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HARDWOOD PLYWOOD

(Third Edition)

COMMERCIAL STANDARD CS35-47

Effective Date for New Production from February 20, 1947



A RECORDED VOLUNTARY STANDARD
OF THE TRADE

UNITED STATES DEPARTMENT OF COMMERCE

W. AVERELL HARRIMAN, Secretary

COMMERCIAL STANDARDS

Commercial Standards are voluntary standards of the trade developed through concerted action of those directly concerned, and issued by the United States Department of Commerce upon written evidence of their acceptability to the trade. They are initiated by written request from a responsible element of business to the Division of Trade Standards of the National Bureau of Standards. The Division of Trade Standards acts as a coordinating and fact-finding agency in ascertaining the desires of all concerned.

The Federal Government exercises no regulatory authority in the enforcement of Commercial Standards. In accepting a Commercial Standard, the producer, distributor, or user says in effect that he considers it a useful standard of practice, and plans to utilize it as far as practicable in his business, reserving the right to depart from the standard so long as no deception results from such departure. When reference to a Commercial Standard is made in contracts, labels, invoices, or advertising literature, however, the provisions of the standard are enforceable through usual legal channels as a part of the sales contract.

Organized in 1927, the Division of Trade Standards has assisted many industries in the development of Commercial Standards for a wide variety of commodities. A list of previously established Commercial Standards appears herein.

COMMERCIAL STANDARD FOR HARDWOOD PLYWOOD

On April 9, 1931, at the instance of the Plywood Manufacturers Association, a general conference of representative manufacturers, distributors, and users of Plywood (Hardwood and Eastern Red Cedar) adopted a recommended commercial standard for this commodity which was subsequently accepted in writing by the trade and published as Commercial Standard CS35-31. The standard was revised in 1942.

On September 6, 1946, with the approval of the Standing Committee, a revision of CS35-42 drafted by the Hardwood Plywood Institute, was circulated for acceptance. Those concerned have since accepted and approved the revised standard as shown herein.

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HARDWOOD PLYWOOD

(Third Edition)

COMMERCIAL STANDARD CS35-47

PURPOSE

1. These commercial standard rules are established as a universal 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 which will result in a better understanding between buyer and seller.

SCOPE

2. This standard provides minimum specifications for four standard types of hardwood plywood based on the water resistance and durability of the bond, in four standard grades. It covers tests, densities, standard thicknesses, widths and lengths, tolerances, workmanship, packing, inspection, grade-marking and certification, method of ordering, and nomenclature and definitions.

GENERAL REQUIREMENTS

3. *Workmanship*.—All plywood sold as of commercial standard quality shall be well manufactured and free from blisters, wrinkles, laps or other defects not specifically permitted in the rules for the various grades. Veneers shall be tight and smoothly cut, uniform in thickness and free from serious buckle.

4. *Packing*.—All commercial standard plywood shall be securely packed to insure delivery in a clean and serviceable condition.

DETAIL REQUIREMENTS

5. *Types of hardwood plywood*.—There are a number of factors which enter into the manufacture of the different types of hardwood plywood, but since the quality of the plywood is definitely limited by the adhesive used, the four standard types of hardwood plywood, as shown in table 1, shall be known by the water resistance and durability of the bond.

5a. The following specifications establish minimum requirements for each type of plywood; therefore, the majority of the panels manufactured as of commercial standard quality will exceed these minimum specifications.

TABLE 1.—Types of hardwood plywood

Limiting factors	Type I, fully waterproof bond	Type II, high water- resistance bond	Type III, low water- resistance bond	Type IV, dry bond (no test)
Type of bond.....	I.....	II.....	III.....	IV.....
Species or density of veneer....	Specify.....	Specify.....	Specify.....	Specify. Do.
Grade of faces or face and back..	do.....	do.....	do.....	Do.
Grade of inner plies.....	2 under 1..... 3 under 2.....	2 under 1..... 3 under 2.....	2 under 1..... 3 under 2.....	2 under 1. 3 under 2.
Grade of lumber core.....	None.....	None.....	Specify.....	Specify.
Edge joints.....	No tape.....	Perforated.....	Perforated or solid tape.	Solid tape.
Maximum veneer thickness in inches:				
High density.....	¹ 1/12.....	¹ 1/12.....	² 1/12.....	No limit.
Medium density.....	¹ 1/10.....	¹ 1/10.....	² 1/10.....	Do. ¹
Low density.....	¹ 1/8.....	¹ 1/8.....	² 1/8.....	Do. ¹
Percentage of wood in face direction.....	45 to 70.....	45 to 70.....	No limit.....	Do.
Sanding.....	Specify.....	Specify.....	Specify.....	Specify.
Tests.....	Cyclic wet and dry boil.	Hot and cold... soak.	Hot soak..... delamination.	None.

¹ Maximum thickness at 6- to 10-percent moisture content.

² In type III plywood, the maximum thicknesses of veneers is left to the discretion of the manufacturer. The thicknesses given in the specifications are recommended maximum thicknesses only.

6. Type of bondage¹.

6a. *Type I, Fully waterproof.*—The bond shall withstand full weather and marine exposure and shall be unaffected by microorganisms. The bond shall be of such quality that specimens will withstand the cyclic wet and dry test and the boil test described in paragraphs 62a and 62b.

6b. *Type II, High water resistance.*—The bond shall be highly resistant to water and dampness and shall withstand moderate weather exposure. The bond shall be of such quality that specimens will withstand the hot and cold soak test described in paragraph 63.

6c. *Type III, Low water resistance.*—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 will withstand the cold soak test described in paragraph 64.

6d. *Type IV, Dry bond.*—The bond is suitable for use where it will not be subject to water, dampness or high humidities. No tests required.

¹ It is not the intent of the standard to specify the particular adhesive to be used nor the conditions under which it must be processed. Adhesives may be developed or improved, from time to time, which may meet the type-test requirements and will, therefore, be considered as conforming to the commercial standard.

7. *Density of veneers:*

<i>High density</i>	<i>Medium density</i>	<i>Low density</i>
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. Cherry, black. Elm, American (white or grey). Hackberry. Magnolia. Mahogany, American. Mahogany, African. Maple, red (soft). Maple, silver (soft). Sweet gum. Sycamore. Tupelo, water, black. Walnut, American. Prima Vera. New Guinea wood. Paldao. Oriental wood.	Basswood, American. Chestnut, American. Cottonwood, eastern, black. Poplar, yellow. Willow, black.

GRADE OF FACES, BACKS, AND INNER PLIES

8. 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.

ASH AND ELM**(Rotary cut)**

9. *Grade 1*.—Each face shall be matched for pleasing effect. Small burls, pin knots, mineral streaks, discolorations, inconspicuous small patches and sapwood shall be admitted. Knots other than pin knots, worm holes, splits, and shake shall not be admitted.

10. *Grades 2, 3, and 4*.—See paragraphs 51 to 54 and table 3.

BASSWOOD**(Rotary cut)**

11. *Grade 1*.—Each face shall be made up entirely of sapwood, tight side exposed, not matched. A few small burls, one pin knot per 12" square, a few mineral streaks, and inconspicuous small patches shall be admitted. Knots other than pin knots, discolorations, worm holes, splits, and shake shall not be admitted.

12. *Grades 2, 3, and 4*.—See paragraphs 51 to 54 and table 3.

BIRCH
(Rotary cut)

13. *Grade 1.*—Each face shall be made up of tight, smoothly cut veneer unselected for uniformity of color, but matched for pleasing effect. A few burls, one pin knot per 12" square, mineral streaks, slight discolorations, and inconspicuous small patches shall be admitted. Knots other than pin knots, worm holes, splits, and shake shall not be admitted.

14. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

GUM, BLACK, SWEET, AND TUPELO
(Rotary cut)

15. *Grade 1.*—Each face shall consist of one or more pieces of veneer not matched for grain or color and with tight side exposed. Burls, pin knots, mineral streaks, a few hair-line checks, discolorations, worm holes if filled or patched, sapwood and inconspicuous small patches shall be admitted. Knots other than pin knots, cross breaks, splits, and shake shall not be admitted.

16. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

GUM, SELECTED FOR COLOR
(Rotary cut)

17. *Grade 1.*—Each face shall consist of one or more pieces of veneer, tight side exposed, matched for pleasing effect to show uniform red or white color throughout. Burls, an average of two pin knots per 12" square, mineral streaks, slight discolorations, a few hair-line checks and small inconspicuous patches shall be admitted. Knots other than pin knots, worm holes, cross breaks, splits, and shake shall not be admitted.

18. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

RED GUM
(Quarter sliced)

19. *Grade 1.*—Each face shall be made up of veneer matched for color and grain at the joints. A few pin knots, sapwood, not to exceed ten percent, and inconspicuous small patches shall be admitted. Knots other than pin knots, burls, mineral streaks, discolorations, worm holes, cross breaks, splits, and shake shall not be admitted.

20. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

MAHOGANY
(Rotary cut)

21. *Grade 1.*—Each face shall consist of one or more pieces of veneer not matched for grain or color and with tight side exposed. Burls, pin knots, a few small mineral or gum streaks, worm holes if inconspicuously filled or patched, and inconspicuous small patches shall be admitted. Knots other than pin knots, discolorations, cross breaks, splits, and shake shall not be admitted.

22. *Grade 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

MAHOGANY**(Plain sliced or flat cut)**

23. *Grade 1.* Each face shall be matched for color and grain at the joints. Burls, pin knots, a few small mineral or gum streaks, worm holes if inconspicuously filled or patched, and inconspicuous small patches shall be admitted. Knots other than pin knots, discolorations, cross breaks, splits, and shake shall not be admitted.

24. *Grades 2, 3, and 4.*—See paragraph 51 to 54 and table 3.

MAHOGANY**(Quarter sliced)**

25. *Grade 1.*—Each face shall be matched for color and grain at the joints. A few small burls, a few pin knots and inconspicuous small patches, a few small mineral or gum streaks and worm holes if filled or patched, shall be admitted. Knots other than pin knots, discolorations, cross breaks, splits, and shake shall not be admitted.

26. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

MAPLE**(Rotary cut)**

27. *Grade 1.*—Each face shall be matched for pleasing effect. A few small burls and bird's-eyes, a few pin knots, occasional small mineral streaks, slight discolorations and inconspicuous small patches shall be admitted. Knots other than pin knots, worm holes, splits, and shake shall not be admitted.

28. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

MAPLE, SELECTED WHITE**(Rotary cut)**

29. *Grade 1.*—Each face shall be matched for pleasing effect to show uniform white color throughout. A few small burls and bird's-eyes, a few pin knots, occasional small mineral streaks, slight discolorations and inconspicuous small patches shall be admitted. Knots other than pin knots, worm holes, splits, and shake shall not be admitted.

30. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

NEW GUINEA WOOD**(Quarter sliced)**

31. *Grade 1.*—Each face shall be matched for color and grain at the joints. Burls, pin knots not exceeding two per 12-in. square, inconspicuous small patches, worm holes if filled or patched, and sapwood not exceeding 10 percent shall be admitted. Knots other than pin knots, mineral streaks, discolorations, cross breaks, splits, and shake shall not be admitted.

32. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

OAK, RED AND WHITE**(Rotary cut)**

33. *Grade 1.*—Each face shall be made of tight, smoothly cut veneer matched for pleasing effect. Burls, pin knots, slight mineral streaks and discolorations, inconspicuous small patches and sapwood shall be admitted. Knots other than pin knots, worm holes, splits, cross breaks, and shake shall not be admitted.

34. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

OAK, RED AND WHITE**(Half-round and plain sliced or flat cut)**

35. *Grade 1.*—Each face shall be matched for color and grain at the joints. A few small burls, slight mineral streaks and discolorations, pin knots not exceeding two per 12-in. square, inconspicuous small patches and sapwood not to exceed 10 percent shall be admitted. Knots other than pin knots, worm holes, splits, and shake shall not be admitted.

36. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

OAK, WHITE**(Quarter sliced, or sawn and comb grain-sliced or sawn)**

37. *Grade 1.*—Each face shall be matched for color and grain at the joints. A few small burls, a few pin knots, sapwood not exceeding 10 percent, mineral streaks not exceeding $1/32$ in. by 4 in. or $1/16$ in. by 2 in. and not more than one per 12 in. square, and inconspicuous small patches shall be admitted. Knots other than pin knots, discolorations, worm holes, splits, broken flake, and shake shall not be admitted.

38. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

ORIENTAL WOOD**(Quarter sliced)**

39. *Grade 1.*—Each face shall be matched for color and grain at the joints. Burls, pin knots not exceeding two per 12-in. square, inconspicuous small patches, worm holes if filled or patched, and sapwood not exceeding 10 percent shall be admitted. Knots other than pin knots, mineral streaks, discolorations, cross breaks, splits, and shake shall not be admitted.

40. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

PALDAO**(Quarter sliced)**

41. *Grade 1.*—Each face shall be matched for color and grain at the joints. Burls, pin knots not exceeding two per 12-in. square, inconspicuous small patches, worm holes if filled or patched, and sapwood not exceeding 10 percent shall be admitted. Knots other than pin knots, mineral streaks, discolorations, cross breaks, splits, and shake shall not be admitted.

42. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

PRIMA VERA

(Quarter sliced)

43. *Grade 1.*—Each face shall be matched for color and grain at the joints. Burls, a few pin knots, worm holes if filled or patched, inconspicuous small patches and sapwood shall be admitted. Knots other than pin knots, mineral streaks, discolorations, cross breaks, splits, and shake shall not be admitted.

44. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

WALNUT

(Rotary cut)

45. *Grade 1.*—Each face shall be matched for pleasing effect. Burls, pin knots, slight discolorations, inconspicuous small patches and sapwood shall be admitted. Knots other than pin knots, mineral streaks, worm holes, splits, and shake shall not be admitted.

46. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

WALNUT

(Half round and plain sliced or flat cut)

47. *Grade 1.*—Each face shall be matched for color and grain at the joints. Burls, pin knots not exceeding two per square foot average, inconspicuous small patches and sapwood not exceeding 10 percent shall be admitted. Knots other than pin knots, mineral streaks, discolorations, worm holes, splits, and shake shall not be admitted.

48. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

WALNUT

(Quarter sliced)

49. *Grade 1.*—Each face shall be matched for color and grain at the joints. Pin knots not exceeding two per square foot average, a few small cross bars, inconspicuous small patches and sapwood not exceeding 10 percent shall be admitted. Knots other than pin knots, mineral streaks, discolorations, worm holes, splits, and shake shall not be admitted.

50. *Grades 2, 3, and 4.*—See paragraphs 51 to 54 and table 3.

TABLE 2.—*Grades of faces, backs, and inner plies for grade 1*

Defects	Species									
	Ash and elm (rotary cut)	Basswood (rotary cut)	Birch (rotary cut)	Gum, black, sweet and tupelo (rotary cut)	Gum, selected for color (rotary cut)	Gum, red (quarter sliced)	Mahogany (rotary cut)	Mahogany (plain sliced or flat cut)	Mahogany (quarter sliced)	Maple (rotary cut)
K knots, other than... pin knots.	No.	No.	No.	No.	No.	No.	No.	No.	No.	No.
Pin knots.	Yes.	1 per sq ft.	1 per sq ft.	Yes.	2 per sq ft.	Few.	Yes.	Yes.	Few.	Few.
Burls.	Small.	Few, small.	Few.	do.	Yes.	No.	do.	do.	Few, small.	Few, small.
Hair-line checks.	Yes.	Few.	Yes.	do.	do.	do.	Few, small.	Few, small.	Few, small.	Few, small.
Mineral streaks.	do.	do.	Slight.	do.	Slight.	do.	No.	No.	No.	Slight.
Discolorations.	No.	do.	No.	Filled.	No.	do.	Filled or patched.	Filled or patched.	Filled or patched.	No.
Worm holes.	do.	do.	do.	No.	do.	do.	No.	No.	No.	Do.
Splits or open joints.	do.	do.	do.	do.	do.	do.	do.	do.	do.	Do.
Cross breaks.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.	Yes.
Patches (small).	do.	All.	do.	do.	10%	10%	do.	do.	do.	Do.
Sapwood.	No.	No.	No.	No.	No.	No.	No.	No.	No.	Yes.
Shake.	do.	do.	do.	do.	do.	do.	do.	do.	do.	No.

Defects	Species				
	New Guinea wood (quarter sliced)	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)	Paldao (quarter sliced)
K knots, other than... pin knots.	No.	No.	No.	No.	No.
Pin knots.	2 per sq ft.	Yes.	2 per sq ft.	Few.	2 per sq ft.
Burls.	Yes.	Slight.	Few, small.	Few, small.	Yes.
Mineral streaks.	No.	Slight.	$\frac{3}{4}$ by 4 in. or $\frac{1}{4}$ by 2 in.	No.	No.
Discolorations.	do.	do.	do.	No.	do.
Cross bars.	Filled or patched.	No.	No.	No.	Filled or patched.
Worm holes.	No.	do.	do.	do.	No.
Splits or open joints.	No.	do.	do.	do.	do.
Cross breaks.	do.	do.	do.	do.	do.
Patches.	Yes.	Yes.	Yes.	Yes.	Yes.
Broken flake.	Broken flake.	Broken flake.	Broken flake.	Broken flake.	Broken flake.
Sapwood.	10%.	Yes.	10%.	10%.	10%.
Shake.	No.	No.	No.	No.	No.

Defects	Species		
	Prima Vera (quarter sliced)	Walnut (rotary cut)	Walnut (half- round and plain sliced or flat cut)
K knots, other than... pin knots.	No.	No.	No.
Pin knots.	Few.	Yes.	2 per sq ft.
Burls.	Yes.	do.	Yes.
Mineral streaks.	No.	No.	No.
Discolorations.	do.	Slight.	do.
Cross bars.	Filled or patched.	No.	No.
Worm holes.	No.	do.	do.
Splits or open joints.	No.	do.	do.
Cross breaks.	do.	do.	do.
Patches.	Yes.	Yes.	Yes.
Broken flake.	Broken flake.	Broken flake.	Broken flake.
Sapwood.	Yes.	Yes.	10%.
Shake.	No.	No.	No.

Defects	Species	
	Walnut (quarter sliced)	Walnut (rotary cut)
K knots, other than... pin knots.	No.	No.
Pin knots.	2 per sq ft.	Yes.
Burls.	Yes.	do.
Mineral streaks.	No.	No.
Discolorations.	do.	Slight.
Cross bars.	Filled or patched.	No.
Worm holes.	No.	do.
Splits or open joints.	No.	do.
Cross breaks.	do.	do.
Patches.	Yes.	Yes.
Broken flake.	Broken flake.	Broken flake.
Sapwood.	10%.	Yes.
Shake.	No.	No.

51. *Grade 2.*—Grade 2 covers all species and is not matched for color or grain. The faces, backs and inner plies shall be free from open defects to provide a sound smooth surface. Veneer containing brashness, shake, doze, or any other form of decay is not permitted. Mineral streaks, stain, discoloration, patches, and sapwood shall not be considered defects. Permissible defects may appear singularly (one type only) or as a combination of more than one type. When more than one type of defect is present, their total limitation, computed according to the equivalent defects given in paragraphs 54a and 54b, shall not exceed the limit specified for any one type.

51a. *Allowable defects.*—

- (1) *Sound tight knots:* No single knot shall exceed $\frac{3}{8}$ in. average diameter. The sum of the diameters of the knots in any 12-in. square shall not exceed $\frac{3}{4}$ in.
- (2) *Sound tight burls:* A burl shall be considered equal to a knot of one-half the diameter of the burl. No single burl shall exceed $\frac{3}{4}$ in. in average diameter. The sum of the diameters of the burls in any 12-in. square shall not exceed $1\frac{1}{2}$ in.
- (3) *Splits and open joints:* Splits and open joints not exceeding $\frac{1}{64}$ in. in width are permitted.
- (4) *Worm holes:* Inconspicuous patched or filled worm holes are allowed. Pin worm holes are permitted.

52. *Grade 3.*—Grade 3 covers all species and is not matched for color or grain. This grade may have the same permissible defects as grade 2 and in addition, defects as described in paragraph 52a. Veneer containing brashness, shake, doze, or any other form of decay is not permitted. Mineral streaks, stain, discoloration, patches, and sapwood shall not be considered defects. Permissible defects may appear singularly (one type only) or as a combination of more than one type. When more than one type of defect is present, their total limitation, computed according to equivalent defects given in paragraphs 54a and 54b, shall not exceed the limit specified for any one type.

52a. *Allowable defects.*—The following defects, in addition to those permitted in grade 2 are acceptable in grade 3:

- (1) *Sound tight knots:* No single knot shall exceed $\frac{3}{4}$ in. in average diameter. The sum of the diameters of the knots in any 12-in. square shall not exceed $1\frac{1}{2}$ in.
- (2) *Sound tight burls:* A burl shall be considered equal to a knot of one-half the diameter of the burl. No single burl shall exceed $1\frac{1}{2}$ in. in diameter. The sum of the diameter of the burls in any 12 in. square shall not exceed 3 in.
- (3) *Knot holes:* No single knot hole shall exceed $\frac{3}{8}$ in. in average diameter. The sum of the diameters of the knot holes in any 12-in. square shall not exceed $1\frac{1}{2}$ in.

- (4) *Worm holes:* No single worm hole shall exceed 2 in. in length along the grain, $\frac{1}{8}$ in. in diameter nor cut across the grain more than $\frac{3}{8}$ in. The sum of the widths across the grain shall not exceed $1\frac{1}{2}$ in. Pin-worm holes are not considered defects.
- (5) *Splits or open joints:* Splits or open joints may extend the full length of the panel but shall not occur more frequently than two in any 12 in. width. The width not to exceed $\frac{1}{16}$ in. for veneer $\frac{1}{16}$ in. and thinner and for veneer over $\frac{1}{16}$ in. in thickness, the width shall not exceed the thickness of the veneer.
- (6) *Cross breaks:* Cross breaks are permitted.
- (7) *Gum spots and bark pockets:* The area of any gum spot or bark pocket shall not be more than $\frac{1}{4}$ sq. in. In any 12 in. square the sum of the areas shall not exceed 1 sq. in. Pockets shall be not closer than 24 in. on the same or adjacent grain lines.

53. *Grade 4 rejects.*—Grade 4 rejects covers all species and may contain any amount of brash wood, shake, compression failures, doze, nonopen defects, and loose or rough cutting. Open knot holes shall be limited to $1\frac{1}{2}$ in. in diameter, and the sum of the diameters in any 12-in. square shall not exceed 3 in. Splits shall not exceed $\frac{1}{4}$ in. in width, but may extend the full length of the panel.

54. *Equivalent defects.*—

54a. The following shall be regarded with respect to their effect as the equivalent of one $\frac{3}{8}$ -in. sound knot:

One $\frac{3}{8}$ -in. knot hole.

One $\frac{3}{4}$ -in. sound tight burl.

One worm hole $\frac{1}{8}$ in. in diameter by 2 in. in length that cuts across the grain $\frac{3}{8}$ in.

One gum spot, with the product of the length and width equal to $\frac{1}{4}$ sq. in.

One bark pocket with the product of the length and width equal to $\frac{1}{4}$ sq. in.

One split or open joint 12 in. in length and $\frac{1}{16}$ in. in width.

54b. The following shall be regarded with respect to their effect as the equivalent of two $\frac{3}{8}$ in. sound knots:

One $\frac{3}{4}$ -in. sound knot.

One $1\frac{1}{2}$ -in. sound burl.

One split or open joint 12 in. in length and $\frac{1}{8}$ in. in width.

TABLE 3.—*Grades of faces, backs, and inner plies for grades 2, 3, and 4 of all species*

Defects	Grade 2 ¹	Grade 3 ¹	Grade 4 ¹
Sound tight knots.....	Max diam, 3/8 in..... Sum diam, 3/4 in. in any sq ft.	Max diam, 3/4 in..... Sum diam, 1 1/2 in. in any sq ft.	Yes.
Sound tight burls.....	Max diam, 3/4 in..... Sum diam, 1 1/2 in. in any sq ft.	Max diam, 1 1/2 in..... Sum diam, 3 in. in any sq ft.	Do.
Mineral streaks.....	Yes.....	Yes.....	Do.
Discolorations.....	do.....	do.....	Do.
Knot holes.....	No.....	Max diam, 3/8 in..... Sum diam, 1 1/2 in. in any sq ft.	Max diam, 1 1/2 in. Sum diam, 3 in. in any sq ft.
Worm holes.....	Filled or patched if.... over 1/16 in. in diam.	Max 1/8 in. diam by... 2 in. See par. 52a (4).	Yes.
Splits or open joints.....	1/64 in.....	Yes, see par. 52a (5)...	1/4 in. in width by full length.
Cross breaks.....	No.....	Yes.....	Yes.
Patches.....	Yes.....	do.....	Do.
Sapwood.....	do.....	do.....	Do.
Gum spots and bark pockets.	No.....	Max area, 1/4 sq in.... sum of areas 1 sq in. in any sq ft.	Do.
Brashness, shake, doze,.... and decay.	do.....	No.....	Do.

¹ Defects permitted in grade 1 shall be admitted in lower grades.

55. *Grade of lumber core.*—The grade designates the quality of the lumber core and banding requirements.

55a. *Clear.*—A core of any wood, unless specifically designated, with any type of tight-glued joint and random widths full-length strips. The maximum width of the strips shall be such that warping tendencies are minimized and shall be based on the density of the species,² straightness of grain, and arrangement of strips with a view to well-balanced stresses. Discolorations shall be admitted, but it shall be clear of defects. Mixing of species is not permitted.

55b. *Regular.*—Same specifications as “Clear” core, but in addition to discolorations, the following are admitted; 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.

55c. *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.

55d. *Banded.*—A core of any wood, unless specifically designated, in either “Clear” or “Regular” grades 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.
Any designated wood.	B2E.	Banded two ends.
Any designated wood.	B1S.	Banded one side.
Any designated wood.	B2S.	Banded two sides.
Any designated wood.	B3	Banded two ends and one side.
Any designated wood.	B2S1E.	Banded two sides and one end.
Any designated wood.	B4.	Banded two sides and two ends.

² The following maximum width of strips are recommended: High density, 3 in.; medium density 3½ in.; and low density, 4 in.

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.

56. *Edge joints.*—

56a. In type I, no tape shall be permitted in the glue line.

56b. In type II perforated tape and in type III perforated or solid tape is permitted in the glue line; however, tape on faces and backs must be exposed. Solid tape is also permitted on faces and backs of type II, providing it is exposed and not in the glue line.

56c. In type IV, solid tape is permitted in the glue line.

57. *Construction.*—

57a. *Maximum thickness of veneer.*—(all-veneer construction) This is governed by the type of plywood desired and the density of the individual ply. The following table specifies the maximum thickness of veneer permitted in the four types of commercial standard hardwood plywood:

	Type I	Type II	Type III ^a	Type IV
High density	(1/12)	(1/12)	(1/10)	No limit
Medium density	(1/10)	(1/10)	(1/8)	Do.
Low density	(1/8)	(1/8)	(3/16)	Do.

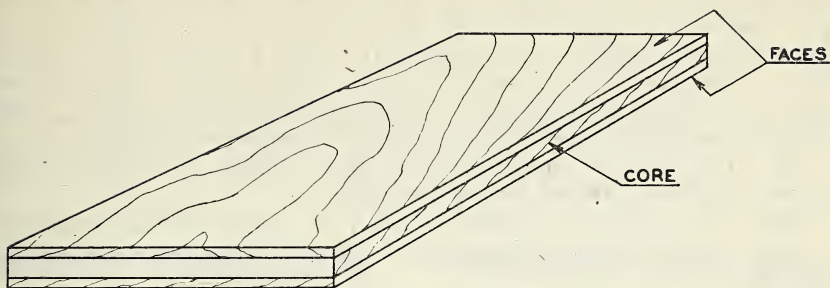
^a In type III plywood, the thicknesses given are recommended maximum thicknesses only.

57b. *Percentage of veneer in face direction.*—(all-veneer construction) The total thickness of veneer running in the same direction as the face is designated by a percentage range of the total panel thickness. This factor helps to govern the stiffness and stability of the panel. The percentage of the wood in the face direction for the four types of commercial standard hardwood plywood is as follows:

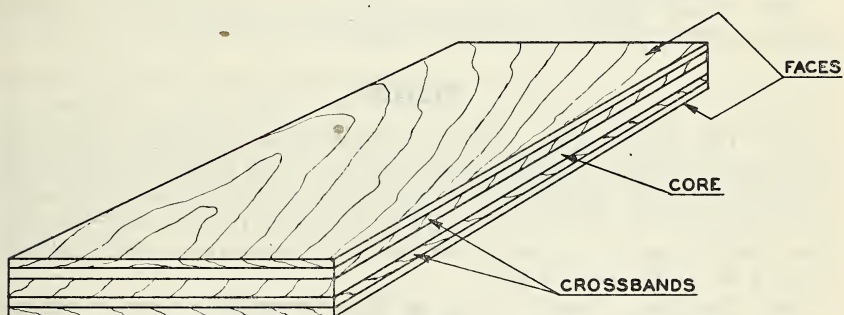
Type I	Type II	Type III	Type IV
45 to 70	45 to 70	No limit	No limit

57c. *Number of plies.*—This is dependent upon the density and maximum thickness of the veneer, the percentage of veneer in the face direction, the stiffness and stability desired.

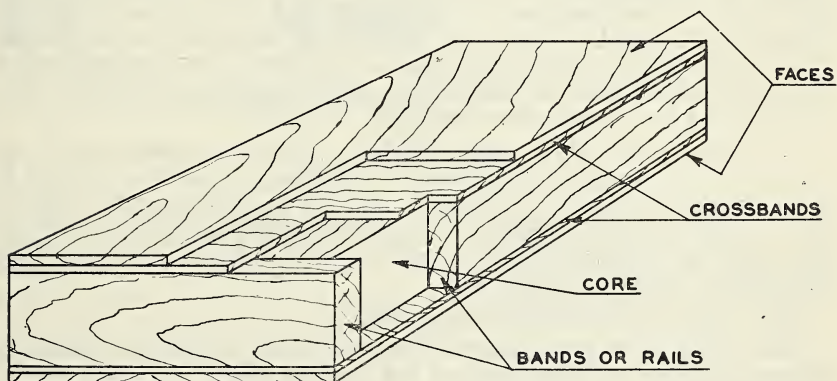
57d. *Lumber-core construction.*—Lumber-core plywood is generally used in the manufacture of case goods and for interiors. It is not intended for high strength requirements or where exposed to weather and water. Therefore, commercial standard lumber-core plywood shall be manufactured to meet the requirements set up in the "Minimum Specifications" for type III and type IV only. In lumber core construction, the core or central layer is of lumber usually edge-glued together from narrow strips. Lumber cores are usually $\frac{5}{8}$ in. or more in thickness, and provision can be made for machining the edges. When strength and exposure requirements are high, all-veneer construction, often 7, 9, or 11 ply, to equal the thickness of standard lumber-core plywood is suggested.



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.

57e. *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 and edges of the panel. Construction other than the above is considered special construction.

58. The type of sanding required and number of surfaces to be sanded shall be specified by the purchaser.

58a. *No sanding*.—Surfaces need not be sanded nor tape removed.

58b. *Rough sanding*.—Sanding hit and miss. Tape removal not required.

58c. *Sanding*.—Surfaces shall be sanded clean and free of tape. Sander streaks no defect.

58d. *Polish sanding*.—Surfaces shall be clean and sanded to a polish. Sander streaks shall be considered defects.

TESTS⁴

59. The manufacturer shall, at the purchaser's request, certify that the panels furnished on the purchaser's order will pass the tests set up in the commercial standard for the particular type or types of hardwood plywood involved. If, in lieu of the certification, the purchaser requires that tests be made, the appropriate standard procedure, as given in paragraphs 60 to 66, shall be used.

60. *Sampling*.—Samples shall be taken at random from 1 percent of the panels in any shipment, but not less than 5 and not more than 10 panels shall be selected. A test piece shall be cut from each end approximately at midwidth of the panel, and from each edge approximately at midlength of the panel, and a fifth piece shall be cut from near the center of the panel. Each piece shall be of sufficient size to provide the required number of test specimens as set forth for the specified type. Purchaser must accept the panels from which test pieces are taken unless the specified tests prove them defective.

61. *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 a rate of 600 to 1000 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 2.

62. *Type I, Fully waterproof bondage*.—

62a. *Cyclic wet and dry test*.—Five specimens of the form shown in figure 2 shall be cut from each of the five test pieces from each sample panel and submerged in water at room temperature for 48 hr. and dried for 8 hr at a temperature of 145° F (plus or minus 5 deg F) and then followed by two cycles of soaking for 16 hr and drying for 8 hr under conditions described above. The specimens shall then again be soaked for a period of 16 hr and tested, while wet, in a

⁴ Tests shall be made only when requested by the purchaser.

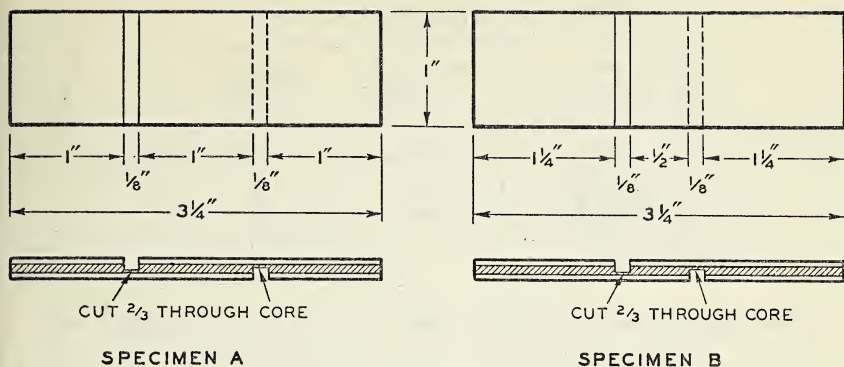


FIGURE 2. Plywood bond shear-test specimens.

shear testing machine, as described in paragraph 61, to failure. Minimum and average wood failure, based on the average strength of the specimens, shall meet the requirements of table 4. The specimens shall also meet the requirements for minimum shear values given in table 5, and shall show no separation of plies at the glue line. If the number of plies exceeds three, at least one half of the test shall include the innermost joints.

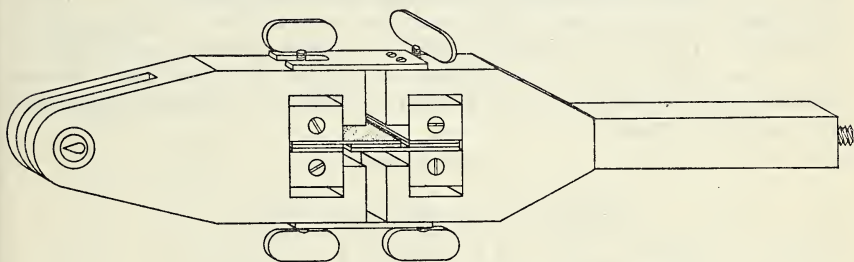


FIGURE 3.—Testing jaws.

62b. *Boil test.*—Five specimens of the form shown in figure 2 shall be cut from each of the five test pieces from each sample panel and submerged for 4 hr in boiling water. They shall then be removed from the boiling water, placed in cold water until at approximately room temperature and, while still wet, tested to failure in a shear testing machine, as described in paragraph 61. Specimens shall meet the requirements of tables 4 and 5. There shall be no separation of the plies at the glue line. If the number of plies exceeds three, at least one-half of the test shall include the innermost joints.

TABLE 4.—Percentage of wood failure

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

TABLE 5.—Minimum shear values (*lb/in.²*) required for cyclic and boil tests

Density of veneers	Strength (wet)
High.....	290
Medium.....	210
Low.....	120

63. *Type II, high water-resistant bondage (Hot and cold soak)*—Five specimens of the form shown in figure 2 shall be cut from each of the five test pieces from each sample panel and submerged in water at a temperature of 145° F (plus or minus 5 deg F) for a period of 3 hr. Specimens shall then be submerged in water at room temperature until cooled and tested, wet, in a shear testing machine, as described in paragraph 61, to failure. The test specimens shall meet the requirements of tables 6 and 7, and shall show no separation of plies at the glue line. If the number of plies exceeds three, at least one-half of the test shall include the innermost joints.

TABLE 6.—Percentage of wood failure

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

TABLE 7.—Minimum shear value (*lb/in.²*) for hot and cold soak test

Density of veneers	Strength (wet)
High.....	270
Medium.....	190
Low.....	100

64. *Type III, low water resistant bond (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 a period of 4 hr. followed by drying at a temperature between 70° to 100° F for a period of 20 hr. The cycle shall be repeated, after which the specimens must not show a delamination between any two layers of veneer totaling more than 2 in., measured parallel to the edge. When this test is applied to lumber-core plywood, the bulk of the lumber core shall be cut away to eliminate the possibility of delamination due to the expansive power of the thick core.

65. *Type IV, dry bond.*—No test required.

66. *Interpretation of tests.*—The average and minimum requirements, tables 4 to 7, given for each type apply to the five specimens from each of the five test pieces from each type I and type II panel, For type III panels, the minimum of 2 in. of delamination between any two layers of veneer applies to each of the five test pieces. If, on the above basis, there is a failure of more than one test piece for any panel, that panel shall be rejected, and five additional panels shall be selected and tested under the conditions described. All five panels of this second set must pass the required test.

STANDARD SIZES AND THICKNESSES

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

- (a) *Widths:* 24 in., 30 in., 36 in., 42 in., 48 in. Tolerance $\pm \frac{1}{32}$ in.
- (b) *Lengths:* 48 in., 60 in., 72 in., 84 in., 96 in. Tolerance $\pm \frac{1}{32}$ in.
- (c) *Thicknesses:* $\frac{1}{8}$ in., $\frac{3}{16}$ in., $\frac{1}{4}$ in., $\frac{5}{16}$ in., $\frac{3}{8}$ in., $\frac{1}{2}$ in., $\frac{5}{8}$ in., $\frac{3}{4}$ in., $1\frac{3}{16}$ in., $\frac{7}{8}$ in., 1 in. Tolerance: unsanded panels $\pm \frac{1}{32}$ in., sanded panels ± 0 in., $-\frac{1}{32}$ in.

68. Commercial Standard hardwood plywood panels shall be square within $\frac{1}{16}$ in., measured on the short dimension.

INSPECTION

69. *Inspection.*—All hardwood plywood guaranteed to conform to the 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.

70. *Grade-marking and certification.*—In order to assure the purchaser that he is getting hardwood plywood of the type and grade specified, manufacturers, may, individually or in concert with their trade associations, issue certificates with each shipment or grade-mark each panel as conforming to the commercial standard.

METHOD OF ORDERING

71. 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 type I and Type II 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.

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

NOMENCLATURE AND DEFINITIONS

Back.—Veneer sheet on underside of plywood panel, corresponding in thickness, frequently in wood, 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 may be finished flat to cover the several colors presented in the end or side grain of the core.

Bands, cross.—See definition under “Crossbanding.”

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

Bird's-eye.—Local sharp depressions in annual rings, accompanied by considerable fiber distortion. Once the depressions are formed, succeeding growth rings follow the same contour for many years. In plain-sawed lumber and rotary veneer the depressions are cut through crosswise and show a series of circlets, portions of annual rings, suggesting rather remotely a bird's eye.

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

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 grain of the wood which usually occurs near a knot but does not contain a knot.

Centers.—See definition under “Cores.”

Centers, banded.—See definition under “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 definition under "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, worm-holes, or other defects interrupting the smooth continuity of the surface.

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

Discolorations.—Stain in wood substances. Common veneer stains are sap stains, blue stains, and stains produced by the chemical action of the iron in the cutting knife 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 wood substance.

Flake, broken.—A breaking or loosening of the flake (medullary ray) or quartered material, most frequent in oak.

Flat cut.—Flat-cut veneer sliced parallel to the pith of the log and approximately tangent to the growth rings. Also termed, "plain sliced."

Grain.—Term applied to the vertical elements of wood as they occur in the living tree. Grain is perhaps most easily delineated in certain wood 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 referred to as "grain."

Gum spots.—Well-defined openings between rings of annual growth, usually containing more or less gum.

Half round.—A manner 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 opposition to softwood produced from evergreen or coniferous trees.

Hairline.—Thin perceptible line usually showing at the joint.

Holes, worm.—Holes resulting from infestation of worms.

Holes, pin worm.—Holes resulting from infestation of worms and not exceeding 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 grain of the wood.

Joints, open.—Joint in which two adjacent pieces of veneer do not fit tightly together.

Knots.—Cross section of branch or limb with grain usually running at right angles to that of the piece in which it occurs.

Knot holes.—Voids produced by dropping of knots from the wood in which originally embedded.

Knots, 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.—A sound knot less than 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 definition under "tight side."

Patches.—Insertions of sound wood placed and glued into panels from which defective portions have been removed.

Plywood.—Wood engineered for beauty, strength, and economical application. The veneer is united under pressure with a bonding agent, making the joints as strong as, or stronger than, the wood itself. It is the product resulting from three or more layers of veneer, usually laid with the grain of each piece at right angles to the one adjacent to it. Almost always an odd number of plies is used to secure balanced construction.

Quartered.—Method of producing 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." 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.—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.—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.

Tape, perforated.—Tape perforated for better plywood adhesion. Tape perforated to permit veneers to bond directly to each other through the perforations.

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."

Worm holes.—See definition under "holes, worm." "holes, pin worm."

EFFECTIVE DATE

73. The standard is effective for new production from February 20, 1947.

STANDING COMMITTEE

74. 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 Division of Trade Standards, which acts as secretary for the committee.

DAWSON ZAUG, Chairman

DAWSON ZAUG, American Plywood Corporation, New London, Wis.

G. L. WILLSON, Pearl City Plywood Co., Inc., Allen Street Extension, Jamestown, N. Y.

W. F. DURBIN, Hoosier Panel Co., New Albany, Ind.

VICTOR S. BARNES, Haskelite Mfg. Corp., 701 Ann St., Grand Rapids, Mich.

R. FAY KULMER, The Mengel Co., Louisville, Ky.

C. W. PERRY, U. S. Plywood Corp., P. O. Box 1346, High Point, N. C.

T. R. WILLIAMS, Ichabod T Williams & Sons, 220 Eleventh Avenue, New York, N. Y.

DON L. DAVIS, Aetna Plywood & Veneer Co., 1731 Elston Avenue, Chicago, Ill.

TED THOMPSON, Plywood-Detroit Company, 4445 Bellevue Avenue, Detroit 7, Mich.

A. E. PYE, National Plywood Distributors Association, Inc., Executive Office, 75 Wacker Drive, Chicago 1, Ill.

GEORGE L. WAETJEN, Milwaukee Plywood Co., 1227 West Bruce Street, Milwaukee 4, Wis.

JAMES A. ROLAND, Fry-Fulton Lumber Co., 148 Carroll Street, St. Louis 4, Mo.

HAL KEELY, Hal Keely Plywood Co., 624 East Carson Street, Pittsburgh 3, Pa.

THEODORE I. COE, American Institute of Architects, 1740 New York Avenue, Washington, D. C.

G. MARVIN HARLACKER, Pennsylvania Furniture Co., York, Pa.

J. C. MCCARTHY, Secretary, National Association of Furniture Manufacturers, Inc., 666 Lake Shore Drive, Chicago 11, Ill.

ROSCOE R. RAU, National Retail Furniture Association, 666 Lake Shore Drive, Chicago 11, Ill.

WALTER JUNGE, Chief, Engineering Section, Technical Division, Federal Housing Administration, Washington 25, D. C.

LT. E. L. KNUTSON, Engineering and Development Branch, Supply Division Office of Chief of Engineers, War Department, New War Department Building, Washington 25, D. C.

M. C. JONES, Gettysburgh Furniture Co., Gettysburg, Pa.

J. T. RYAN, Southern Furniture Manufacturers Association, High Point, N. C.

HISTORY OF PROJECT

75. Pursuant to a request from the Plywood Manufacturers Association, a general conference of manufacturers, distributors, and users of plywood, made from hardwoods and Eastern red cedar, was held in Chicago, Ill., on April 9, 1931, to consider the adoption of standard grading rules for the guidance of the trade.

76. The proposed standard was thoroughly discussed, and, after several constructive changes were made, the conference recommended that it be circulated to the trade for written acceptance. Accordingly, the recommended standard was submitted to producers, distributors, and users under date of May 29, 1931. Following receipt of written acceptances from a satisfactory majority, the standard was announced on August 1, 1931, to become effective for new production on September 1, 1931.

FIRST REVISION

77. On February 6, 1942, the Hardwood Plywood Institute submitted a proposed revision which included 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 which are or are not permissible in the various species and grades. These changes were approved by the standing committee and the recommended revision was circulated on May 1, 1942, to those directly concerned, for written acceptance.

78. Following acceptance by a satisfactory majority, the success of the revision was announced on June 15, 1942, and the standard became effective for new production on July 15, 1942, as CS35-42.

SECOND REVISION

79. Pursuant to a request from the Hardwood Plywood Institute, dated June 4, 1946, and following approval by the standing committee, the second revision was circulated on September 6, 1946, to the trade for written acceptance. The purpose of this revision was to include an additional type of bondage, making four types now covered, requiring minimum shear strength for type I and type II, and a complete revision of all grades according to present manufacturing practice and use with a better description of the defects permitted in the inner plies and backs as well as in the face veneers. Following acceptance by a satisfactory majority, the establishment of the revision was announced on January 20, 1947, as Commercial Standard CS35-47.

APPENDIX STATEMENT

Commentary on Method of Sampling and Bondage Test

Although the methods of test set forth in paragraphs 60-66 of the above commercial standard are now in general use throughout the industry, it may be well to note that the whole problem of bondage tests is still under study, and that fully satisfactory criteria remain to be developed.

The determination of percentage of wood failure in particular is subject to rather erratic fluctuations. This seems to be due in part to the fact that the specimen is subjected to bending as well as shearing stresses, and it seems reasonable to conclude therefore that the resulting observation may be rather heavily affected by the minute variations in the depths of the notches cut in the specimen.

The statistical nature of the tests renders an exact appraisal of the lot acceptance sampling plan specified in paragraphs 60 and 66 too complicated to be given here in detail. It is believed, however, that the following rough analysis prepared by the Statistical Engineering Laboratory of the National Bureau of Standards, may prove helpful to users of the plan in evaluating the protection it affords to purchaser and manufacturer.

Assume random selection of sample panels from the shipment. Assume further, for a moment, that the sample panel is evaluated in a completely reproducible manner by the applicable tests. The exact operating characteristics of the sampling plan are then as outlined in table 8. The table indicates that under the above assumptions (1) a shipment in which less than 3 percent of the panels were rejectible would almost always be accepted; (2) shipments in which from 13 percent (in the case of five original sample panels) to 20 percent (in the case of 10) of the panels were rejectible would be accepted about half the time; and (3) 40 percent of the panels in a shipment represented by 5 original sample panels would have to be rejectible to assure the rejection of the entire shipment.

TABLE 8.—Operating characteristics of the acceptance sampling plan

Probability of accepting the shipment	True percentage of rejectible ¹ panels in the shipment	
	Using 5 original sample panels	Using 10 original sample panels
	<i>Percent</i>	<i>Percent</i>
0.95	5	3
.50	20	13
.10	40	27

¹ As determined by criterion in paragraph 66.

The complications enter when it is taken into consideration that each sample panel is not evaluated in a completely reproducible manner by the tests and that there is some uncertainty in the classification of the panel as rejectible or not rejectible. In general, the result of this uncertainty will be to *decrease* the probability of acceptance of a shipment with a low true proportion of rejectible panels (say less than 5 percent) and to *increase* slightly (or leave unchanged) the probability of acceptance if the true proportion of rejectible panels is high (say about 25 percent). In other words, the lack of precision in the test is unfavorable to the manufacturer of good material, and is of no assistance to the purchaser in eliminating really bad material.

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.....

Division of Trade Standards,
National Bureau of Standards,
Washington 25, D. C.

Gentlemen:

We believe that the Commercial Standard CS35-47 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 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.....

¹ Underscore which one. 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.

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 commercial 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 Nation-wide 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 the Department of Commerce, the support of any standard is inadequate, the right is reserved to withhold promulgation and publication.

ACCEPTORS

80. 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 therefrom as they individually deem advisable. It is expected that articles 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 Institute of Architects, Cincinnati Chapter, Cincinnati, Ohio.
 American Institute of Architects, Kansas City Chapter, Kansas City, Mo.
 American Specification Institute, Chicago, Ill.
 Building Officials Conference of America, Inc., Washington, D. C.
 Carolina Lumber & Building Supply Association, Charlotte, N. C.
 Hardwood Plywood Institute, Chicago, Ill.
 National Hardwood Lumber Association, Chicago, Ill.
 National Plywood Distributors Association, Chicago, Ill.
 Plastic Materials Manufacturers Association, Inc., Washington, D. C.
 Southern Hardwood Producers, Inc., Memphis, Tenn.
 Southern Plywood Manufacturers Association, Atlanta, Ga.
 Veneer Association, The, Chicago, Ill.
 Victoria Standards Institute, Victoriaville, Province of Quebec, Canada.

FIRMS

ACF-Brill Motors Co., Philadelphia, Pa.
 Adams, Franklin O., Tampa, Fla.
 Aetna Plywood & Veneer, Chicago, Ill.
 Albany Plywood Co., Albany, N. Y.
 Algoma Plywood & Veneer Co., Algoma, Wis.
 Altfillisch, Charles, Decorah, Iowa.
 American Chair Co., Sheboygan, Wis.
 American Forest Products Co., New York, N. Y.
 American Furniture Co., Batesville, Ind.
 American Mutual Liability Insurance Co., Boston, Mass.
 American Plywood Corp., New London, Wis.
 American Seating Co., Grand Rapids, Mich.
 Andrews, Jones, Biscoe & Goodell, Boston, Mass. (General support.)
 Andrews Lumber Co., C. E., New Bethlehem, Pa.
 Angelus Furniture Manufacturing Co., Los Angeles, Calif.
 Arlington Seating Co., Arlington Heights, Ill.
 Associated Plywood Mills, Inc., Eugene, Oreg.
 Atkin Co., C. B., Knoxville, Tenn.
 Atlanta Oak Flooring Co., Atlanta, Ga.
 Austin, Ennis R., South Bend, Ind.
 Bakelite Corp., New York, N. Y.
 Bakelite Corp., Bloomeld, N. Y. (General support.)
 Baldwin Plywood & Veneer Co., Gillett, Wis.
 Baltimore, City of, Bureau of Plans & Surveys, Division of Architecture, Baltimore, Md.
 Beals Furniture Co., Thos. P., Portland, Maine.
 Beck Plywood & Lumber Co., Inc., Chicago, Ill.
 Behrend, Jacob, Philadelphia, Pa.

Bell Telephone Laboratories, Murray Hill, N. J.
 Bennett-Bailey Lumber Co., Minneapolis, Minn.
 Bennett Lumber Corp., North Tonawanda, N. Y.
 Big Rapids Furniture Manufacturing Co., Big Rapids, Mich.
 Bishop Horatio W., La Mesa, Calif.
 Blair Veneer Co., North Troy, Vt.
 Boehm, George A., New York, N. Y.
 Bogner, Harry, Milwaukee, Wis.
 Border Queen Kitchen Cabinet Co., Fort Smith, Ark.
 Bradley Plywood Co., Savannah, Ga.
 Brainerd, Harry B., New York, N. Y. (General support.)
 Brazier, Clarence W., New York, N. Y.
 Breece Veneer & Pasel Co., Inc., New Albany, Ind.
 Brickwede Bros. Co., The, Marietta, Ohio.
 Brown-Graves Co., Akron, Ohio.
 Bruce Co., E. L., Memphis, Tenn.
 Brust & Brust, Milwaukee, Wis.
 Buck, Inc., Daniel, Philadelphia, Pa.
 Bucky, Fred W., Jr., Jacksonville, Fla.
 Budde & Weis Manufacturing Co., Jackson, Tenn.
 Buffalo, City of, Department of Public Works, Architectural Service, Buffalo, N. Y.
 Buffalo Plywood Corp., Buffalo, N. Y.
 Buffelin Lumber & Manufacturing Co., Fort Worth, Tex.
 Burnham Manufacturing Co., Los Angeles, Calif.
 Burnside Veneer Co., Inc., Burnside, Ky.
 Burrill Co., The A. W., Bridgeport, Conn.
 Cadenhead, George L., Fort Lauderdale, Fla.
 Cadillac Plywood Co., Cadillac, Mich.
 California Panel & Veneer Co., Los Angeles, Calif.
 Calypso Veneer Co., Calypso, N. C.
 Camlet, J. Thomas, Passaic, N. J.
 Cannon & Mullen, Salt Lake City, Utah.
 Carolina Panel Co., Inc., Lexington, N. C.
 Cavalier Corp., Chattanooga, Tenn.
 Chapin, Rollin C., Minneapolis, Minn. (General support.)
 Christmann Veneer & Lumber Co., St. Louis, Mo.
 Clore & Hawkins, Brightwood, Va.
 Coffin, R. V., Seattle, Wash.
 Coit, Elisabeth, Washington, D. C.
 Collins Upholstery Manufacturing Co., Silver Creek, N. Y.
 Conrad & Cummings, Binghamton, N. Y.
 Coolidge, Shepley, Bulfinch & Abbott, Boston, Mass.
 Cram & Ferguson, Boston, Mass.
 Crane Co., The Arthur D., Sparta, N. J.
 Crawford Door Co., Detroit, Mich.
 Crawford Furniture Manufacturing Corp., Jamestown, N. Y.
 Crompton & Knowles Loom Works, Worcester, Mass.
 Cron-Kills Co., Inc., Piqua, Ohio.

- Cross, Austin & Ireland Lumber Co., Brooklyn, N. Y.
 Crowell & Lancaster, Bangor, Maine.
 Davenport Cabinet Works, Inc., Davenport, Iowa.
 Davis Plywood Corp., The, Cleveland, Ohio.
 Daystrom Laminates, Inc., Daystrom, N. C.
 Denny Roll & Panel Co., High Point, N. C.
 Dietzgen Co., Eugene, Chicago, Ill.
 Downes Lumber Co., Boston, Mass.
 Drexel Furniture Co., Kingstree, S. C.
 Durite Plastics, Inc., Philadelphia, Pa.
 Eggers Plywood & Veneer Co., F., Two Rivers, Wis.
 Elliott Bay Mill Co., Seattle, Wash.
 Emery Industries, Inc., St. Bernard, Ohio.
 Empire Case Goods, Jamestown, N. Y.
 English, Miller & Hockett, Hutchinson, Kans.
 Estes Lumber Co., Birmingham, Ala.
 Evans, M. R., Lancaster, Pa.
 Everett & Associates, H. F. Allentown, Pa.
 Fine Arts Furniture Co., Grand Rapids, Mich.
 Flannagan, Eric G., Henderson, N. C.
 Forest Furniture Co., North Wilkesboro, N. C.
 Fry Fulton Lumber Co., St. Louis, Mo.
 Fuller & Son Lumber Co., G., Brighton, Mass. (General support.)
 Furer, Wm. C., Honolulu, Hawaii.
 Fyles & Rice Co., Inc., Bethel, Vt.
 General Plywood Corp., Louisville, Ky.
 Greene & Wood, Inc., New Bedford, Mass.
 Groffmann, L. C., St. Louis, Mo.
 Gunn Furniture Co., Grand Rapids, Mich.
 Hackner Co., Inc., The E., La Crosse, Wis.
 Hahn, Stanley W., Cleveland, Ohio.
 Hale Co., Inc., East Arlington, Vt.
 Hale Manufacturing Co., F. E. Herkimer, N. Y.
 Hall, Fessenden, Philadelphia, Pa.
 Hallack & Howard Lumber Co., Denver, Colo.
 Hamilton Veneer Co., Orangeburg, S. C.
 Haralson & Mott, Fort Smith, Ark.
 Harbor Plywood Corp. of California, San Francisco, Calif.
 Harbor Plywood Corp. (Chicago Division), Chicago, Ill.
 Harbor Sales Co., The, Baltimore, Md.
 Harbor Sales Co., Inc., Washington, D. C.
 Harmony Co., The, Chicago, Ill.
 Hartshorn, Inc., C. H., Gardner, Mass.
 Haskelite Manufacturing Corp., Grand Rapids, Mich.
 Hasness, Carlisle D., Harrisburg, Pa.
 Hausman, N. W., Glen Cove, N. Y.
 Haxby & Bissell, Minneapolis, Minn.
 Henrich Plywood Co., Inc., Buffalo, N. Y.
 Higgins, Charles H., New York, N. Y.
 Hill Plywoods, Lyman, Hollywood, Calif.
 Hodgdon, Charles, San Gabriel, Calif.
 Holsman & Holsman & Klekamp, Chicago, Ill.
 Hoosier Panel Co., The, New Albany, Ind.
 Hope, Frank L., Jr., San Diego, Calif.
 Houkom, S. M., Fargo, N. Dak.
 Houston Sash & Door Co., Houston, Tex.
 Howell, Leslie D., Portland, Oreg. (General support.)
 Huss Lumber Co., Chicago, Ill.
 Hutchings, E. T., Louisville, Ky.
 Huttig Sash & Door Co., St. Louis, Mo.
 Hyde Murphy Co., Ridgway, Pa.
 International Detrola Corp. (Caswell-Runyan, Goshen Division), Goshen, Ind.
 Ipik Plywood Co., Kenner, La.
 Iron City Sash & Door Co., Pittsburgh, Pa.
 Irwin Co., Robert W., Grand Rapids, Mich.
 James Lumber Co., Boston, Mass.
 Jamestown Veneer & Plywood Co., Jamestown, N. Y.
 Jasper Novelty Furniture Co., Inc., Jasper, Ind.
 Jasper Wood Products Co., Inc., Jasper, Ind.
 Johnson-Carper Furniture Co., Inc., Roanoke, Va.
 Johnson, Wallwork & Dukehart, Portland, Ore.
 Kansas State College, Department of Architecture, Manhattan, Kans. (General support.)
 Karpen & Bros., S., Chicago, Ill.
 Keely Plywood Co., Hal. Pittsburgh, Pa.
 Keich & O'Brien, Warren, Ohio.
 Kelley, Frederic P., Millington, N. J.
 Kennebec, Inc., Bingham, Maine.
 Kilham, Hopkins & Greeley, Boston, Mass.
 Klopstock Bros., San Francisco, Calif.
 Kneeland, Arthur, Montreal, Que., Canada.
 Kroehler Manufacturing Co., Naperville, Ill.
 Kyle, Herbert S., Charleston, W. Va.
 Latenser & Sons, John, Omaha, Nebr.
 Laucks, Inc., I. F., Seattle, Wash.
 Law, Law, Potter & Nystrom, Madison, Wis.
 Leopold Co., The, Burlington, Iowa.
 Levy, Will, St. Louis, Mo.
 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.
 Lovatt, George S., Philadelphia, Pa.
 Macy's Bureau of Standards, New York, N. Y.
 Maloney, John W., Yakima, Wash., and Seattle, Wash.
 Manter Lumber Co., The, Winchester, Mass.
 Markland Contracting Co., M. B., Atlantic City, N. J.
 Mason & Co., George D., Detroit, Mich.
 McClelland Co., The, Davenport, Iowa.
 Mears Plywood Co., Baltimore, Md.
 Meloy Manufacturing Co., Inc., Shelbyville, Ind.
 Memphis Plywood Corp., Memphis, Tenn.
 Memphis Sash & Door Co., Memphis, Tenn.
 Mengel Co., The, Louisville, Ky.
 Mersman Bros. Corp., The, Celina, Ohio.
 Metropolitan Millwork Co., Brooklyn, N. Y.
 Meyercord Compound Lumber Co., Mobile, Ala.
 Miller & Vrydagh, Terre Haute, Ind.
 Mills Industries, Inc., Chicago, Ill.
 Milwaukee Plywood Co., Milwaukee, Wis.
 Minneapolis Desk Manufacturing Co., Minneapolis, Minn.
 Missouri Furniture Co., St. Louis, Mo.
 Moore, J. W.—Furniture Manufacturer, New Orleans, La.
 Mooser, William, San Francisco, Calif.
 Mueller Furniture Co., Grand Rapids, Mich.
 Mueller, Hair & Hetterich, Hamilton, Ohio.
 Muhlberg Brothers, Reading, Pa.
 National Plywood Co., Inc., New York, N. Y.
 National Plywoods, Inc., Chicago, Ill.
 New England Box Co., The, Greenfield, Mass.
 New England Panel Co., Everett, Mass.
 Niagara Plywood Co., Buffalo, N. Y.
 Nicky Brothers, Inc., Memphis, Tenn.
 Nurenburg, W. S., Fort Worth, Tex.
 Officer, Gwynn, Lafayette, Calif.
 Omaha Hardwood Lumber Co., Omaha, Nebr.
 Old Dominion Plywood Corp., Bristol, Va.
 and Sioux City, Iowa.
 Patten-Blinn Lumber Co., Los Angeles, Calif.
 Patterson-Buck Hardwood Co., Dearborn, Mich.
 Patzky Testing Laboratories, Des Moines, Iowa.
 Peabody Seating Co., Inc., The, North Manchester, Ind.
 Pearl City Plywood Co., Inc., Jamestown, N. Y.
 Peerless Built-In Fixture Co., Berkeley, Calif.
 Pehrson & Associates, G. A., Spokane, Wash.
 Penn Veneer Co., Inc., York, Pa.
 Phelps & Dewees & Simmons, San Antonio, Texas.
 Pittsburgh Board of Public Education, Pittsburgh, Pa.
 Pluswood, Inc., Oshkosh, Wis.
 Plywood Detroit Co., Detroit, Mich.
 Portsmouth Lumber Corp., Portsmouth, Va.
 Precision-Built Homes Corp., Trenton, N. J.
 Prescott & Son, Inc., R., Keeseville, N. Y.
 Reichhold Chemicals, Inc., Detroit, Mich.
 Rensselaer Polytechnic Institute, Department of Architecture, Troy, N. Y.
 Resnikoff, Abraham, New York, N. Y.
 Rhodes, Harry A., Rensselaer, N. Y.

- Richmond Furniture Manufacturing Co., Richmond, Ind.
- Rincones Co., Inc., P. R., Jr., New York, N. Y.
- Ritchie & Associates, James H., Boston, Mass.
- Robert & Co., Inc., Atlanta, Ga.
- Rockford Chair & Furniture Co., Rockford, Ill.
- Rockford National Furniture Co., Rockford, Ill.
- Rockford Peerless Furniture Co., Rockford, Ill.
- Rockwell Bros. & Co., Houston, Tex.
- Roddie Lumber & Veneer Co., Marshfield, Wis.
- Rushville Furniture Co., The, Rushville, Ind.
- St. Louis Plywood Manufacturers, Inc., Chicago, Ill.
- Schlendorf, M. Allen, Brooklyn, N. Y.
- Scott Lumber Co., The, Wheeling, W. Va.
- Scranton Plywood Co., Forty Fort (Kingston), Pa.
- Segelke & Kohlhaus Co., La Cross, Wis.
- Seidel Furniture Manufacturing Co., Inc., New Orleans, La.
- Sellers & Sons Co., G. I., Elwood, Ind.
- Setter Bros., Inc., Cattaraugus, N. Y.
- Sheboygan Fruit Box Co., Sheboygan, Wis.
- Showers Brothers Co., Bloomington, Ind.
- Singer Cabinet Shops, Inc., New York, N. Y.
- Skinner, Colin, New York, N. Y. (General support.)
- Sleeper, Harold R., New York, N. Y.
- Southern Box & Lumber Co., Wilmington, N. C.
- Southern Laminating Co., Memphis, Tenn.
- Southern Veneer Manufacturing Co., Inc., Louisville, Ky.
- Specification Record, Chicago, Ill.
- Spencer Cardinal Corp., Marion, Ind.
- Splicedwood Corp., Mellen, Wis.
- Standard Chair Co., Union City, Pa.
- Stark Co., James E., Memphis, Tenn.
- Staub & Rather, Houston, Tex.
- Stoetzel, Ralph, Chicago, Ill.
- Strable Hardwood Co., Oakland, Calif.
- Stravs, Carl B., Minneapolis, Minn.
- Sweets Catalog Service, New York, N. Y. (General support.)
- Taylor, Ellery K., Haddonfield, N. J.
- Temple, Seth J.—Arthur Temple, Davenport, Iowa.
- Thaden Jordan Furniture Corp., Roanoke, Va.
- Thayer Co., Gardner, Mass.
- Thompson Veneer Co., Cleveland, N. C.
- Tidewater Plywood Co., Brunswick, Ga.
- Tomlinson of High Point, Inc., High Point, N. C.
- Tonk Manufacturing Co., Chicago, Ill.
- Torrey Veneer Co., F. S., Grand Rapids, Mich.
- Transogram Co., Inc., Coudersport, Pa.
- Tulane Hardwood Lbr. Co., Inc., New Orleans, La.
- Twin City Hardwood Lumber Co., St. Paul, Minn.
- Underwood Veneer Co., Wausau, Wis.
- Union Furniture Corp., Batesville, Ind.
- U. S. Plywood Corp., Cleveland, Ohio.
- Van Os & Flaxman, Shreveport, La. (General support.)
- Veneer Lumber & Plywood Co., The, Chicago, Ill.
- Virginia Polytechnic Institute, Blacksburg, Va.
- Wanke Panel Co., Portland, Oreg.
- Waynesboro Veneer Co., Waynesboro, Ga.
- Weber Veneer & Plywood Co., Shawano, Wis.
- Welch, Carroll E., Huntington, N. Y.
- West, Albert E., Boston, Mass. (General support.)
- Western Hardwood Lumber Co., Los Angeles, Calif.
- White Brothers, San Francisco, Calif.
- Whitney Reed Co., Leominster, Mass.
- Wilbur Lumber Co., West Allis, Wis.
- Willard, Rudolph, Ridgewood, N. J.
- Wilson, Adrian, Los Angeles, Calif.
- Winde, McCormick & Chapin, Inc., Charlestown, Mass.
- Winshp Co., Inc., Utica, N. Y.
- Wisconsin Chair Co., The, Port Washington, Wis.
- Wisconsin Laminating Co., Chilton, Wis.
- Wood Products Magazine, Chicago, Ill. (General support.)
- Wood-Ply Research Foundation, Inc., Chicago, Ill.
- Woodward Furniture Co., Owosso, Mich.
- Woodcroftery Shops, The, Wayland, N. Y.
- Wooster Novelty Co., New York, N. Y.
- Wright & Wright, Detroit, Mich. (General support.)
- Youngstown Plywood Co., Youngstown, Ohio.
- Zimmerman, A. C., Los Angeles, Calif.

UNITED STATES GOVERNMENT

Interior, Department of the, Office of Indian Affairs, Chicago, Ill.

National Housing Agency, Federal Public Housing Authority, Washington, D. C.

Veterans Administration, Washington, D. C.

COMMERCIAL STANDARDS

CS No.	Item	CS No.	Item
0-40.	Commercial standards and their value to business (third edition).	46-40.	Hosery lengths and sizes (third edition).
1-42.	Clinical thermometers (third edition).	47-34.	Marking of gold-filled and rolled-gold-plate articles other than watchcases.
2-30.	Mopsticks.	48-40.	Domestic burners for Pennsylvania anthracite (underfeed type) (second edition).
3-40.	Stoddard solvent (third edition).	49-34.	Chip board, laminated chip board, and miscellaneous boards for book-binding purposes.
4-29.	Staple porcelain (all-clay) plumbing fixtures.	50-34.	Binders board for bookbinding and other purposes.
5-46.	Pipe nipples; brass, copper, steel and wrought-iron (second edition).	51-35.	Marking articles made of silver in combination with gold.
6-31.	Wrought-iron pipe nipples (second edition). Superseded by CS5-46	52-35.	Mohair pile fabrics (100-percent mohair plain velvet, 100-percent mohair plain frieze, and 50-percent mohair plain frieze).
7-29.	Standard weight malleable iron or steel screwed unions.	53-35.	Colors and finishes for cast stone.
8-41.	Gage blanks (third edition).	54-35.	Mattresses for hospitals.
9-33.	Builders' template hardware (second edition).	55-35.	Mattresses for institutions.
10-29.	Brass pipe nipples. Superseded by CS5-46.	56-41.	Oak flooring (second edition).
11-41.	Moisture regains of cotton yarns (second edition).	57-40.	Book cloths, buckrams, and impregnated fabrics for bookbinding purposes except library bindings (second edition).
12-40.	Fuel oils (fifth edition).	58-36.	Woven elastic fabrics for use in overalls (overall elastic webbing).
13-44.	Dress patterns (fourth edition).	59-44.	Textiles — testing and reporting (fourth edition).
14-43.	Boys' button-on waists, shirts, junior and sport shirts (made from woven fabrics) (third edition).	60-36.	Hardwood dimension lumber.
15-46.	Men's pajama sizes (made from woven fabrics) (third edition).	61-37.	Wood-slat venetian blinds.
16-29.	Wall paper.	62-38.	Colors for kitchen accessories.
17-42.	Diamond core drill fittings (third edition).	63-38.	Colors for bathroom accessories.
18-29.	Hickory golf shafts.	64-37.	Walnut veneers.
19-32.	Foundry patterns of wood (second edition).	65-43.	Methods of analysis and of reporting fiber composition of textile products (second edition).
20-42.	Staple vitreous china plumbing fixtures (third edition).	66-38.	Marking of articles made wholly or in part of platinum.
21-39.	Interchangeable ground-glass joints, stopcocks, and stoppers (fourth edition).	67-38.	Marking articles made of karat gold.
22-40.	Builders' hardware (nontemplate) (second edition).	68-38.	Liquid hypochlorite disinfectant, deodorant, and germicide.
23-30.	Feldspar.	69-38.	Pine oil disinfectant.
24-43.	Screw threads and tap-drill sizes.	70-41.	Phenolic disinfectant (emulsifying type) (second edition) (published with CS71-41).
25-30.	Special screw threads. Superseded by CS24-43.	71-41.	Phenolic disinfectant (soluble type) (second edition) (published with CS70-41).
26-30.	Aromatic red cedar closet lining.	72-38.	Household insecticide (liquid spray type).
27-36.	Mirrors (second edition).	73-45.	Old growth Douglas fir standard stock doors (third edition).
28-46.	Cotton fabric tents, tarpaulins and covers (second edition).	74-39.	Solid hardwood wall paneling.
29-31.	Staple seats for water-closet bowls.	75-42.	Automatic mechanical draft oil burners designed for domestic installations (second edition).
30-31.	Colors for sanitary ware.	76-39.	Hardwood interior trim and molding.
31-38.	Wood shingles (fourth edition).	77-40.	Sanitary cast-iron enameled ware.
32-31.	Cotton cloth for rubber and pyrox-lylin coating.	78-40.	Ground-and-polished lenses for sun glasses (second edition) (published with CS79-40).
33-43.	Knit underwear (exclusive of rayon) (second edition).	79-40.	Blown, drawn, and dropper lenses for sun glasses (second edition) (published with CS78-40).
34-31.	Bag, case, and strap leather.	80-41.	Electric direction signal systems other than semaphore type for commercial and other vehicles subject to special motor vehicle laws (after market).
35-47.	Hardwood plywood (third edition).		
36-33.	Fourdrinier wire cloth (second edition).		
37-31.	Steel bone plates and screws.		
38-32.	Hospital rubber sheeting.		
39-37.	Wool and part wool blankets (second edition). (Withdrawn as commercial standard, July 14, 1941).		
40-32.	Surgeons' rubber gloves.		
41-32.	Surgeons' latex gloves.		
42-43.	Structural fiber insulating board (third edition).		
43-32.	Grading of sulphonated oils.		
44-32.	Apple wraps.		
45-45.	Douglas fir plywood (sixth edition).		

CS No.	Item	CS No.	Item
81-41.	Adverse-weather lamps for vehicles (after market).	111-43.	Earthenware (vitreous-glazed) plumbing fixtures.
82-41.	Inner-controlled spotlamps for vehicles (after market).	112-43.	Homogeneous fiber wallboard.
83-41.	Clearance, marker, and identification lamps for vehicles (after market).	113-44.	Oil-burning floor furnaces equipped with vaporizing pot-type burners.
84-41.	Electric tail lamps for vehicles (after market).	114-43.	Hospital sheeting for mattress protection.
85-41.	Electric license-plate lamps for vehicles (after market).	115-44.	Porcelain-enamelled tanks for domestic use.
86-41.	Electric stop lamps for vehicles (after market).	116-44.	Bituminized-fibre drain and sewer pipe.
87-41.	Red electric warning lanterns.	117-44.	Mineral wool; blankets, blocks, insulating cement, and pipe insulation for heated industrial equipment.
88-41.	Liquid-burning flares.	118-44.	Marking of jewelry and novelties of silver.
89-40.	Hardwood stair treads and risers.	(E)119-45. ¹	Dial indicators (for linear measurements).
90- .	(Reserved for power shovels and cranes.)	120-46.	Standard stock ponderosa pine doors (second edition).
91-41.	Factory-fitted Douglas fir entrance doors.	121-45.	Women's slip sizes (woven fabrics).
92-41.	Cedar, cypress and redwood tank stock lumber.	122-45.	Western hemlock plywood.
93-41.	Portable electric drills (exclusive of high frequency).	123-45.	Grading of diamond powder.
94-41.	Calking lead.	(E)124-45. ¹	Master disks.
95-41.	Lead pipe.	125-45.	Prefabricated homes.
96-41.	Lead traps and bends.	126-45.	Tank mounted air compressors.
97-42.	Electric supplementary driving and passing lamps for vehicles (after market).	127-45.	Self-contained mechanically refrigerated drinking water coolers.
98-42.	Artists' oil paints.	128-45.	Men's sport shirt sizes—woven fabrics (other than those marked with regular neckband sizes).
99-42.	Gas floor furnaces—gravity circulating type.	129-46.	Materials for safety wearing apparel.
100-44.	Porcelain-enamelled steel utensils (second edition).	130-46.	Color materials for art education in schools.
101-43.	Flue-connected oil-burning space heaters equipped with vaporizing pot-type burners.	131-46.	Industrial mineral wool products, all types—testing and reporting.
102- .	(Reserved for Diesel and fuel-oil engines.)	132-46.	Hardware cloth.
103-42.	Cotton and rayon velour (jacquard and plain).	133-46.	Woven wire netting.
104-46.	Warm-air furnaces equipped with vaporizing pot-type oil burners (second edition).	134-46.	Cast aluminum cooking utensils (metal composition).
105-43.	Mineral wool; loose, granulated, or tested form, in low-temperature installations.	135-46.	Men's shirt sizes (exclusive of work shirts).
106-44.	Boys' pajama sizes (woven fabrics) (second edition).	136-46.	Blankets for hospitals (wool, and wool and cotton).
107-45.	Commercial electric-refrigeration condensing units (second edition).	137-46.	Size measurements for men's and boys' shorts (woven fabrics).
108-43.	Treading automobile and truck tires.	138-47.	Insect wire screening.
109-44.	Solid-fuel-burning forced-air furnaces.	139-47.	Work gloves.
110-43.	Tire repairs—vulcanized (passenger, truck, and bus tires).	140-47.	Convector: testing and rating.
		141-47.	Sine bars, blocks, plates, and fixtures.

¹ Where (E) precedes the CS number, it indicates an emergency commercial standard, drafted under war conditions with a view toward early revision.

NOTICE.—Those interested in commercial standards with a view toward accepting them as a basis of everyday practice may secure copies of the above standards, while the supply lasts, by addressing the Division of Trade Standards, National Bureau of Standards, Washington 25, D. C.