1}{32}$  inch.

(b) *Lengths:* 48, 60, 72, 84, 96, and 120 inches  
Tolerance  $\pm \frac{1}{32}$  inch.

(c) *Thicknesses:*  $\frac{1}{8}$ ,  $\frac{3}{16}$ ,  $\frac{1}{4}$ ,  $\frac{5}{16}$ ,  $\frac{3}{8}$ ,  $\frac{1}{2}$ ,  $\frac{5}{8}$ ,  $\frac{3}{4}$ ,  $\frac{13}{16}$ ,  $\frac{7}{8}$ , and 1 inch.

*Tolerance:* Unsanded panels  $\pm \frac{1}{32}$  inch  
sanded panels + 0 inch, -  $\frac{1}{32}$  inch.

6.2 Commercial Standard hardwood plywood panels shall be square within  $\frac{1}{16}$  inch, measure on the short dimension.

## 7. INSPECTION

7.1 All hardwood plywood guaranteed to conform to the Commercial Standard grading rule is sold subject to inspection in the white only.

Note: See Appendix for information on reinspection.

## 8. GRADEMARKINGS AND CERTIFICATION

8.1 In order to assure the purchaser that he is getting hardwood plywood of the grade specified, producers may individually or in concert with their trade associations or inspection bureau issue certificates with each shipment, or grade mark each panel according to the standard.

8.1.1 Hardwood plywood producers who maintain a control and inspection service for the careful checking of their products, may use a certificate of inspection to insure that the initial buyer receives plywood of the type and grade specified. The certificate may be of the producer's own design. Following is a suggested form:

#### CERTIFICATE OF INSPECTION

----- Company  
This is to certify that the plywood identified below was manufactured in accordance with the inspection and testing standards of the ----- Company, and the bond specifications established by Commercial Standard CS35-61, Hardwood Plywood, issued by the U.S. Department of Commerce.

Order No. ----- Company  
Car No. ----- By -----  
Date -----

8.2 Producers individually or in concert with their trade association or inspection bureau may adopt grademarks of their own design provided that the conformance to the standard is clearly stated. The grademarking may be stamped on the backs of the panels, on the ends of the panels, or on labels affixed to the panels, so that the ultimate consumer can be assured of receiving the kind of plywood specified. Panels are classified by three types, according to glue line performance and the combination of the appearance grades, based on the faces or faces and backs, as the case may be. Core construction must be specified separately.

### 9. METHOD OF ORDERING

9.1 The established procedure in ordering hardwood plywood is to list the number of pieces, type of plywood, number of plies, thickness, width across the grain, length with the grain, species or density of face ply, density of inner plies in Technical type and Type I only, grade of face, grade of back, grade of lumber core if required, whether sanded or unsanded, and use to which plywood will be put. Width should always be specified first.

9.2 For special types of service, special construction features may be desirable, in which case all applicable standard specification data together with the special construction features should be itemized.

### 10. NOMENCLATURE AND DEFINITIONS

**Adhesive.**—A substance capable of holding materials together by surface attachment. It is a general term and includes cements, mucilage, and paste, as well as glue.

**Back.**—Veneer sheet on under side of plywood panel, corresponding in thickness to face veneer on upper or exposed surface; grain running parallel to grain of face.

**Banding.**—Also referred to as "railing." Portion of wood of specified kind, extending around one or more sides of piece of core, usually with grain extending the long way. This banding of solid wood facilitates shaping the

edges of the piece, or it may be finished flat to cover the several colors presented in the end or side grain of the core.

**Bands, cross.**—See "Crossbanding."

**Bark pocket.**—Comparatively small area of bark around which normal wood has grown.

**Blister.**—Spot or area where veneer does not adhere and bulges like a blister.

**Bond.**—Grip of adhesive on wood at the line of application, particularly with heat-reactive resins.

**Brashness.**—Condition of wood characterized by low resistance to shock and by abrupt failure across the grain without splintering.

**Burl.**—A swirl or twist in the grain of the wood, which usually occurs near a knot but does not contain a knot.

**Centers.**—See "Cores."

**Centers, banded.**—See "Cores, banded."

**Checks.**—Small splits running parallel to grain of wood, caused chiefly by strains produced in seasoning.

**Comb grain (sliced or sawn).**—(Also termed "rift sliced" or "rift sawn"). A method of producing veneer by slicing or sawing at an angle of approximately 45° with the annual rings to bring out certain figures produced by the medullary rays, which are especially conspicuous in oak.

**Compression failures.**—Minute ridges formed by crumpling or buckling of the cells, resulting from excessive compression stresses along the grain.

**Cores.**—Also referred to as centers. They are the innermost portions of plywood. They may be of sawn lumber, either one piece or several pieces joined and glued, or they may be of veneer, or they may be of particle-board core.

**Cores, banded.**—Cores that have been made with banding on one or more sides. See "Banding."

**Crossbanding.**—Veneer used in the construction of plywood with five or more plies. In five-ply construction, it is placed at right angles between the core and faces.

**Cross-bar.**—Type of figure or irregularity of grain resembling a dip in the grain, running at right angles, or nearly so, to the length of the veneer.

**Cross break.**—Separation of the wood cells across the grain. Such breaks may be due to internal strains resulting from unequal longitudinal shrinkage, or to external forces.

**Defects, open.**—Checks, splits, open joints, cracks, loose knots, wormholes, or other defects interrupting the smooth continuity of the surface.

**Density.**—Mass of a body per unit of volume. When expressed in the cgs system, it is numerically equal to the specific-gravity of the same substance.

**Discolorations.**—Stains in wood substances. Common veneer stains are sap stains, blue stains, stain produced by the chemical action caused by the iron in the cutting knife coming in contact with the tannic acid in the wood, and those resulting from the chemical action of the glue.

- Dose.**—A form of incipient decay characterized by a dull and lifeless appearance of the wood, accompanied by a lack of strength and a softening of the wood substance.
- Extender.**—An additive often combined with adhesive resins in order to reduce the cost of resin in the mix.
- Face.**—The veneer used on the exposed side of plywood, usually carefully selected and matched where attractive appearance is required. When location or use demands, face veneer is used on both sides.
- Figure.**—The pattern produced in a wood surface by annual growth rings, rays, knots, deviations from regular grain such as interlocked and wavy grain, and irregular coloration.
- Fillers.**—An additive often combined with adhesive resins to change bonding characteristics of the resin mix.
- Finger-joint.**—A series of fingers machined on the ends of two pieces to be joined, which mesh together and are held firmly in position by an adhesive.
- Flake, broken.**—A breaking or loosening of the flake (medullary ray) or quartered material, most frequent in oak.
- Flat cut.**—Refers to flat-cut veneer sliced parallel to the pith of the log and approximately tangent to the growth rings. Also termed "plain sliced."
- Flat grain.**—Veneer cut so that the growth rings meet the face over at least half the width at an angle of less than 45°. Also called plain cut, flat sawn, slash grain.
- Fitch.**—A portion of a log sawed on two or more sides and intended for remanufacture into lumber or sliced or sawed veneer. The term is also applied to the resulting sheets of veneer laid together in sequence of cutting.
- Gap.**—Open slits in the inner ply or plies, or improperly joined veneers when joined veneers are used for the inner plies.
- Grain.**—Term applied to the vertical elements of wood as they occur in the living tree. Grain is perhaps most easily delineated in certain woods by the presence of annual layers of more densely aggregated cells, or in groups of prominent vessels which form the well-known growth rings. When severed, they may become quite pronounced, and the effect is referred to as grain.
- Grain character.**—A varying pattern produced by cutting through growth rings, exposing various layers. It is most pronounced in veneer cut tangentially or rotary cut.
- Grain rupture.**—Veneer with slight breaks from improper cutting or irregular grain.
- Gum spots.**—Well-defined openings between rings of annual growth, usually containing more or less gum.
- Half-round.**—Refers to a method of cutting veneer to bring out certain beauty of figure, accomplished in the same manner as rotary cutting, except that the piece being cut is secured to a "stay log," a device that permits the cutting of the log on a wider sweep than when mounted with its center secured in the lathe.
- Hardwood.**—General term used to designate lumber produced from broad-leaved or deciduous trees in contrast to softwood produced from evergreen or coniferous trees.
- Hairline.**—Thin perceptible line usually showing at the joint.
- Heartwood.**—The wood extending from the pith to the sapwood, the cells of which no longer participate in the life processes of the tree. Heartwood may be infiltrated with gums, resins, and other materials that usually make it darker and more decay resistant than sapwood.
- Holes, worm.**—Holes resulting from infestation of worms.
- Holes, pinworm.**—Holes resulting from infestation of worms, and not exceeding  $\frac{1}{16}$  inch in diameter.
- Joint.**—The line between the edges or ends of two adjacent sheets of veneer or strips of lumber core in the same plane.
- Joint edge.**—Joint running parallel to the grain of the wood.
- Joint, open.**—Joint in which two adjacent pieces of veneer do not fit tightly together.
- Knot.**—Cross section of branch or limb with grain usually running at right angles to that of the piece in which it occurs.
- Knotholes.**—Voids produced by dropping of knots from the wood in which they were originally embedded.
- Knot, open.**—Opening where a portion of the wood substance of the knot has dropped out, or where cross checks have occurred to present an opening.
- Knots, pin.**—Sound knots less than  $\frac{1}{4}$  inch in diameter.
- Lap.**—A condition where the veneers used are so misplaced that one piece overlaps the other and does not make a smooth joint.
- Loose side.**—See "Tight side."
- Patches.**—Insertions of filler or sound wood placed and glued into panels from which defective portions have been removed.
- Ply.**—See "Veneer."
- Plywood.**—A cross-banded assembly made of layers of veneer, or veneer in combination with a lumber core, particleboard core, or other type of composition material, or plies joined with an adhesive. Three types of plywood are recognized, namely, veneer plywood, lumber-core plywood, and particleboard core plywood. (Except for special construction, the grain of one or more plies is approximately at right angles to that of the other plies; and an odd number of plies is used.)
- Quartered.**—Refers to method of manufacturing veneer by slicing or sawing to bring out certain figures produced by the medullary or pith rays, which are especially conspicuous in oak. The log is fitched in several different ways to allow the cutting of the veneer in a radial direction.

*Railing*.—See "Banding."

*Rift sliced, rift sawn*.—Also termed "comb-grain".

Refers to method of producing veneer by slicing or sawing at an angle of approximately 45° with the annual rings to bring out certain figures produced by the medullary rays, which are especially conspicuous in oak.

*Rotary cut*.—Refers to manner of cutting veneer by which the entire log is centered in a lathe and turned against a broad cutting knife, which is set into the log at a slight angle.

*Sapwood*.—Light-colored wood substances occurring in the outer portion of the tree.

*Shake*.—A separation along the grain, the greater part of which occurs between the rings of annual growth.

*Sliced*.—Refers to manner of cutting veneer, by which logs or sawn flitches are held securely in a slicing machine and thrust downward into a large knife, which shears off the veneer in sheets.

*Species*.—A distinct kind.

*Splits*.—Separations of wood fiber running parallel with the grain.

*Streaks, mineral*.—Natural discolorations of the wood substance.

*Swirls*.—Irregular grain usually surrounding knots or crotches.

*Tape*.—Strips of gummed paper or cloth used to hold the edges of the veneer together at the joints prior to gluing.

*Tight side*.—Term used with its opposite, "loose side," to refer to veneer cut with a knife. The product as it is cut by the wedged-shaped or beveled knife may be curved, thus producing small ruptures on the convex side, known as the loose side. The opposite surface, strained slightly in compression but free from any ruptures, is known as the tight side.

*Veneer*.—A thin sheet of wood rotary cut, sliced or sawn from a log, bolt, or flitch. Veneer may be referred to as a ply when assembled into a panel.

*Worm holes*.—See "Holes, worm," and "Holes, pinworm."

*Wood filler*.—An aggregate of resin and strands or shreds of wood which are used to fill openings and to provide a smooth durable surface.

## APPENDIX

The following material based on industry practices, is offered for the information of purchasers of hardwood plywood.

All complaints regarding the quality of any shipment must be made within 15 days from receipt thereof.

If the grade of any plywood shipment is in dispute and a reinspection is demanded, the cost of such reinspection shall be borne by the seller and the shipment settled for on the basis of the reinspection report if the shipment is more than 5 percent below grade.

The buyer need not accept those panels estab-

lished as below grade, but shall accept the balance of the shipment as invoiced.

If reinspection establishes the shipment to be 5 percent or less below grade, the buyer pays the cost of reinspection and pays for the shipment as invoiced.

## HISTORY OF PROJECT

**First edition**.—Pursuant to a request from the Plywood Manufacturers Association, a general conference of manufacturers, distributors, and users of plywood was held in Chicago, Illinois, on April 9, 1931, to consider the adoption of a Commercial Standard for hardwood plywood and Eastern red cedar for the guidance of the trade. The proposed standard was adjusted at this conference, and circulated to the trade for acceptance on May 29, 1931. Following acceptance of the recommended standard by a satisfactory majority, it was issued as Commercial Standard CS35-31, effective for new production from September 1, 1931.

**First revision**.—A recommended revision of the standards proposed by the Hardwood Plywood Institute, was circulated to the industry and trade on May 1, 1942, for consideration and acceptance. It covered requirements and tests for three types of adhesive bondage having a high, moderate, and low resistance to moisture, as well as a number of changes in the defects permitted or not permitted in the various species and grades. This revision became effective for new production on July 15, 1942, as CS35-42.

**Second revision**.—A second revision of the standard, issued as CS35-47, became effective February 20, 1947. The purpose of this revision was to add one type of bondage to the three already covered; to establish requirements for minimum shear strength for fully waterproof bond and high-water-resistant bond; and to revise all grades to bring them abreast of current manufacturing practice and use, with a better description of the defects permitted.

**Third revision**.—The standard was again revised in 1949. Grades for magnolia, bay, and poplar plywood were added, the maximum thickness of veneer permitted in Type I plywood was increased, and the bondage test requirements were strengthened. This revision, issued as CS35-49, became effective for new production on December 1, 1949.

Additional details regarding the development of the first edition of the standard in 1931 and the three subsequent revisions are included in the respective issues of the standard referred to above.

**Fourth revision**.—On January 6, 1955, the Hardwood Plywood Institute submitted a proposed revision which had been prepared by its technical committee after a year's cooperative work with manufacturers and the Forest Products Laboratory. It provided for (1) an increase in the number of cycles for the cold-soak test with Type II bond; (2) a delamination test for Type III; (3) the addition of several species to the density classification; and (4) a revision of table 2 of CS35-49

to include characteristics and defects permitted in grade 1 veneer, previously covered in the text. The recommended revision was approved by the standing committee and circulated for acceptance on April 6, 1956. Following acceptance of the revised standard by a satisfactory majority, an announcement was made August 31 that it would become effective October 1, 1956, as CS35-56.

**Fifth revision.**—On March 10, 1960, the Hardwood Plywood Institute submitted a proposed revision which had been prepared by its technical committee after a year's work with manufacturers, the Birch Club, and the National Woodwork Manufacturers Association. It provided for (1) five standard grades (Premium 1, Good 1, 2, 3, and 4), and one specialty grade; (2) a definition of hardwood plywood; (3) the addition of particle-board core and softwood veneer core; (4) the addition of several species to the density classification; (5) summary of characteristics and defects for grade species were revised; (6) the method of reinspection is outlined; and (7) definitions of cores and plywood have been revised and definitions of finger-joint and wood-filler have been added. The recommended revision was approved by the Standing Committee and circulated for acceptance on October 14, 1960. Following acceptance of the revised standard by a satisfactory majority, an announcement was made, March 1, 1961 that it would become effective March 31, 1961, as CS35-61.

Project Manager: H. A. Bonnet, Commodity Standards Division, Office of Technical Services.

#### STANDING COMMITTEE

The function of the Standing Committee is to review, prior to circulation for acceptance, changes proposed to keep the standard abreast of progress. Comments concerning the standard and suggestions for revision may be addressed to the Commodity Standards Division, Office of Technical Services, U.S. Department of Commerce, which acts as secretary for the committee, or to any of its members listed below:

Oscar Witt, Roddis Plywood Corp., Marshfield, Wis. (Chairman).  
 M. C. Davidson, Houston Sash & Door Co., Houston, Tex.  
 Don Davis, Jr., Aetna Plywood & Veneer Co., 1731 Elston Ave., Chicago 22, Ill.  
 Clarence W. Dietherich, Southern Plywoods, Inc., P.O. Box 448, Greenville, Fla.  
 A. J. Honzel, Sr., Klamath Hardwoods Inc., P.O. Box 431, Klamath Falls, Ore.  
 Ormie Lance, National Woodwork Manufacturers Association, 332 S. Michigan Ave., Chicago 4, Ill.  
 Clark E. McDonald, Hardwood Plywood Institute, P.O. Box 6246, Arlington 6, Va.  
 Fred F. Montlegel, National Institute of Wood Kitchen Cabinets, 75 East Wacker Drive, Chicago 1, Ill.  
 Mahlon Munson, National Plywood Distributors Association, 530 Terminal Sales Bldg., Portland, Ore.  
 John M. Prince, Jones Veneer & Plywood Co., P.O. Box 789, Eugene, Ore.  
 John L. Rose, Architectural Woodwork Institute, 332 S. Michigan Ave., Chicago 4, Ill.  
 Tinsley W. Rucker, Dixon-Powdermaker Furniture Co., P.O. Box 2700, Jacksonville 3, Fla.  
 J. T. Ryan, Southern Furniture Manufacturers Association, Box 951, High Point, N.C.

#### ACCEPTORS

The manufacturers, distributors, users and others listed below have individually indicated in writing their acceptance of this Commercial Standard prior to its publication. The acceptances indicate an intention to utilize the standard as far as practicable but reserve the right to depart from it as may be deemed desirable. The list is published to show the extent of recorded public support for the standard, and should not be construed as indicating that all products made by the acceptors actually comply with its requirements.

Products that meet all requirements of the standard may be identified as such by a certificate, grade mark or label. Purchasers are encouraged to require such specific evidence of compliance, which may be given by the manufacturer whether or not he is an acceptor.

#### ASSOCIATIONS

(General Support)

Carolina Lumber & Building Supply Association, Inc., Charlotte, N.C.  
 Douglas Fir Plywood Association, Tacoma, Wash.  
 Hardwood Plywood Institute, Arlington, Va.  
 Modular Building Standards Association, Washington, D.C.  
 National Particleboard Association, Washington, D.C.  
 National Plywood Distributors Association, Portland, Ore.  
 National Woodwork Manufacturers Association, Chicago, Ill.  
 Southern Sash & Door Jobbers Association, Memphis, Tenn.  
 West Coast Particleboard Association, Roseburg, Ore.

#### FIRMS AND OTHER INTERESTS

Aberdeen Plywood & Veneers, Inc., Aberdeen, Wash.  
 Aetna Plywood & Veneer Co., Chicago, Ill.  
 Algoma Plywood & Veneer Co., Algoma, Wis.  
 Allegheny Lumber Co., Elkins, W. Va.  
 Allen Quimby Veneer Co., Bingham, Maine.  
 Alesa Lumber Co., Dillard, Ore.  
 Anacortes Veneer, Inc., Anacortes, Wash.  
 Anderson-Tully Co., Memphis, Tenn.  
 Ashby Veneer & Lumber Co., Jackson, Tenn.  
 Bacon-McMillan Veneer Manufacturing Co., Stockton, Ala.  
 Beck Plywood & Lumber Co., Chicago, Ill.  
 Ben Pivnick Plywood & Veneer Co., Detroit, Mich.  
 Bickford, Robert T., Architect, Elmira, N.Y.  
 Birchwood, Inc., Maywood, Calif.  
 Blue Ridge Veneer & Plywood Corp., Waynesboro, Va.  
 Bonneau, J. J., Co., Long Island City, N.Y.  
 Bradley Plywood Corp., Savannah, Ga.  
 Breece Plywood, Inc., New Albany, Ind.  
 Bruce, E. L., Company of Texas, Center, Tex.  
 Burnet-Binford Lumber Co., Inc., Indianapolis, Ind.  
 California Panel & Veneer Co., Los Angeles, Calif.  
 Calypso Plywood Co., Inc., Calypso, N.C.  
 Camlet, J. Thomas, Architect & Engineer, Garfield, N.J.  
 Carnahan Manufacturing Co., Inc., Loogootee, Ind.  
 Carolina Panel Co., Inc., Lexington, N.C.  
 Carolina Veneer & Plywood Co., Florence, S.C.  
 Cheraw Veneer Co., Inc., Cheraw, S.C.  
 Churchill Cabinet Co., Chicago, Ill.  
 Clarke Veneers & Plywood, Jackson, Miss.  
 Conrad & Cummings, Binghamton, N.Y.  
 Consider H. Willett, Inc., Louisville, Ky.  
 Crawford Furniture, Inc., New Bethlehem, Pa.  
 Crawford Furniture Mfg. Corp., Jamestown, N.Y.  
 Curtis Companies Inc., Clinton, Iowa.  
 Davis Manufacturing Co., Inc., New Orleans, La.  
 Denmark Veneer Co., Denmark, S.C.  
 Denny Roll & Panel Co., High Point, N.C.  
 Detroit Edison Co., The, Detroit, Mich.  
 Dillon Veneer & Plywood Co., Dillon, S.C.  
 District of Columbia Government, Dept. of General Administration, Washington, D.C.  
 Dixie Veneer Co., Abbeville, Ala.  
 Dixon Powdermaker Furniture Co., Jacksonville, Fla.  
 Downes Lumber Co., Boston, Mass.  
 Eggers Plywood Co., Two Rivers, Wis.  
 Ehrlich Harrison Co., Seattle, Wash.  
 Elliott Bay Lumber Co., Seattle, Wash.  
 Elmendorf Research Inc., Palo Alto, Calif.  
 Export-Import Corp., Jacksonville, Fla.

Fellheimer & Wagner, Architects and Engineers, New York, N.Y.  
Flannagan, Eric G., & Sons, Architects & Engineers, Henderson,  
N.C.

Fry-Fulton Lumber Co., St. Louis, Mo.  
Fyles Co., Inc., The, Orwell, Vt.  
Fyles & Rice Co., Inc., Bethel, Vt.

Georgia Lumber & Veneer Corp., Toombsboro, Ga.  
Georgia-Pacific, Portland, Oreg.  
Georgia-Pacific Corp., Plymouth, N.C.  
Georgia Plywood Corp., Dublin, Ga.  
Glenwood Lumber Co., The, Bridgeport, Conn.  
Goodman Lumber Division, Calumet & Hecla, Inc., Goodman,  
Wis. (General Support)  
Gramwood of Carolina, Inc., Jasper, Ind.  
Grossmann, Louis C., St. Louis, Mo.  
Gulf Laminates, Inc., Picayune, Miss.

Harbor Sales Co, Inc, The, Baltimore, Md  
Hayworth Roll & Panel Co, High Point, N.C.  
Henrich Plywood Corp., Inc., Buffalo, N.Y.  
Henry County Plywood Corp., Ridgeway, Va.  
Henry Dahlquist Sales Co., Plywood Division, Birmingham, Mich.  
Higgins, J. E. Lumber Co., San Francisco, Calif.  
Hirzel, Charles K., Architect, New York, N.Y. (General Support)  
Houston Sash & Door Co., Houston, Tex.  
Hult Plywood Co., Junction City, Oreg.  
Huttig Sash & Door Co., St. Louis, Mo.

Idaho Veneer Co., Post Falls, Idaho  
International Paper Co., Long-Bell Division, Longview, Wash.  
Interstate Veneer Co., Inc., Emporia, Va.

James Lumber Co., Boston, Mass.  
Jamestown Table Co., Salamanca, N.Y.  
Jasper Corp., The, Plywood Division, Jasper, Ind.  
Jasper Wood Products Co., Inc., Watsonstown, Pa.  
Jefferson Plywood Co., Madras, Oreg.  
Jones, J. M., Lumber Co., Natchez, Miss.  
Jones Veneer and Plywood Co., Eugene, Oreg.

Karpen Plywood Co., Huntington Park, Calif.  
Kearse Manufacturing Co., Olar, S.C.  
Keller Products Inc., Manchester, N.H.  
King Veneer Co., Inc., Florence, S.C.  
Kneeland, Arthur, Montreal, Quebec, Canada

Larson Plywood Co. Inc., Sheboygan, Wis.  
Law, Law, Potter & Nystrom, Madison, Wis.  
L. D. T. Veneer & Panel Co., Inc., Dillon, S.C.  
Linwood Inc., Gillett, Wis.  
Loeb, Laurence M., Architect, White Plains, N.Y.  
Lullabye Furniture Corp., Stevens Point, Wis.  
Lund Plywood & Manufacturing Co., Crescent City, Calif.

Marion Plywood & Veneers, Marion, Wis.  
McKnight Veneer & Plywoods Inc., West Helena, Ark.  
Memphis Plywood Corp., Memphis, Tenn.  
Mengel Division, Container Corporation of America, Louisville,  
Ky.

Met-L-Wood Corp., Chicago, Ill.  
Miller-Vrydagh-Miller, Architects, Terre Haute, Ind.  
Monsanto Chemical Co., Seattle, Wash. (General Support)  
Mooney Plywood, Inc., Benton, Ark.

National Casein, Chicago, Ill.  
National Casein of N.J., Riverton, N.J. (General Support)  
National Plywood Co. Inc., New York, N.Y.  
Niagara Plywood Co., Inc., Buffalo, N.Y.  
Nickey Brothers, Inc., Memphis, Tenn.  
Nixon Lumber Co., Inc., Memphis, Tenn.  
Nordic Plywood, Inc., Sutherlin, Oreg.  
Norsolina Veneer & Lumber Co., Inc., Rowland, N.C.  
Northern Hardwood Veneers, Inc., Butternut, Wis.  
Nurenborg, W. S., Fort Worth, Tex.

Paramount Plywood Products, Inc., New Albany, Ind.  
Pascagoula Veneer Co., Pascagoula, Miss.  
Pease Woodwork Co., Hamilton, Ohio  
Penn Veneer Co., Inc., York, Pa.  
Penokee Veneer Co., Mellen, Wis.  
Penrod, Jurden & Clark Co., Norfolk, Va.  
Perry County Plywood Corp., Beaumont, Miss.  
Pittsburgh Testing Laboratory, Pittsburgh, Pa.

Pluswood Industries, Oshkosh, Wis.  
Ply-Curves, Inc., Grand Rapids, Mich.  
Portsmouth Lumber Corp., Portsmouth, Va.  
Prescott Products Corp., Elizabeth City, N.C.  
Prinsho Veneer Co., Inc., Valdosta, Ga.

Ramsey, A. H., and Sons, Inc., Miami, Fla.  
Rankin Bros. Co., Fayetteville, N.C.  
Rawlings, Wayne I., Sales Co., San Rafael, Calif.  
Resnikoff, Abraham, Architect, New York, N.Y.  
Rinehimer Bros. Manufacturing Co., Elgin, Ill.  
Ritchie, James H., & Associates, Boston, Mass.  
Rockford National Furniture Co., Rockford, Ill.  
Roseburg Lumber Co., Roseburg, Oreg.

St. Paul & Tacoma Lumber Co., Olympia, Wash.  
Sears, Roebuck & Co., Chicago, Ill.  
Setter Bros. Inc., Cattaraugus, N.Y.  
Simpson Redwood Co., Eureka, Calif. (General Support)  
Snellstrom Lumber Co., Eugene, Oreg.  
Southern Oregon Plywood, Inc., Grants Pass, Oreg.  
Southern Plywoods, Inc., Greenville, Fla.  
Southern Veneer Manufacturing Co., Inc., Louisville, Ky.  
Southwestern Veneer Co., Cotton Plant, Ark.  
Splicedwood Corp., Mellen, Wis.  
Stover Plywood Corp., New York, N.Y.  
Stravs, Carl B., Architect, Twin Falls, Idaho.  
Sunset Plywood Co., Inc., Los Angeles, Calif.

Technoply Corp., Jamaica, N.Y.  
Thompson Mahogany Co., Philadelphia, Pa.  
Thompson, Ted, Sales Co., Grand Rapids, Mich.  
Thompson & Swaim Plywood Inc., Tuscaloosa, Ala.  
Tillamook Veneer Co., Tillamook, Oreg.  
Trans-Oceanic Trading Co., New Orleans, La.  
Tulane Hardwood Lumber Co., Inc., New Orleans, La.  
Twin City Hardwood Lumber Co., St. Paul, Minn.  
Tyre Plywood, Inc., Alhambra, Calif.

United States Plywood Corp., New York, N.Y.  
United States Plywood Corp., Orangeburg, S.C.  
United States Testing Co., Inc., Hoboken, N.J.

Valdosta Plywoods, Inc., Valdosta, Ga.  
Virginia-Carolina Veneer Corp., Danville, Va.  
Virginia Plywood Corp., Danville, Va.

Warvel Products, Inc., Gillett, Wis.  
Weber Veneer & Plywood Co., Shawano, Wis.  
Welch, Carroll E., Registered Architect, Huntington, Long  
Island, N.Y.  
Weldon Veneer Co., Inc., Weldon, N.C.  
Weyerhaeuser Co., Arcata, Calif.  
Weyerhaeuser Co., Roddis Division, North Troy, Vt.  
Weyerhaeuser Co., Roddis Division, Marshfield, Wis.  
Williamson Veneer Co., The, Cockeysville, Md.  
Winnboro Plywood Co., Winnboro, S.C.  
Wolverine Plywood Co., Kalamazoo, Mich.  
Wurlitzer Co., The, DeKalb, Ill.  
Wynnewood Products Co., Jacksonville, Tex. (General Support)

#### U.S. GOVERNMENT

Atomic Energy Commission, Property & Supply Management  
Branch, Washington, D.C.  
Army, Department of, Office of the Chief of Engineers, Wash-  
ington, D.C.  
Department of the Interior, Office of the Secretary, Division of  
Property Management, Washington, D.C.  
Post Office Department, Bureau of Facilities, Washington, D.C.  
Treasury Department, Washington, D.C.  
Veterans Administration, Washington, D.C.

#### OTHER COMMERCIAL STANDARDS

A list of Commercial Standards may be obtained from the Commodity Standards Division, Office of Technical Services, U.S. Department of Commerce, Washington 25, D.C. This list includes the purchase price of the publication and directions for ordering copies.

# ACCEPTANCE OF COMMERCIAL STANDARD

CS35-61 HARDWOOD PLYWOOD

If acceptance has not previously been filed, this sheet properly filled in, signed, and returned will provide for the recording of your organization as an acceptor of this Commercial Standard.

Date \_\_\_\_\_

Commodity Standards Division  
Office of Technical Services  
Business and Defense Services Administration  
U. S. Department of Commerce  
Washington 25, D. C.

Gentlemen:

We believe that this Commercial Standard constitutes a useful standard of practice, and we individually plan to utilize it as far as practicable in the

production<sup>1</sup>      distribution<sup>1</sup>      purchase<sup>1</sup>      testing<sup>1</sup>  
of this commodity.

We reserve the right to depart from the standard as we deem advisable.

We understand, of course, that only those articles which actually comply with the standard in all respects can be identified or labeled as conforming thereto.

Signature of authorized officer \_\_\_\_\_  
(In ink)

(Kindly typewrite or print the following lines)

Name and title of above officer \_\_\_\_\_

Organization \_\_\_\_\_  
(Fill in exactly as it should be listed)

Street address \_\_\_\_\_

City, zone, and State \_\_\_\_\_

<sup>1</sup> Underscore the applicable words. Please see that separate acceptances are filed for all subsidiary companies and affiliates which should be listed separately as acceptors. In the case of related interest, trade associations, trade papers, etc., desiring to record their general support, the words "General support" should be added after the signature.

(Cut on this line)

## TO THE ACCEPTOR

The following statements answer the usual questions arising in connection with the acceptance and its significance:

1. *Enforcement.*—Commercial Standards are commodity specifications voluntarily established by mutual consent of those concerned. They present a common basis of understanding between the producer, distributor, and consumer and should not be confused with any plan of governmental regulation or control. The United States Department of Commerce has no regulatory power in the enforcement of their provisions, but since they represent the will of the interested groups as a whole, their provisions through usage soon become established as trade customs, and are made effective through incorporation into sales contracts by means of labels, invoices, and the like.

2. *The acceptor's responsibility.*—The purpose of Commercial Standards is to establish, for specific commodities, nationally recognized grades or consumer criteria, and the benefits therefrom will be measurable in direct proportion to their general recognition and actual use. Instances will occur when it may be necessary to deviate from the standard and the signing of an acceptance does not preclude such departures; however, such signature indicates an intention to follow the standard, where practicable, in the production, distribution, or consumption of the article in question.

3. *The Department's responsibility.*—The major function, performed by the Department of Commerce in the voluntary establishment of Commercial Standards on a nationwide basis is fourfold: First, to act as an unbiased coordinator to bring all interested parties together for the mutually satisfactory adjustment of trade standards; second, to supply such assistance and advice as past experience with similar programs may suggest; third, to canvass and record the extent of acceptance and adherence to the standard on the part of producers, distributors, and users; and fourth, after acceptance, to publish and promulgate the standard for the information and guidance of buyers and sellers of the commodity.

4. *Announcement and promulgation.*—When the standard has been endorsed by a satisfactory majority of production or consumption in the absence of active, valid opposition, the success of the project is announced. If, however, in the opinion of the standing committee or of the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.