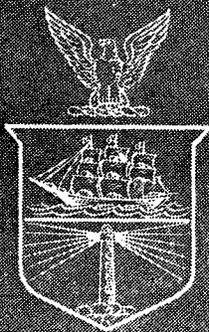


COMMERCIAL STANDARD CS35-56
Supersedes CS35-49

Hardwood Plywood

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



For sale by the Superintendent of Documents
U. S. Government Printing Office, Washington, D. C. Price 15 cents

U. S. DEPARTMENT OF COMMERCE

SINCLAIR WEEKS, *Secretary*

Prepared by
OFFICE OF TECHNICAL SERVICES
Commodity Standards Division

COMMODITY STANDARDS.

Simplified Practice Recommendations and Commercial Standards are developed by manufacturers, distributors, and users in cooperation with the Commodity Standards Division of the Office of Technical Services, and with the National Bureau of Standards.

The purpose of Simplified Practice Recommendations is to eliminate avoidable waste through the establishment of standards of practice for stock sizes and varieties of specific commodities that currently are in general production and demand. The purpose of Commercial Standards is to establish standard methods of test, rating, certification, and labeling of commodities, and to provide uniform bases for fair competition.

The adoption and use of a Simplified Practice Recommendation or 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.

A Simplified Practice Recommendation or a Commercial Standard originates with the proponent industry. The sponsors may be manufacturers, distributors, or users of the specific product. One of these three elements of industry submits to the Commodity Standards Division the necessary data to be used as the basis for developing a standard of practice. The Division, by means of assembled conferences or letter referenda, or both, assists the sponsor group in arriving at a tentative standard of practice and thereafter refers it to the other elements of the same industry for approval or for constructive criticism that will be helpful in making any necessary adjustments. The regular procedure of the Division assures continuous servicing of each effective Simplified Practice Recommendation and Commercial Standard, through review and revision, whenever, in the opinion of the industry, changing conditions warrant such action.

Hardwood Plywood

(Fifth Edition)

[Effective October 1, 1956]

1. PURPOSE

1.1 These Commercial Standard rules are established to provide a basis of common understanding in the hardwood plywood industry. 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 this should result in a better understanding 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, and in four standard grades (1, 2, 3, and 4). 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 well manufactured 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.

TABLE 1. *Types of hardwood plywood*

Limiting factors	Technical	Type I	Type II	Type III
Bond.....	Fully water-proof.	Fully water-proof.	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 ¹	2 or 3. ¹
Grade of lumber core.....	None.....	Specify.....	Specify.....	Specify.....
Edge joints.....	No tape.....	No tape.....	Tape.....	Tape.
Maximum veneer thickness, in inches:				
High density.....	1/2.....	1/8.....	Not specified.....	Not specified.
Medium density.....	1/10.....	3/16.....	do.....	Do.
Low density.....	1/8.....	1/4.....	do.....	Do.
Percentage of wood in face direction.....	40 to 60.....	Not specified.....	do.....	Do.
Blisters.....	None.....	None.....	None.....	None.
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).

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

4.3.2 *Type I—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—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 cycles when subjected to the 15-cycle cold-soak test as described in paragraph 5.5.

4.3.4 *Type III—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:

High density	Medium density	Low density
Ash, commercial white. Beech, American. Birch, yellow, sweet. Elm, rock. Maple, black (hard). Maple, sugar (hard). Oak, commercial red. Oak, commercial white. Pecan, commercial.	Ash, black. Bay. Cherry, black. Elm, American (white or gray). Gum, black. Gum, sweet. Hackberry. Limba. Magnolia. Mahogany, African. Mahogany, American. Maple, red (soft). Maple, silver (soft). Paldao. Philippine mahogany. Primavera. Sycamore. Tupelo, water. Walnut, American.	Basswood, American. Cativo. Chestnut, American. Cottonwood, eastern, black. Poplar, yellow. Willow, black.

4.5 In determining density of softwoods for inner plies or of hardwoods not mentioned in the preceding table, 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-percent moisture content.

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 table 2 for special characteristics.

4.7.1 *Custom grade.*—This grade includes special selections and types produced by individual mills, or panels of a grade description agreed upon by buyer and seller. Architectural plywoods, technical types, and matched-grain panels for special uses also are included.

4.7.2 *Good grade (1), (for natural finish).*—The face shall be made up of tight, smoothly cut veneer containing the natural character markings inherent in the species; if made of more than one piece, the veneer shall be matched at the joints to avoid sharp contrasts in color and grain. 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.

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 $\frac{3}{4}$ in. in average diameter, and sound smooth burls up to 1 in. in average diameter. Rough-cut veneer, brashness, splits, shake, doze, or other forms of decay are not permitted.

4.7.4 *Utility grade (3).*—This grade shall permit discolorations, stain, mineral streaks, patches, tight knots, tight burls, knotholes up to $\frac{3}{4}$ in. in average diameter, wormholes, splits or open joints not exceeding $\frac{3}{16}$ in. 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. Brashness, shake, doze, or other forms of decay are not permitted.

4.7.5 *Backing, grade (4).*—The veneer may be unselected for grain or color. Knotholes no greater than 2 in. in maximum diameter and no group of knotholes in any 12-in. square exceeding 4 in. in diameter, and splits no wider than 1 in. shall be permitted. Splits 1 in. wide at widest point may be one-fourth panel length; those not more than $\frac{1}{2}$ in. wide at widest point may be one-half panel length; those not more than $\frac{1}{4}$ in. wide may be full-panel length. Mineral streaks, stain and discolorations not associated with rot or doze, shims, plugs, patches, knots, burls, worm or borer holes, and other characteristics are permitted, provided they do not seriously impair the strength or serviceability of the panel into which the veneer is incorporated.

4.7.6 Table 3 gives a summary of the defects permitted in Grades 2, 3, and 4 veneers.

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

Defects	Grade 2 ¹	Grade 3 ¹	Grade 4 ¹
Sound tight knots.....	Max. diam. ¾ 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. ¾ 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; ¾ in. for one-half length of panel.	1 in. for one-fourth length of panel; ½ in. for one-half length of panel; ¼ in. for full length of panel.
Cross breaks.....	No.....	Max. ¾ 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.

¹ Defects permitted in Grade 1 (Good) shall be allowed in this grade. (See table 2.)

4.8 *Grade of lumber core.*—The grade designates the quality of the lumber core and banding requirements, as follows:

4.8.1 *Clear.*—A core of any wood, unless otherwise specifically designated, with any type of tightly glued joint and random width full-length strips. The maximum width of the strips shall be such that warping tendencies are minimized, and it shall be based on the density of the species,¹ straightness of grain, and arrangement of strips with a view to well-balanced stresses. Discolorations shall be permitted but the wood shall be clear of defects. Mixing of species is not permitted.

4.8.2 *Regular.*—Same specifications as for “Clear” core, but in addition to discolorations, the following are permitted: Sound knots, open defects, if securely patched or filled, and butt-joints other than at the edges. Brashness, doze, and mixed species are not permitted.

4.8.3 *Clear edge.*—A core of “Regular” grade with edges clear of defects to permit shaping or molding to a depth of 1½ in. on all edges.

4.8.4 *Banded core.*—A core of any wood, unless otherwise specifically designated, in either “Clear” or “Regular” grade, as may be specified, provided with bands to finish net width, as specified; clear of any defect that may prevent required shaping or molding. The purchaser may specify any suitable wood or woods for banded cores. 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.
- B3..... Banded two ends and one side.
- B2S1E..... Banded two sides and one end.
- B4..... Banded two sides and two ends.

¹ The following maximum widths of strips are recommended: High density, 2½ in.; medium density, 3 in.; and low density, 4 in.

4.8.5 *Mitred bands*, or any construction requiring bands other than those described above, 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 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 *Construction.*

4.10.1 *Maximum thickness of veneer (all-veneer construction).*—This is governed by the type of plywood desired and the density of the individual ply. Table 4 specifies the maximum thickness of veneer permitted in the four types of Commercial Standard hardwood plywood to insure a balanced construction.

TABLE 4. *Maximum thickness of veneer*

Density	Technical type	Type I	Type II	Type III
High.....	<i>in.</i> 1/12	<i>in.</i> 1/8	Not specified..	Not specified.
Medium.....	1/10	3/16	do.....	Do.
Low.....	1/8	1/4	do.....	Do.

4.10.2 *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.

4.10.3 *Number of plies.*—This is dependent upon the density and maximum thickness of each veneer, the percentage of veneer in the face direction, and the stiffness and stability desired.

4.10.4 *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 1.

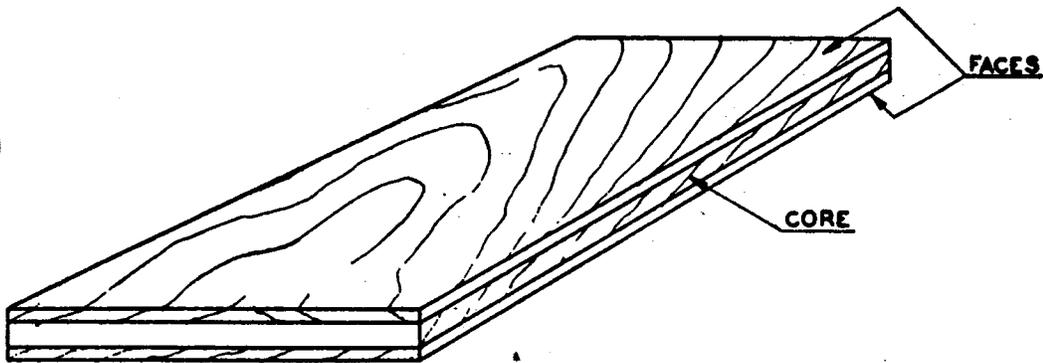
4.11 *Sanding.*—The type of sanding required and number of surfaces to be sanded shall be specified by the purchaser.

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

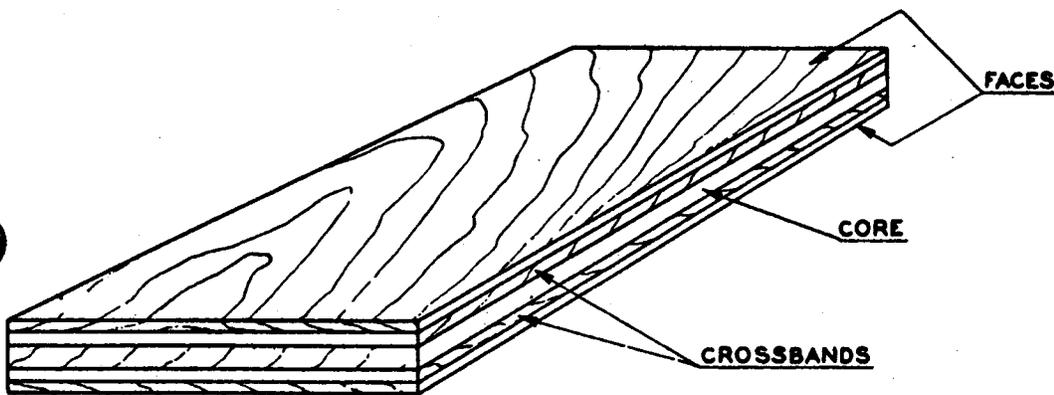
4.11.2 *Rough sanding.*—Sanding hit-and-miss. Tape removal is not required.

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

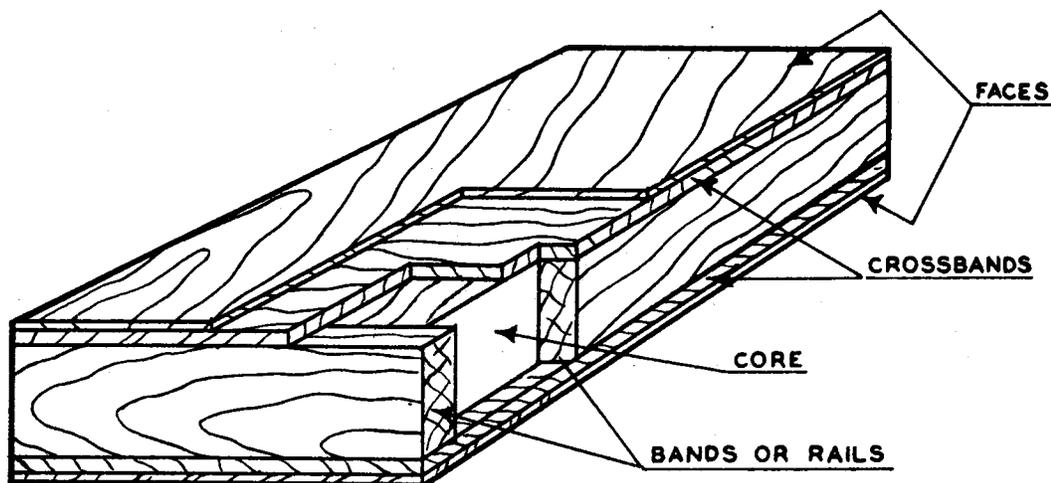
4.11.4 *Polish sanding.*—Surfaces shall be clean and smoothly sanded, except for removal of handling marks or effects of exposure to moisture. In no case is the plywood to be considered as ready for painter's finish.



THREE-PLY CONSTRUCTION WITH VENEER CORE.



FIVE-PLY CONSTRUCTION WITH VENEER CORE.



FIVE-PLY CONSTRUCTION WITH SAWN LUMBER CORE AND BANDING OR RAILING.

FIGURE 1. *Plywood construction.*

5. TESTS²

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 requires 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, 5 for dry shear tests and 5 for cyclic boil tests. For cold-soak delamination tests, the test pieces shall be 6 in. by 6 in. 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 2. The ends of the specimen shall be gripped in jaws of the type shown in figure 3, and the load applied at the rate of 600 to 1,000 pounds a minute. Plywood consisting of more than 3 plies shall be stripped of all except any 3 selected plies, and then prepared as shown in figure 2. In plywood with face plies thicker than $\frac{1}{20}$ in., the shear area shall be 1 sq. in., as shown in figure 2, specimen A. Specimens of plywood with face plies $\frac{1}{20}$ in. or less in thickness shall be of the form shown in figure 2, specimen B, in which the shear area shall be reduced, without changing the width of the specimen, to $\frac{1}{2}$ sq. in. Test machine loads obtained from specimens of $\frac{1}{2}$ sq. in. 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 5. For shear tests of lumber core plywood, the core shall be cut away to about $\frac{1}{10}$ in. in thickness.

5.4 *Tests for fully waterproof bond (for Technical type and Type I plywood.)*

5.4.1 *Dry shear test.*—Five specimens of the form shown in figure 2 shall be cut from each of the 3 test pieces for each sample panel. The specimens shall be subjected to a dry shear test. Minimum and

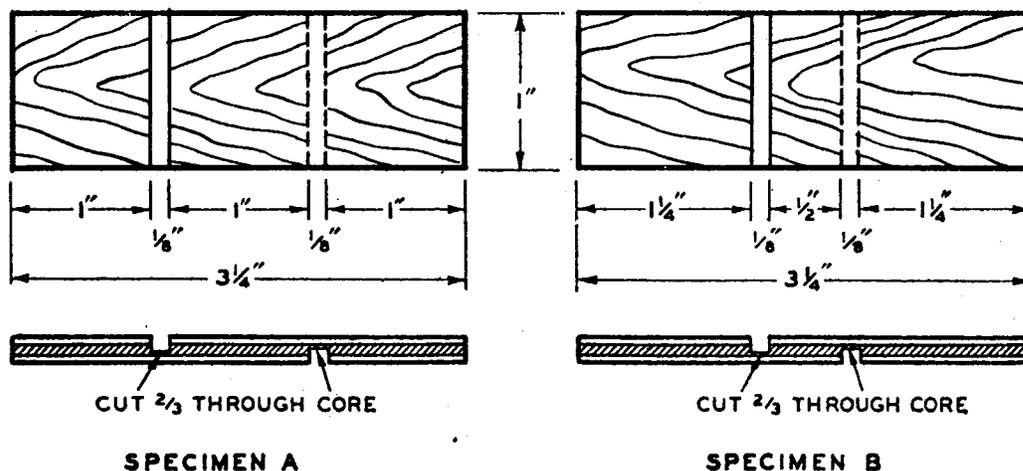


FIGURE 2. Plywood bond shear-test specimens.

² These tests shall be made when requested by the purchaser.

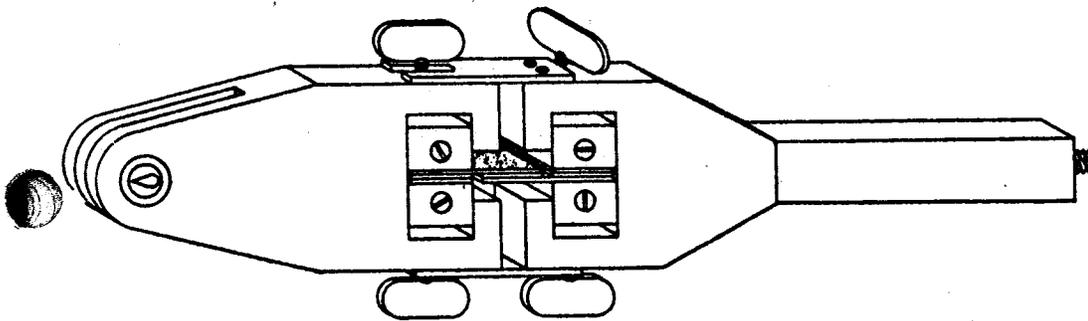


FIGURE 3. Testing jaws.

average wood failure, based on the average strength of the specimens, shall meet the requirements of table 5. If the number of plies exceeds 3, 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 2 shall be cut from each of the 3 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 5. There shall be no separation of the plies at the glue line. If the number of plies exceeds 3, the outer pairs of glue lines and innermost glue lines shall be tested with separate sets of test pieces.

TABLE 5. Percentage of wood failure

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

¹ These values are based on the area of the adhesive joint.

² These values are based on the wood area of the fractured surface.

5.5 *Test for water-resistant bond (for Type II plywood) (cold soak for delamination).*—One specimen, 6 in. by 6 in., 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° to 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 in. in continuous length and over 1/8 in. 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 in. 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 plywood).*—Same as for Type II plywood except that only two cycles are required.

5.7 *Interpretation of tests.*

5.7.1 *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 5. If, among the 10 panels selected, no defectives are found, the lot shall be accepted. If more than 2 defective panels are found, the lot shall be rejected. If 1 or 2 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 3, the lot shall be accepted; if it is 3 or more, the lot shall be rejected.

5.7.2 *Delamination test (for Type II plywood).*—A panel shall be classified as defective if the average number of cycles passed by the 3 test pieces is less than 10. If among the 10 panels selected no defectives are found, the lot shall be accepted. If more than 2 defective panels are found, the lot shall be rejected. If 1 or 2 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 3, the lot shall be accepted; if it is 3 or more, the lot shall be rejected.

5.7.3 *Delamination test (for Type III plywood).*—The minimum test requirements apply to each of the test pieces, and if there is a failure of more than 1 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 2 defective panels are found, the lot shall be rejected. If 1 or 2 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 3, the lot shall be accepted; if it is 3 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:* 24, 30, 36, 42, and 48 in. Tolerance $\pm 1/32$ in.
- (b) *Lengths:* 48, 60, 72, 84, and 96 in. Tolerance $\pm 1/32$ in.
- (c) *Thicknesses:* $1/8$, $3/16$, $1/4$, $5/16$, $3/8$, $1/2$, $5/8$, $3/4$, $13/16$, $7/8$, and 1 in.
Tolerance: unsanded panels $\pm 1/32$ in., sanded panels +0 in., $-1/32$ in.

6.2 Commercial Standard hardwood plywood panels shall be square within $1/16$ in., measured on the short dimension.

7. INSPECTION

7.1 All hardwood plywood guaranteed to conform to this Commercial Standard is sold subject to inspection in the white only, and prior to fabrication. Complaints regarding the quality of any shipment must be made within 15 days from receipt thereof.

8. GRADE-MARKINGS 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 cer-

tificates with each shipment; or grade-mark each panel according to the standard.

8.1.1 Hardwood plywood producers who are not members of an association nor participants in the use of a group quality certification, but 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 CS35-56, Hardwood Plywood, issued by the U. S. Department of Commerce.

Order No.-----
Car No.-----
Date -----

----- Company
By -----

8.2 Producers individually or in concert with their trade association or inspection bureau may adopt grade-marks of their own design. For example, the trade promotion subscribers of the Hardwood Plywood Institute, in order to preserve the standards of quality set up by this standard, intend to use the following grade-marking in conjunction with a trade-mark. The grade-marking and trade-mark 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.

8.2.1 *Technical type.*—This type is made only with Type I adhesive, with the grade and thickness limited to the special requirements set up in table 1 (par. 4.2). Density limitations and other requirements may also be shown. For limitations on Technical plywood veneer grades, see paragraph 4.3.1. This type is stamped as indicated below.



8.2.2 *Type I—fully waterproof bond.*—To identify the Type I or exterior type of hardwood plywood, the symbol "Type I" together with the "HPI" label is branded or stamped on either the back or the edge of the panel. The various grades within Type I are

additionally identified by the following terms or combination of terms describing the grade of face and the grade of back :



Grades :
 Good----- (1)
 Sound---- (2)
 Utility--- (3)
 (For full description, see par. 4.3.2.)

8.2.3 *Type II—water-resistant bond.*—To identify the Type II or water-resistant type of hardwood plywood, the symbol “Type II” and the “HPI” label are branded or stamped on either the back or the edge of the panel. The various grades within Type II are additionally identified by the following grade-marks in combination to describe the appearance factors of the face and the back :



Grades :
 Good----- (1)
 Sound---- (2)
 Utility--- (3)
 Backing-- (4)
 (For full description, see par. 4.3.3.)

8.2.4 *Type III—moisture-resistant bond.*—To identify the Type III or moisture-resistant hardwood plywood used in some furniture applications and certain industrial uses, the symbol “Type III” and the “HPI” label are branded on either the back or the edge of the panel. In cases where the special sizes, which are bundled, are ordered, the identification may appear on each bundle only, or a certification given with the shipment. The various grades within Type III are additionally identified by the following grade-marks :



Grades :
 Good----- (1)
 Sound---- (2)
 Utility--- (3)
 Backing-- (4)
 (For full description, see par. 4.3.4.)

8.2.5 An alternate procedure to that illustrated in paragraphs 8.2.1 to 8.2.4 is to use the following trade-mark for labeling the ends of the panel where both sides of the panel are exposed :



The stamp may include designations of grade and type as indicated in paragraphs 8.2.1 to 8.2.4.

8.3 Hardwood plywood producers in concert with their trade association or inspection bureau may use a group quality certification. For example, the Hardwood Plywood Institute trade promotion program maintains a quality control and inspection service for the careful checking of its subscribers' products. The certificate of inspection, which applies only to subscribers' grade-marked plywood, is to insure that the initial buyer receives plywood of the type and grade specified. A facsimile of the certificate of inspection is shown in figure 4, and the reverse side of the certificate is shown in figure 5.

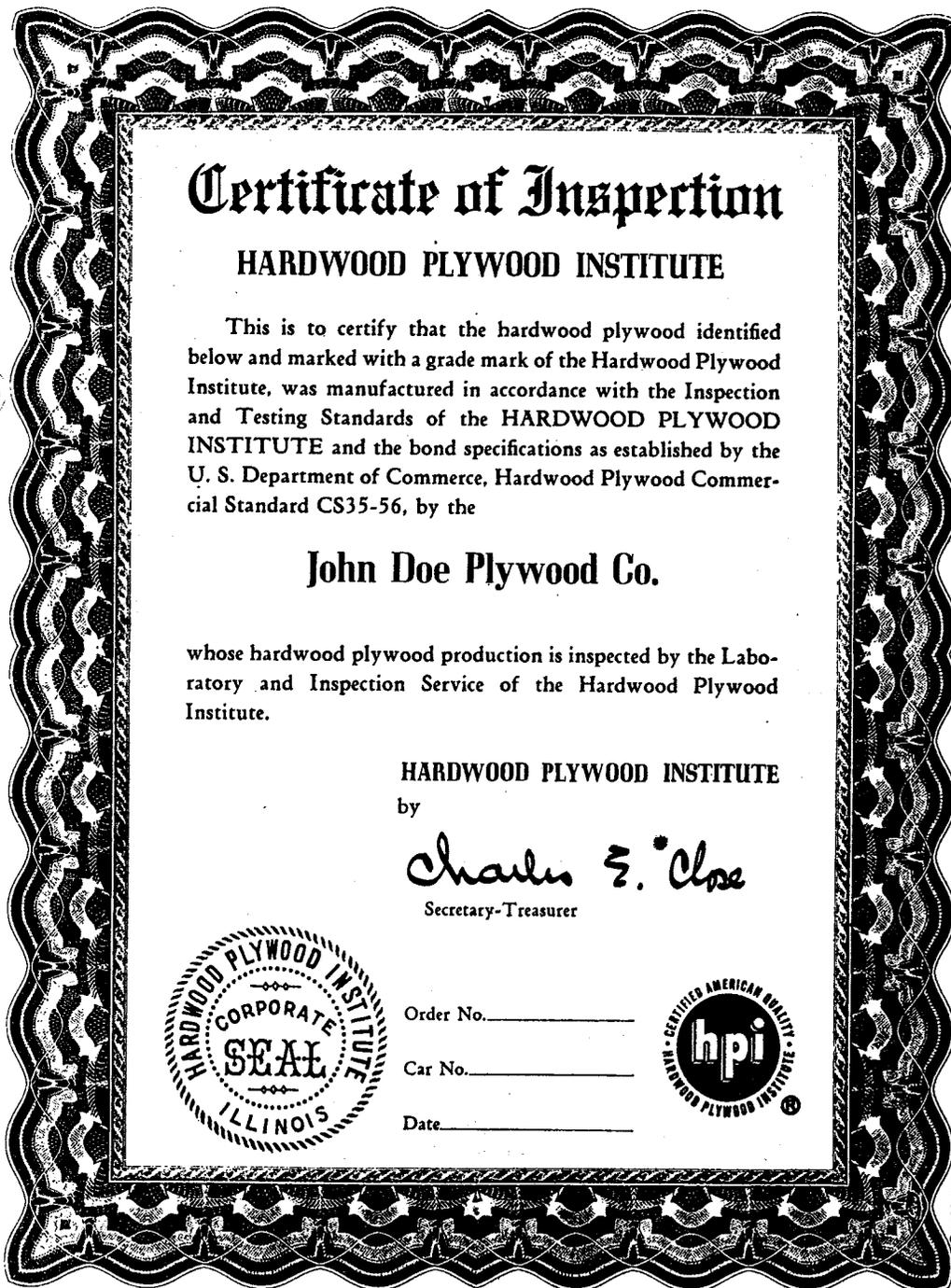


FIGURE 4. Certificate of inspection of the Hardwood Plywood Institute.

THE GRADE MARKING LABELS OF THE HARDWOOD PLYWOOD INSTITUTE

Grade markings reproduced below identify panels as to TYPE of adhesive between plys and the APPEARANCE GRADE of the outer plys or veneers as stipulated in the U. S. Commercial Standard CS 35-56.

Technical Grade



For limitations on Technical plywood Veneer Grades
(see par. 4.3.1)

Type II (Water Resistant)



Appearance Grades include combinations of
 Good (1)
 Sound (2)
 Utility (3)
 Backing .. (4)
 (see par. 4.3.3 for full description of grades)

Type I (Fully Waterproof)



Appearance Grades include combinations of
 Good (1)
 Sound (2)
 Utility (3)
 (see par. 4.3.2 for full description of grades)

Type III (Moisture Resistant)



Appearance Grades include combinations of
 Good (1)
 Sound (2)
 Utility (3)
 Backing (4)
 (see par. 4.3.2 for full description of grades)

Alternate procedure for labeling the ends of panels uses the following trade mark with appropriate grade markings and type (adhesive) designations above.

AMERICAN QUALITY HARDWOOD PLYWOOD

FIGURE 5. Reverse side of certificate of inspection of the Hardwood Plywood Institute.

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.

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, 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.

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, stains 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.

Doze.—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 to give it special value, such as providing body or reducing cost.

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.

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.

Flitch.—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 by 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 $\frac{1}{16}$ in. 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 $\frac{1}{4}$ in. 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 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 or plies joined with an adhesive. Two types of plywood are recognized, namely, veneer plywood and lumber-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 flitched

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 substance 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 wedge-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 sawed 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.”

11. EFFECTIVE DATE

11.1 Having been passed through the regular procedure of the Commodity Standards Division, and approved by the acceptors hereinafter listed, this Commercial Standard was issued by the United States Department of Commerce, effective from October 1, 1956.

EDWIN W. ELY,
Chief, Commodity Standards Division.

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, Ill., 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 standard, 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 bondages 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 1 type of bondage to the 3 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.

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

STANDING COMMITTEE

The following individuals comprise the membership of the standing committee, which is to review, prior to circulation for acceptance, revisions proposed to keep the standard abreast of progress. Comment concerning the standard and suggestions for revision may be addressed to any member of the committee or to the Commodity Standards Division, Office of Technical Services, United States Department of Commerce, which acts as secretary for the committee.

M. H. SPELTZ, Memphis Plywood Corp., Memphis, Tenn. (Chairman)
CHARLES E. CLOSE, Hardwood Plywood Institute, 600 South Michigan Ave., Chicago 5, Ill.

CLARENCE W. DIETTERICH, Darlington Veneer Co., Darlington, S. C.
W. F. DURBIN, Hoosier Panel Co., New Albany, Ind.
R. FAY KULMER, The Mengel Co., Louisville, Ky.
A. D. PATCHEN, Jamestown Veneer & Plywood Corp., Jamestown, N. Y.
J. H. TIGELAAR, Haskelite Manufacturing Corp., 701 Ann St., Grand Rapids, Mich.
B. P. ADAMS, JR., United States Plywood Corp., Orangeburg, S. C.
DON L. DAVIS, Aetna Plywood & Veneer Co., 1731 Elston Ave., Chicago, Ill.
C. E. DEVLIN, National Plywood Distributors Association, Inc., 20 North Wacker
Drive, Chicago 6, Ill.
THOS. R. GUNSAULLUS, Fry-Fulton Lumber Co., 148 Carroll St., St. Louis 4, Mo.
HAL KEELY, Hal Keely Plywood Co., 2001 Preble Ave., Pittsburgh 33, Pa.
THEODORE IRVING COE, American Institute of Architects, 1740 New York Ave. NW.,
Washington, D. C.
TINSLEY W. RUCKER, Dixon-Powdermaker Furniture Co., P. O. Box 2700, Jack-
sonville 3, Fla.
WM. A. RUSSELL, Technical Standards, Federal Housing Administration, Wash-
ington 25, D. C.
J. T. RYAN, Southern Furniture Manufacturers Association, High Point, N. C.
WALTER M. SCHALL, Kroehler Manufacturing Co., Naperville, Ill. (representing
National Association of Furniture Manufacturers, and National Retail Furni-
ture Association)

ACCEPTANCE OF COMMERCIAL STANDARD

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,
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

production¹ distribution¹ purchase¹ testing¹

of hardwood plywood. We reserve the right to depart from it as we deem advisable.

We understand, of course, that only those products 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-----

¹ Underscore the one that applies. 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 interests, 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.

ACCEPTORS

The organizations listed below have individually accepted this standard for use as far as practicable in the production, distribution, testing, or purchase of hardwood plywood. In accepting the standard, they reserved the right to depart from it as they individually deem advisable. It is expected that products which actually comply with the requirements of this standard in all respects will be regularly identified or labeled as conforming thereto, and that purchasers will require such specific evidence of conformity.

ASSOCIATIONS

(General Support)

American Specification Institute, Chicago, Ill.
 Carolina Lumber & Building Supply Association, Charlotte, N. C.
 Douglas Fir Plywood Association, Tacoma, Wash.
 Hardwood Plywood Institute, Chicago, Ill.
 Mississippi Retail Lumber Dealers Association, Inc., Jackson, Miss.
 National Plywood Distributors Association, Chicago, Ill.
 National Woodwork Manufacturers Association, Chicago, Ill.
 Northern Hemlock & Hardwood Manufacturers Association, Oshkosh, Wis.
 Prefabricated Home Manufacturers' Institute, Washington, D. C.
 Southern Sash & Door Jobbers Association, Memphis, Tenn.
 The Associated General Contractors of America, Inc., Washington, D. C.

FIRMS AND OTHER INTERESTS

Albany Plywood Co., Inc., Buffalo, N. Y.
 Algoma Plywood & Veneer Co., Algoma, Wis.
 Altfillisch, Charles, Decorah, Iowa
 American Cyanamid Co., New York, N. Y.
 American Seating Co., Grand Rapids, Mich.
 Anacortes Veneer, Inc., Anacortes, Wash.
 Anderson-Tully Co., Memphis, Tenn.
 Andrews, C. E., Lumber Co., New Bethlehem, Pa.
 Angelus Furniture Manufacturing Co., Los Angeles, Calif.
 Atlanta Oak Flooring Co., Atlanta, Ga.
 Atlantic Plywood Co., Inc., New York, N. Y.
 Avco Manufacturing Corp., Carrollton, Ky.
 Ballman Cummings Furniture Co., Fort Smith, Ark.
 Baltimore, City of, Bureau of Building Construction, Baltimore, Md.
 Bank Building & Equipment Corp., of America, St. Louis, Mo.
 Beck Plywood & Lumber Co., Chicago, Ill.
 Birmingham Sash & Door Co., Birmingham, Ala.
 Bissell & Belair, Minneapolis, Minn.
 Blue Ridge Veneer & Plywood Corp., Waynesboro, Va.
 Brew Manufacturing Co., Puyallup, Wash.
 Brust & Brust, Milwaukee, Wis.
 Buffalo Plywood Corp., Buffalo, N. Y.
 C. E. Felen Sales Co. (of Tacoma, Wash.), Fort Worth, Tex.
 California Panel & Veneer Co., Los Angeles, Calif.
 Calypso Veneer Co., Inc., Calypso, N. C.
 Cameron, William, & Co., Waco, Tex.
 Chas. J. T. J. Thomas, Passaic, N. J.

Carnahan Manufacturing Co., Inc., Loogootee, Ind.
 Carolina Panel Co., Inc., Lexington, N. C.
 Cellarius, Charles F., Cincinnati, Ohio
 Charlotte Chair Co., Charlotte, Mich.
 Christmann Plywood Co., St. Louis, Mo.
 Churchill Cabinet Co., Chicago, Ill.
 Clark, Carl W., Syracuse, N. Y.
 Commonwealth-New Guinea Timbers Ltd., Bulolo, New Guinea
 Conrad & Cummings, Binghamton, N. Y.
 Crawford Furniture, Inc., New Bethlehem, Pa.
 Crawford Furniture Manufacturing Corp., Jamestown, N. Y.
 Crowell, Lancaster & Higgins, Bangor, Maine.
 Curtis Cos., Inc., Chicago, Ill.; Clinton, Iowa; Lincoln, Nebr.; Minneapolis, Minn.; New London, Wis.; Scranton, Pa.; Sioux City, Iowa; Wausau, Wis.
 Darby, Bogner & Associates, Milwaukee, Wis.
 Darlington Veneer Co., Inc., Darlington, S. C.
 Davis Cabinet Co., Nashville, Tenn.
 Davis Plywood Corp., Cleveland, Ohio.
 De Jarnette, Charles W., Des Moines, Iowa.
 Denny Roll & Panel Co., High Point, N. C.
 Dixon-Powdermaker Furniture Co., Jacksonville, Fla.
 Downes Lumber Co., Boston, Mass.
 Drexel Furniture Co., Kingstree, S. C.
 Dulaney Plywood Corp., Louisville, Ky.
 Dulaney Veneer Co., Inc., Cuthbert, Ga.
 Eggers, F., Plywood & Veneer Co., Two Rivers, Wis.
 Ehrlich-Harrison Co., Seattle, Wash.
 Farley & Loetscher Manufacturing Co., Dubuque, Iowa.
 Fellheimer & Wagner, New York, N. Y.
 Fernwood Industries, Fernwood, Miss.
 Flannagan, Eric G., & Sons, Henderson, N. C.
 Florida, University of, School of Forestry, Gainesville, Fla.
 Fry-Fulton Lumber Co., St. Louis, Mo.
 Fyles Co., Inc., Orwell, Vt.
 General Plywood Corp., Louisville, Ky.
 Georgia Lumber & Veneer Corp., Toombsboro, Ga.
 Georgia Pacific Corp., Savannah, Ga.
 Georgia Plywood Corp., Dublin, Ga.
 Glenwood Lumber Co., Bridgeport, Conn.
 Gordon Veneer Co., Lexington, N. C.
 Groffmann, Louis C., St. Louis, Mo.
 Haralson & Mott, Fort Smith, Ark.
 Harbor Plywood Corp., Chicago, Ill.
 Harbor Sales Co., Inc., Baltimore, Md.
 Haskelite Manufacturing Corp., Grand Rapids, Mich.
 Hasty Veneer Co., Inc., Maxton, N. C.
 Hayworth Roll & Panel Co., High Point, N. C.
 Henrich Plywood Co., Inc., Buffalo, N. Y.
 Higgins, J. E., Lumber Co., San Francisco, Calif.
 Hoosier Panel Co., New Albany, Ind.
 Huttig Sash & Door Co., Atlanta, Ga.
 Huttig Sash & Door Co., Charlotte, N. C.
 Huttig Sash & Door Co., Columbus, Ohio.
 Huttig Sash & Door Co., of Texas, Dallas, Tex.

Huttig Sash & Door Co., Jacksonville, Fla.
 Huttig Sash & Door Co., Knoxville, Tenn.
 Huttig Sash & Door Co., Louisville, Ky.
 Huttig Sash & Door Co., Miami, Fla.
 Huttig Sash & Door Co., Nashville, Tenn.
 Huttig Sash & Door Co., Roanoke, Va.
 Huttig Sash & Door Co., St. Louis, Mo.
 Hygrade Cabinet Co., Inc., Mount Vernon,
 N. Y.
 Interstate Veneer Co., Inc., Emporia, Va.
 James Lumber Co., Boston, Mass.
 Jamestown Table Co., Salamanca, N. Y.
 Jasper Wood Products Co., Inc., Jasper, Ind.
 Jones & Bindon, Seattle, Wash.
 K. F. Plywood Corp., Mayville, N. Y. (General support).
 Keely, Hal, Plywood Co., Pittsburgh, Pa.
 Kemp, Bunch & Jackson, Jacksonville, Fla.
 Kewaunee Manufacturing Co., Adrian, Mich.
 Kneeland, Arthur, Montreal, Quebec, Canada.
 L. D. T. Veneer & Panel Co., Inc., Dillon,
 S. C.
 Larson Plywood Co., Sheboygan, Wis.
 Law, Law, Potter & Nystrom, Madison, Wis.
 Leland Door Co. (Plywood Division), Detroit, Mich.
 Linwood, Inc., Gillett, Wis.
 Loeb, Laurence M., White Plains, N. Y.
 Loetscher & Burch Manufacturing Co., Des Moines, Iowa.
 Los Angeles, City of, Los Angeles, Calif.
 Loughman Cabinet Co., St. Louis, Mo.
 Lulla Bye Furniture Corp., Plywood Division, Stevens Point, Wis.
 Mann & Co., Hutchinson, Kans.
 Marquette Veneer Co., Marquette, Mich.
 McCulloch Lumber Co., Atlanta, Ga.
 McKnight Veneer & Plywoods, Inc., West Helena, Ark.
 Memphis Plywood Corp., Memphis, Tenn.
 Memphis Sash & Door Co., Memphis, Tenn.
 Mengel Co., Elizabeth City, N. C.
 Met-L-Wood Corp., Chicago, Ill.
 Miller, Vrydagh & Miller, Terre Haute, Ind.
 Monsanto Chemical Co., Springfield, Mass.
 Morgan Co., Oshkosh, Wis.
 Morrison-Merrill & Co., Salt Lake City, Utah.
 Muhlenberg Bros., Wyomissing, Pa.
 National Casein Co., Chicago, Ill.
 National Casein of New Jersey, Riverton, N. J.
 National Plywood Co., Inc., New York, N. Y.
 Niagara Plywood Co., Inc., Buffalo, N. Y.
 Nickey Bros., Inc., Memphis, Tenn.
 Norsolina Veneer & Lumber Co., Inc., Norway, S. C.
 North Carolina State College, Raleigh, N. C. (General support.)
 Norway Veneer Co., Inc., Norway, S. C.
 Norwood Veneer Co., Norwood, N. C. (General support.)
 Nurenborg, W. S., Fort Worth, Tex.
 Owosso Manufacturing Co., Benton, Ark.
 Pacific Lumber Co., San Francisco, Calif.
 Pascagoula Veneer Co., Pascagoula, Miss.
 Pease Woodwork Co., Inc., Hamilton, Ohio.
 Penn Veneer Co., Inc., York, Pa.
 Perry County Plywood Corp., Beaumont, Miss.
 Plywood Associates, Inc., Ste. Rose (Laval), Quebec, Canada.
 Plywood Co., Sumter, S. C.
 Portsmouth Lumber Corp., Portsmouth, Va.
 Prinsho Veneer Co., Inc., Valdosta, Ga.
 Quimby, Allen, Veneer Co., Bingham, Maine.
 Ramsey, A. H., & Sons, Inc., Miami, Fla.
 Rawlings, Wayne I., Sales Co., San Francisco, Calif.
 Reichhold Chemicals, Inc., White Plains, N. Y.
 Stravs, Carl D., Minneapolis, Minn.
 Stremming Veneer Co., Maplesville, Ala.
 Sweet's Catalog Service, New York, N. Y. (General support.)
 Synvar Corp., Wilmington, Del.
 Thomason Plywood Corp., Fayetteville, N. C.
 Thompson & Swaim Plywood Co., Tuscaloosa, Ala.
 Timber Engineering Co., Washington, D. C.
 Trans-Oceanic Trading Co., New Orleans, La.
 Trexler Lumber Co., Allentown, Pa.
 Tulane Hardwood Lumber Co., Inc., New Orleans, La.
 Union Furniture Co., Batesville, Ind.
 United States Outboard, Inc., Warsaw, Ind.
 United States Plywood Corp., New York, N. Y.
 United States Plywood Corp., Orangeburg, S. C.
 Valdosta Plywoods, Inc., Valdosta, Ga.
 Virginia Plywood Corp., Danville, Va.
 Wanke Panel Co., Portland, Oreg.
 Weber Veneer & Plywood Co., Shawano, Wis.
 Welch, Carroll E., Huntington, N. Y.
 Willett, Consider H., Inc., Louisville, Ky.
 Williamson Veneer Co., Cockeysville, Md.
 Winnsboro Plywood Co., Winnsboro, S. C.
 Wurlitzer, Rudolph, Co., DeKalb, Ill.
 Youngblood Lumber Co., Minneapolis, Minn.
 Zimmerman, A. C., Los Angeles, Calif.
 Bureau of Yards and Docks, Department of the Navy, Washington, D. C.

OTHER COMMERCIAL STANDARDS

A list of all effective Commercial Standards may be obtained from the Commodity Standards Division, Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C. These publications may be purchased at the prices indicated on the list, which also includes directions for ordering copies.