panels) shall be permitted. For composite panels, if more than 85 percent but fewer than 90 percent of specimens pass delamination requirements following six cycles of 6.4.18 evaluated according to 6.4.13, another lot of twenty tests (one sample from each of twenty panels) shall be permitted. If the restest meets the requirements, bond durability requirements shall be considered satisfied.

b. Exposure 2 — Panels composed entirely of veneer and rated as Exposure 2 shall satisfy PS-1 bond requirements for interior panels bonded with intermediate glue. Composite and mat-formed panels which are so rated shall be moisture cycled according to the procedures of 6.4.14. Structural tests required for the grade shall be evaluated according to the performance requirements of 6.2.2.

c. Exterior — Panels composed of veneer and rated as Exterior shall satisfy PS-1 bond requirements for exterior panels.

6.2.4.2 Bond durability associated with knots and knotholes — Structural-use panels composed entirely of veneer and rated as Exposure 1 shall be tested according to 6.4.19 and 6.4.20. Knots and/or knotholes to be tested shall be greater than 51 mm (2 inches) but not exceeding 76 mm (3 inches) in width measured across the grain. Twenty knots and/or knotholes shall be tested according to 6.4.19 and twenty according to 6.4.20.

Knots and/or knotholes tested according to 6.4.19 shall meet dry concentrated static and impact requirements, conformance criteria and retest options of table 1 and 6.2.2.1(a) and 6.2.2.1(b). For each lot of twenty, 95 percent of the knots and/or knotholes tested according to 6.4.20 shall not exhibit delamination extending radially more than 3 mm (3/4 inch) beyond the boundary of the knot or knothole and across the width of a full sector or the continuous equivalent of the width of a full sector as measured by 6.4.20.4.

Retest — If no more than two knots or knotholes in a lot of twenty fail to meet the test requirements, another lot of twenty tests for that requirement shall be permitted. If all specimens pass the retest, the requirements shall be considered satisfied.

6.2.4.3 Mold resistance — Four panels shall be tested according to the procedures of 6.4.15.

a. Panels composed entirely of veneer shall be considered to have satisfactory mold resistance if each test group over the twenty-week period shows an average glue-line shear load of at least 90 percent of the control. In addition, no more than two groups shall rate less than 80 percent and no single group shall rate less than 75 percent.

b. Other panels shall be considered to have satisfactory mold resistance if no test group average is less than the control sample mean minus 1.8 times the control sample standard deviation.

6.2.4.4 Resistance to elevated temperature — Panels satisfying the moisture-cycling requirements of Section 6.2.4.1 shall be considered to have satisfactory resistance to elevated temperature.

6.2.4.5 Bacteria resistance — At least four panels shall be tested according to procedures of 6.4.16.

a. Panels composed entirely of veneer shall be considered to have bacteria resistance if each test group over the twelve-week test shows an average load of at least 80 percent of the control. No single group shall rate below 70 percent of the control.

b. Other panels shall be considered to have satisfactory bacteria resistance if no test group average is less than the control sample mean minus 1.8 times the control sample standard deviation.

6.3 Product evaluation

6.3.1 Mill specification — Upon satisfactory completion of the appropriate paragraphs of 6.2, a proprietary manufacturing specification unique to the product and mill shall be written based on product evaluation under this section. This specification shall be used in conjunction with policies of a qualified inspection and testing agency (see 7.1.1). Product evaluation shall be made on the same lot supplied by the manufacturer for qualification testing. Control values (see definition) established during product evaluation shall be the basis for quality evaluation of future production by both the individual mill quality control procedures and by an inspection program of a qualified inspection and testing agency.

In addition to the panel characteristics specifically evaluated in this section, any unique manufacturing technique which influences product qualification shall be included in the individual mill manufacturing specification. This would include special coatings; heat, water or chemical treatments; overlays; additives; or other manufacturing-related activities. In addition, the maximum size knot or knothole tested according to 6.2.4.2 shall be included in the manufacturing specification.

6.3.2 Panel construction

6.3.2.1 All-veneer panels — Panels shall be defined as to species and veneer construction for the mill specification and evaluated under 6.3.3 and 6.3.4 but excluding 6.3.4.2.
6.3.2.2 Composite panels — Wood-based material shall be evaluated as required in 6.3.3.6.3.4.1 and 6.3.5. In addition, the finished (veneered) panel shall be evaluated by the provisions 6.3.3.6.3.4.1, 6.3.4.3 and 6.3.5.

6.3.2.3 Mat-formed panels — Mat-formed panels shall be evaluated under the provisions 6.3.3.6.3.4 and 6.3.5.

6.3.3 Mechanical properties

6.3.3.1 Bending stiffness — Twenty tests (specimens taken from at least ten panels) shall be evaluated for bending stiffness both along and across the major panel axis according to the procedures of 6.4.5. Control values for each panel direction shall be the sample mean and the minimum shall be the lower value of a 90 percent confidence interval established on the mean.

6.3.3.2 Bending strength — Ten tests (specimens taken from at least ten panels) shall be evaluated for maximum bending moment both along and across the major panel axis according to the procedures of 6.4.5. The control value for each panel direction shall be the minimum observed value, or the sample mean minus 1.8 times the sample standard deviation, whichever is the higher value.

6.3.4 Physical properties

6.3.4.1 Panel thickness — Finished panel thickness shall be evaluated on each of twenty panels by the procedures of 6.4.12. The control value shall be the observed minimum individual panel average. The trademark shall include the minimum nominal fractional thickness rounded up to the nearest 0.8 mm (1/32 inch).

6.3.4.2 Moisture content — Panel moisture content shall be measured on one specimen from each of twenty panels according to 6.4.11. The control value shall be the maximum panel moisture content. A control value shall be established only if necessary under linear expansion performance testing per 6.2.3.1.

6.3.4.3 Linear expansion — Linear expansion shall be evaluated for specimens taken from twenty panels by the procedures of 6.4.4. For composite panels and for mat-formed panels containing non-oriented furnish, one specimen 75 by 300 mm (3 by 12 inches) shall be prepared perpendicular to the major panel axis only from each panel to be tested. For mat-formed panels containing oriented furnish, one 75 by 300 mm (3 by 12 inch) specimen parallel and one perpendicular to the major panel axis shall be prepared from each panel to be tested. The control value shall be the highest observed value, or the sample average plus 1.8 times the sample standard deviation, whichever is the lower value. When mat-formed panels contain oriented furnish, separate parallel and perpendicular control values shall be determined.

6.3.5 Adhesive bond properties

6.3.5.1 Moisture cycled breaking load — For composite and mat-formed panels classified Exposure 1 and Exposure 2, a minimum of twenty samples, one taken from each of twenty panels, shall be moisture cycled according to the procedures of 6.4.17 (single-cycle soak-dry test) using specimens described in 6.4.6. For composite and mat-formed panels classified Exposure 1, a minimum of twenty samples, one taken from each of twenty panels, shall be moisture cycled according to the procedures of 6.4.18 (six-cycle test) using specimens described in 6.4.6. Immediately following moisture cycling, panels containing veneer shall be examined for delamination of veneer-to-veneer or veneer to other wood-based materials according to 6.4.13. At least 95 percent of the samples tested shall exhibit no delamination, as defined in 6.4.13. Moisture-cycled samples shall then be tested according to the procedures of 6.4.6. The individual control value for each specification shall be the lowest observed breaking load (five-specimen average), or the sample average minus 1.8 times the sample standard deviation, whichever is the higher value. In addition, for Exposure 1 panels tested according to 6.4.17 and 6.4.6, the lower 90 percent confidence interval shall be established on the qualification mean.

6.3.5.2 Exposure 1 bond durability of all-veneer panels — Control values for bond durability of Exposure 1 all-veneer panels shall be as specified in 6.2.3.1(a).

6.3.5.3 Bond durability associated with knots and knotholes — Control values for bond durability associated with knots and knotholes shall be as specified in 6.2.3.2 for knots and knotholes tested according to 6.4.20.

ADVISORY NOTE: Assessment of bond durability associated with knots and knotholes on a quality assurance basis shall be conducted when a maximum-sized knot or knothole appears in the routine bond durability samples. When available, they should be tested according to 6.4.20 and meet the criteria of 6.2.3.2.

6.4 Test methods

6.4.1 Performance under concentrated static and impact loads

6.4.1.1 General — The general provisions of the most recent edition of ASTM E-661 shall be followed.

6.4.1.2 Specimen preparation — ASTM E-661 shall be followed with regard to specimen preparation and 6.2 shall be followed with regard to the number of specimens required. Specimens shall also be moisture cycled as required.

6.4.1.3 Test procedure

Concentrated static — Procedures of ASTM E-661 shall be followed, except that a test frame of steel rather than lumber using fasteners which simulate nails shall be permitted. During
6.4.20.4 Test procedure — Each specimen shall be cut into 8 sectors with radii intersecting at center of knot or knothole. The area surrounding the knot or knothole shall be visually inspected for delamination. Where separations are visible, the probe shall be inserted with a force of 35.5±4.5 N (8±1 lbf). No prying action or lateral movement shall be applied.

For each sector the radial distance from the tip of the sector to the boundary of separation beyond the knot or knothole shall be measured along both edges of the sector and recorded. Where a separation is not found, the distance from the tip of the sector to the boundary of the knot or knothole shall be measured and recorded.

The total area of separation for each specimen shall be calculated as:

\[ A = \pi R^2 \]

where,

\[ A = \text{total area of separation (mm}^2 \text{ or in}^2) \]

\[ R = \text{average radius of separation, calculated as the average of 16 distances (measured at edges of sectors) from the tips of the sectors to either the boundary of separation or the boundary of the knot or knothole (mm or in).} \]

7. TRADEMARKING AND CERTIFICATION

7.1 Certification of shipments — In order to insure that the purchaser has received structural-use panels of the grade and quality specified, the producer shall include with each shipment a “Certificate of Inspection” which states that the panels conform to this Standard. Each panel certified as being in conformance with this Standard shall bear the stamp of a qualified inspection and testing agency which (1) either inspects the manufacture (with adequate sampling, testing and examination for quality) or which (2) has tested a randomized sampling of the finished panels in the shipment being certified for conformance with this Standard.

7.1.1 Qualified inspection and testing agency — A qualified inspection and testing agency is defined to be one that:

(a) has the facilities and trained technical personnel to verify that the grading, measuring, species, construction, sanding, bonding, workmanship, and other characteristics of the products as determined by inspection, sampling and testing conform to all of the applicable requirements specified herein;

(b) has developed procedures to be followed by agency personnel in performance of inspection and testing;

(c) has no financial interest in, or is not financially dependent upon, any single company manufacturing the product being inspected or tested; and

(d) is not owned, operated or controlled by any such company.

7.2 Panel marking — All Sheathing, Structural 1 Sheathing and Single Floor panels represented as conforming to this Standard shall be identified with a mark bearing the grade name appropriate under these specifications, or a mark of a qualified inspection and testing agency. If identified by such a mark, the product specification shall be available from the qualified inspection and testing agency whose mark appears on the panel. The manufactured nominal thickness, span rating, exposure durability classification and the symbol PS 2 signifying conformance to this Standard shall be included in the trademark. Any supplemental application specifications of the manufacturer shall be clearly marked on each panel.

7.2.1 Voiding marks — Panels originally marked as conforming to this Standard but subsequently rejected as not conforming thereto shall have any reference to the Standard voided or obliterated by the manufacturer as follows:

Such panels shall be plainly marked by means of a 100- by 125-mm (4- by 5-inch) minimum size rectangular stamp carrying the legend, “Shop-cutting panel—all other marks void.” (See definition of shop-cutting panel.)

No reference shall be made to this Standard in the certification or trademarking of panels not conforming to all of the applicable provisions of this Standard.