ANSI/APA PRP 210-2014

AMERICAN NATIONAL STANDARD

Standard for Performance-Rated Engineered Wood Siding

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APA – The Engineered Wood Association

Approved March 7, 2014
American National Standards Institute

FOREWORD (This Foreword is not a part of American National Standard ANSI/APA PRP 210-2014)

This Standard provides requirements and test methods for qualification and quality assurance for performance-rated engineered wood siding, which is a veneer-based, structural-use product intended for use in construction applications as exterior siding. Product marking that conforms to this Standard is also specified.

This Standard was originally promulgated under the *Manufacturing and Performance Standard for APA Rated Siding Panels*, as documented in the *Performance Standards and Qualification Policy for Structural-Use Panels*, APA PRP 108, which has been in use by the wood structural panel industry in North America since April 1980. The development of this consensus American National Standard was achieved by following the *Operating Procedures for Development of Consensus Standards* of APA – The Engineered Wood Association, approved by the American National Standards Institute (ANSI).

Inquiries or suggestions for improvement of this Standard should be directed to APA – The Engineered Wood Association at 7011 South 19th Street, Tacoma, WA 98466, www.apawood.org.

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1. GENERAL

Performance-rated engineered wood siding (referred to as "siding" hereinafter) is a veneer-based, structural-use product intended for use in construction applications as exterior siding when fastened to supports spaced in accordance with the Span Rating in inches. Siding can be in the form of panel or lap when qualified under this standard and installed in accordance with the recommendations provided by the manufacturer and/or qualified agency that are consistent with this standard.

2. SCOPE

This standard provides qualification and trademark requirements for performance-rated engineered wood siding at the time of manufacturing. This includes the raw materials and binding materials as they affect performance, dimensions, tolerances, and moisture content of siding. This standard does not cover the efficacy or effect of preservative treatments on the siding products when applicable. Finish adhesion on engineered wood siding is beyond the scope of this standard.

Note 1: AWPA U1 Standard provides detailed information for preservative treatments on plywood when necessary.

This standard incorporates the U.S. customary units as well as the International System of Units (SI). The values given in the U.S. customary units are the standard and the SI values given in parentheses are for information only.

3. REFERENCED DOCUMENTS

3.1. ASTM Standards

- D1037-12 Standard Test Methods for Evaluating Properties of Wood-Base Fiber and Particle Panel Materials
- D1761-12 Standard Test Methods for Mechanical Fasteners in Wood
- D3043-00 (2011) Standard Test Methods for Structural Panels in Flexure
- D3501-05a (2011) Standard Test Methods for Wood-Based Structural Panels in Compression
- D4442-07 Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials
- E72-13a Test Methods of Conducting Strength Tests of Panels for Building Construction
- E661-03 (2009) Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads

3.2. Other Standards and Referenced Documents

- ANSI/AHA A135.4-2012 American National Standard for Basic Hardboard
- AWPA U1-13 Use Category System: User Specification for Treated Wood
- Voluntary Product Standard PS 1-09 Structural Plywood

4. TERMINOLOGY

4.1. Definitions

For terms that are not defined in this standard, see referenced standards.

4.2. Description of Terms Specific to This Standard

Engineered Wood Siding – a veneer-based, structural-use product intended for use in construction applications as exterior siding when fastened to supports spaced in accordance with the Span Rating in inches. The engineered wood siding may contain hardboard for the top and/or bottom layers.

Mill Specification – A manufacturing specification based on product evaluation to be used for quality assurance purposes by the manufacturer and the qualified agency.

Performance Category – A panel designation related to the panel thickness range that is linked to the nominal panel thickness designations used in the International Building Code (IBC) and International Residential Code (IRC). For purposes of labeling, as defined in Section 10.1(b), abbreviations PERF CAT, CAT or Category are permitted.

Span Rating – An index number, based on customary inch units, that identifies the recommended maximum center-to-center support spacing for the specified siding application under normal use conditions. Spans are defined for wall applications. As a matter of convention, spans are typically specified by a single index number. For example, a siding Span Rating of 24 designates a wall application with stud spacing of 24 inches (610 mm) or less on center.

Lap Siding – A siding that is typically manufactured from panel siding in widths of 12 inches (305 mm) or less with the long siding axis across supports for application as engineered wood siding.

Panel Siding – A siding that is manufactured in minimum widths of 4 feet (1219 mm) for application as engineered wood siding with or without grooves on the face and with or without the impregnated resin overlay. Grooves in panel siding shall be parallel to the major strength axis of the panel. Panel siding is typically used in application with the long panel axis parallel to the supports.

5. MATERIAL AND APPEARANCE REQUIREMENTS

5.1. Wood Veneer

Any wood veneer used as a component of a siding shall comply with the "C" or better veneer grade and workmanship requirements specified in PS 1.

5.2. Hardboard Face

The hardboard face shall comply with the requirements of Class 1 of ANSI/AHA A135.4.

5.3. Overlay

The overlay shall comply with Section 5.6.7 of PS 1 and Section 8.2.1 of this standard.

5.4. Adhesive

The adhesive shall comply with the requirements specified in Section 7 of this standard.

5.5. Grooves

The bottom of any groove shall occur within the face or within a ply whose grain is parallel to the face veneer with the following exception:

The bottom of V-grooves whose sides slope at an angle of 75 degrees or less from the plane of the face may occur within a core veneer. Any openings 1/16 inch (1.6 mm) or more in dimension intersected in the core veneer shall be solidly filled with an approved synthetic patching material. Where grooves are wider than 3/8 inch (9.5 mm), any voids at the base of the grooves shall be solidly filled with a synthetic patching material or be patched with an appropriate wood repair.

6. STRUCTURAL PERFORMANCE QUALIFICATION

Performance shall be as specified in this section when tested in accordance with the referenced standard test methods provided in this standard. Specimens shall be tested in the as-received conditions except as noted otherwise in this standard. Tests shall be conducted at the support spacing to be shown on the trademark. Any special product modification which enhances performance, such as moisturizing or water repellent treatment, shall be noted in the mill specification. If a change in siding configuration or processing is made, additional qualification tests, as necessary, shall be performed.

The following notes shall apply to Sections 6.1 through 6.4:

1) Specimens shall be tested wet, as defined in Sections 11.1.3, 11.2.3, 11.3.3, and 11.4.3,

2) Residual indentation or deflection shall be measured one minute ± 5 seconds after removal of the load, and

3) Specimens shall be tested at the maximum intended Span Rating for the product (typically 16 or 24 oc).

6.1. Concentrated Static Loads

Siding shall be tested in accordance with Section 11.1 for concentrated static loads and shall conform to the criteria shown in Table 1.

TABLE 1

CONCENTRATED STATIC LOAD PERFORMANCE CRITERIA

Maximum Residual Deflection After 100-lbf (0.445-kN) Load	Average Residual Indentation After 100-lbf (0.445-kN) Load	Minimum Ultimate Load
0.20 in. (5.1 mm)	0.04 in. (1.0 mm)	200 lbf (0.89 kN)

A minimum of five tests (one specimen taken from at least five siding panels) shall be evaluated for concentrated static loads according to Section 11.1.

A minimum of 90 percent of the tests shall exhibit residual deflections no more than the maximum residual deflection specified in Table 1; the average residual indentation shall not be greater than the value specified in Table 1; and a minimum of 90 percent of the tests shall conform to the minimum ultimate load specified in Table 1.

6.2. Uniform Loads

Siding shall be tested in accordance with Section 11.2 for uniform loads and shall conform to the criteria shown in Table 2.

TABLE 2

UNIFORM LOAD PERFORMANCE CRITERIA

Maximum Residual Deflection After 50-psf (2.39 kPa) Load	Minimum Ultimate Load
0.20 in. (5.1 mm)	150 psf (7.18 kPa)

A minimum of five tests (one specimen taken from at least five siding panels) shall be evaluated for uniform load capacity according to Section 11.2.

A minimum of 90 percent of the tests shall exhibit residual deflections no more than the value specified in Table 2; and a minimum of 90 percent of the tests shall conform to the minimum ultimate load specified in Table 2.

6.3. Hard-Body Impact Loads

Siding shall be tested in accordance with the procedures of Section 11.3 for hard-body impact loads and shall conform to the criteria shown in Table 3.

TABLE 3

HARD-BODY IMPACT LOAD PERFORMANCE CRITERIA

Average Residual Indentation After 4 lbf-ft (5.42 kN-mm) Impact	Minimum Ultimate Load
0.04 in. (1.0 mm)	8 lbf-ft (10.85 kN-mm)

A minimum of five tests (one specimen taken from at least five siding panels) shall be evaluated for hard-body impact load capacity according to Section 11.3.

The average residual indentation shall not be greater than the value specified in Table 3; and a minimum of 90 percent of the tests shall conform to the minimum ultimate load specified in Table 3.

6.4. Soft-Body Impact Loads

Siding shall be tested in accordance with the procedures of Section 11.4 for soft-body impact loads and shall conform to the criteria shown in Table 4.

TABLE 4

SOFT-BODY IMPACT LOAD PERFORMANCE CRITERIA

Maximum Residual Deflection After 30 lbf-ft (40.67 kN-mm) Impact	Minimum Ultimate Load
0.20 in. (5.1 mm)	45 lbf-ft (61.01 kN-mm)

A minimum of five tests (one specimen taken from at least five siding panels) shall be evaluated for soft-body impact load capacity according to Section 11.4.

A minimum of 90 percent of the tests shall exhibit residual deflections no more than the maximum residual deflection specified in Table 4; and a minimum of 90 percent of the tests shall conform to the minimum ultimate load specified in Table 4.

6.5. Fastener Head Pull-Through

Siding shall be tested in accordance with the procedures of Section 11.5 for fastener head pull-through and shall conform to the criteria shown in Table 5.

TABLE 5

FASTENER HEAD PULL-THROUGH CRITERIA

Test Exposure Conditions	Nail Size[a]	Minimum Ultimate Load
Dry	6d	55 lbf (0.245 kN)
Wet		40 lbf (0.178 kN)

(a) Hot-dipped galvanized casing nail or siding nail.

A minimum of twenty tests (four specimens taken from at least five siding panels) shall be conducted for each exposure condition for fastener head pull-through according to Section 11.5. For the purpose of this testing, thickness of the siding shall be measured and reported at the base of grooves (if present) unless otherwise recommended by the manufacturer.

At least 90 percent of the tests shall conform to the minimum ultimate load specified in Table 5.

6.6. Wall Racking

Panel siding shall be tested in accordance with the procedures of Section 11.6 for wall racking and shall conform to the criteria shown in Table 6. Lap siding products do not have racking resistance capability and therefore do not need to be tested.

A minimum of two tests for each test exposure condition shall be evaluated for wall racking according to Section 11.6.

TABLE 6

RACKING LOAD PERFORMANCE CRITERIA

Thickness	Nail Size (galvanized box)	Nail Spacing: Panel Edge	Nail Spacing: Intermediate Studs	Test Exposure Conditions	Performance Requirements[a]: Design Load	Performance Requirements[a]: Maximum Deflection at Design	Performance Requirements[a]: Minimum Ultimate Load
At Point of Nailing[b]	6d	6 in. (152 mm)	12 in. (305 mm)	Dry	150 lbf/ft (2.2 N/mm)	0.20 in (5.1 mm)	650 lbf/ft (9.5 N/mm)
					300 lbf/ft (4.4 N/mm)	0.60 in. (15.2 mm)	
				Wet[c]	150 lbf/ft (2.2 N/mm)	0.28 in. (7.1 mm)	500 lbf/ft (7.3 N/mm)
					300 lbf/ft (4.4 N/mm)	0.80 in. (20.3 mm)	

(a) Stud spacing at 16 in. (406 mm) o.c. or 24 in. (610 mm) o.c., depending on the maximum Span Rating.
(b) Thickness at point of nailing shall be measured at base of grooves (if grooved) unless otherwise recommended by the manufacturer.
(c) Wet exposure shall follow the recommended procedures outlined in ASTM E72.

6.6.1. *Deflection*

The average deflection shall not be greater than the value specified in Table 6. If the average deflection is greater than the value specified in Table 6, but does not exceed the requirement by 20 percent, another wall may be tested. If the average of the three walls taken together does not exceed the value specified in Table 6, the requirement shall be considered satisfied.

6.6.2. *Ultimate Load*

All tests shall conform to the minimum ultimate load specified in Table 6. If only two tests are evaluated, then values shall be within 10 percent of each other. If the two ultimate loads do not agree within 10 percent, another wall may be tested. If the lowest value of the three walls tested exceeds the minimum ultimate load specified in Table 6, the requirement shall be considered satisfied.

7. BOND PERFORMANCE QUALIFICATION

The bond lines for veneer-to-veneer, hardboard-to-veneer, and overlay-to-veneer shall meet the PS 1 Exterior bond requirements.

8. ADDITIONAL PERFORMANCE QUALIFICATIONS

8.1. Buckling Performance

Siding shall be tested according to the procedures of Section 11.7 for stability on a large-scale test frame.

The upper 5 percent exclusion limit of buckling distortions across the supports shall be no greater than 0.20 inch (5.1 mm) as determined by the procedures of Section 11.7. Any special feature included by the manufacturer, such as coatings or moisture conditioning, shall be noted in the mill specification.

8.2. Surface Characteristics

Performance shall be as specified in this section for properties that affect finish performance when tested in accordance with the referenced test method.

8.2.1. *Overlays*

Siding with overlays shall be tested in accordance with the procedures of Section 11.8 and shall conform to the criteria shown in Table 7. A minimum of five specimens (one specimen each taken from at least five siding panels) shall be tested for each exposure condition.

TABLE 7

OVERLAY PERFORMANCE CRITERIA

Test Exposure Condition		Performance Requirements
Test 1	Vacuum-Pressure-Dry	Delamination limited to an area 1/2 in. (12.7 mm) deep x 1 in. (25.4 mm) wide; No internal separation of the overlay; No cracks in the overlay
Test 2	Machinability	Performance of the overlay must be at least equivalent to that of the typical PS 1 phenolic Medium Density Overlay – General. The overlay shall present a smooth edge after the machining tests (sawing, nailing, routing, and drilling) and shall not tear, crack, chip or exhibit fuzzy grain.

9. DIMENSIONAL TOLERANCE AND SQUARENESS OF SIDING

9.1. Size

A tolerance of plus 0, minus 1/8 inch (3.18 mm) on specified length and/or width shall be permitted.

9.1.1. Performance Category and Thickness Tolerances

Siding thickness shall be measured with a micrometer having 3/4 in. (19.1 mm) (minus 0, plus 0.050 in. [1.3 mm]) diameter anvils. Measurements shall be taken at an applied anvil pressure of not less than 5 psi (34 kPa) or more than 10 psi (69 kPa). The location of the measurements shall be representative of general siding thickness at approximate mid-length along each edge of the panel and the average of the four measurements shall be taken as the thickness of that siding. If a measurement point contains a permissible grade characteristic that affects siding thickness, the measurement point shall be shifted from that point. The siding thickness shall conform to the provisions for unsanded panels in Table 10 of PS 1.

9.1.2. Squareness and Straightness

Siding shall be square within 1/64 inch per lineal foot (5.21 mm per lineal meter) of panel length, as measured along the diagonals. All siding shall be manufactured so that the maximum distance from the panel edge to a straight line drawn from one corner to the adjacent corner of the siding is within 1/16 inch (1.59 mm).

10. PRODUCT EVALUATION

10.1. Mill Specification

Upon conformance with the requirements specified in this standard, a manufacturing specification unique to the product and mill shall be written based on product evaluation. This specification shall be used for quality assurance purposes by the manufacturer and the qualified agency. Product evaluation will be accomplished on the same lot supplied by the manufacturer for qualification testing. Reference values shall be established during product evaluation or from applicable performance requirements in this standard.

The mill specification shall contain the following information:

a) Siding panel construction – Siding panels shall be defined as to veneer species and construction.

b) Thickness – The panel fractional Performance Category (see Section 9.1.1) and term "Performance Category" or abbreviation (i.e., PERF CAT, CAT or Category) shall be labeled on the panel. In addition, the thickness in 1000ths of an inch within the permitted tolerance for the Performance Category shall be labeled on the panel. Appendix D of PS 1 provides a table of recommended thickness labels. Alternatively, the reference value shall be the average panel thickness less 1.932 standard deviations (the 95 percent lower tolerance limit at 75 percent confidence) for twenty panels tested in accordance with Section 11.9.

c) Bending stiffness – Twenty tests (two specimens taken from each of at least ten siding panels) shall be evaluated for bending stiffness both along and across the major panel strength axis according to the procedures of Section 11.10. The reference value for each panel direction shall be the lower value of a 90 percent confidence interval established on the mean.

d) Bending strength – Ten tests (one specimen taken from each of ten different siding panels) shall be tested for maximum bending moment both along and across the major panel strength axis according to the procedures of Section 11.10. The reference values for each panel direction shall be the minimum observed value, or the sample mean less 1.8 times the sample standard deviation, whichever is the higher value.

e) Linear expansion and thickness swell (this section applies only to hardboard-faced siding) – Tests shall be conducted using specimens taken from twenty siding panels by the procedures of Section 11.11. The reference 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 tested in accordance with Section 11.11.

10.2. Trademarking and Certification

10.2.1. Certification

All siding represented as being in conformance with this standard shall bear the stamp of a qualified agency which (1) either inspects the manufacture (with adequate sampling, testing of bond line, and examination for quality of all veneers) or (2) has tested a random sampling of the finished siding panels in the shipment being certified for conformance with this standard.

10.2.2. Qualified Agency

A qualified 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 the 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.

10.2.3. Siding Panel Marking

All siding represented as conforming to this standard shall be identified with marks giving the following information:

a) *Span Rating* qualified in accordance with this standard.

b) *"Exterior"* – Signifying the gluebond classification. Any further reference to adhesive bond, including those which imply premium performance or special warranty by the manufacturer, as well as manufacturer's proprietary designations, shall be separated from the grademarks or trademarks of the qualified agency by not less than 6 inches (152 mm).

c) The symbol "ANSI/APA PRP 210" signifying conformance with this standard.

d) The trademark-specified thickness, expressed as *"Performance Category"* or a thickness.

10.2.4. Voiding Marks

Siding originally marked as conforming to this standard but subsequently rejected as not conforming thereto shall have any reference to the standard obliterated or voided by the manufacturer.

10.2.5. Moisture Content

Moisture content of siding panels at time of shipment shall not exceed 16 percent of oven-dry weight as determined by Section 11.12.

11. TEST METHODS

11.1. Siding Performance Under Concentrated Static Loads

11.1.1. General

This method covers a procedure for determining the performance of siding products under concentrated static loads, such as a ladder resting against a vertical wall. Residual indentation and deflection, and puncture resistance are measured. Siding panels are subjected to concentrated loads applied through a 1-inch-diameter (25.4-mm-diameter) loading rod.

11.1.2. Equipment

Supports. The framing members shall be supported in order not to deflect under the applied loads. The support conditions shall include all wall framing elements including top and bottom plate.

Loading Device. Any convenient means may be used for applying a compressive load up to ultimate, and for measuring the load within plus or minus 1 percent accuracy.

Loading Rod. A loading rod one inch in diameter is required. The edge of the loading rod contacting the test specimen shall be rounded to a radius not to exceed 0.06 inch (1.52 mm).

Deflection Gages. A deflection gage shall be mounted rigidly to the loading rod. The deflection gage shall have a range exceeding the maximum anticipated deflection, have a maximum error of plus or minus 1 percent, and be graduated to 0.001 inch (0.025 mm).

To measure indentation, a metal sleeve shall be fabricated to fit around the loading rod. The bottom of the sleeve shall be chamfered to create a 1/4-inch-wide bearing ring around the rod. Clearance between the rod and the sleeve shall be approximately 0.0005 inch (0.0127 mm) to prevent the sleeve from tilting, yet allow it to slide freely. The dial gage shall be mounted on the rod with its tip contacting the top of the sleeve.

A second dial gage shall be mounted rigidly beneath the loading rod with its tip contacting the back side of the siding product.

11.1.3. Specimen Preparation

Samples shall be selected that are representative of the product being evaluated. A specimen can usually be made from a single panel, or for lap siding products, assembled from a number of boards to simulate typical installation conditions.

Length. Specimen length parallel to the main framing members shall conform to the intended application.

Width. Specimen width perpendicular to the main framing members shall conform to the center-to-center spacing anticipated in service. Specimen width shall be equal to the minimum number of spans permitted or recommended for the product used in its intended application, multiplied by the center-to-center spacing of the framing members.

Conditioning. Prior to static testing, siding shall be subjected to wetting to simulate typical in-service conditions. Siding products shall be tested under wet conditions.

Wetting. Siding shall be exposed to a continuous water spray for seven days applied to the top surface of the siding at a rate such that this surface is kept continually wet. The siding shall be positioned within 30 degrees of vertical so as to preclude water ponding on it or immersion of any portion.

11.1.4. Test Procedure

The concentrated load shall be applied at mid-length to an outside span. If the siding product is a lap product, the concentrated load shall be applied at mid-width of a single lap located at mid-length of the specimen. The concentrated load shall be applied midway between the framing members if the siding product is not grooved. If the siding product is grooved, the concentrated load shall be applied to a groove nearest to the midpoint between framing members.

Residual *indentation* shall be measured relative to the surface of the siding product, but residual *deflection* shall be measured relative to the framing members. The specimen shall be tested in accordance with the following procedure:

- Record initial measurements at 0 lbf (0 kN).
- Apply the load continuously at a rate of 0.04 ± 0.01 inch/minute (1.02 ± 0.25 mm/minute) to 100 lbf (0.445 kN).
- Remove the load and allow the specimen to recover for one minute ± 5 seconds.
- Residual values at the test location are the difference between the original gage reading at 0 lbf (0 kN) and the second gage reading, taken after the 100-lbf (0.445-kN) proof load.
- Following measurement of residual indentation and deflection, the load shall be reapplied at a rate of 0.2 ± 0.01 inch/minute (5.08 ± 0.25 mm/minute), until maximum load occurs.

11.2. Siding Performance Under Uniform Loads

11.2.1. General

This method covers a procedure for determining the performance of siding products under uniform loads, such as a wind load, against a vertical wall. Strength and residual deflection are measured. Siding panels are subjected to uniform loads through use of atmospheric pressure in a vacuum test frame.

11.2.2. Equipment

Supports. The framing members shall be supported in order not to deflect under the applied loads. The support conditions shall include all wall framing elements, including top and bottom plates.

Vacuum Chamber. An external frame shall be fabricated large enough to enclose the test specimen. The chamber must be strong and rigid to resist the applied load without failure or excessive deformation. The floor and walls of the test chamber must be sealed sufficiently to prevent airflow in and out of the chamber. Following placement of the test specimen within the chamber, a 6-mil polyethylene sheet is laid over the specimen and taped to the frame to obtain an airtight seal. Air is removed from the chamber through use of a vacuum pump. The load is measured with absolute pressure gages for electronic data readout, but manometers or vacuum gages may also be used.

Deflection Gage. The deflection gage shall be mounted on a rigid tripod. The legs of the tripod shall rest on the siding immediately above the framing, adjacent to the span being loaded. The deflection gage shall have a range exceeding the maximum anticipated deflection, have a maximum error of plus or minus 1 percent, and be graduated to 0.001 inch (0.025 mm).

11.2.3. Specimen Preparation

Samples shall be selected that are representative of the product being evaluated. A specimen can usually be made from a single panel, or for lap siding products, assembled from a number of boards to simulate typical installation conditions.

Length. Specimen length parallel to the main framing members shall conform to the intended application.

Width. Specimen width perpendicular to the main framing members shall conform to the center-to-center spacing, S, anticipated in service. Specimen width shall be equal to the minimum number of spans permitted or recommended for the product used in its intended application, multiplied by the center-to-center spacing of the framing members.

Conditioning. Siding products shall be subjected to wetting prior to testing to simulate typical in-service conditions and tested wet.

Wetting. Siding shall be exposed to a continuous water spray for seven days applied to the top surface of the siding at a rate such that this surface is kept continually wet. The siding shall be positioned within 30 degrees of vertical so as to preclude water ponding on it or immersion of any portion.

11.2.4. Test Procedure

The deflection shall be measured at mid-length of each outside span. If the siding product is a lap product, the deflection shall be measured at mid-width of a single lap located at mid-length of the specimen. The deflection shall be measured at the theoretical point of maximum deflection. The point of maximum deflection for a uniformly loaded two-span system occurs at 0.4215 (S) measured from the centerline of the outer support, where S equals the center-to-center support spacing. The point of maximum deflection for a uniformly loaded three-span system occurs at 0.446 (S) measured from the centerline of the outer support, where S equals the center-to-center support spacing.

The specimen shall be tested in accordance with the following procedure:

- Record the initial deflection at 0 psf relative to the framing.
- Apply a continuous load at 25 ± 1 psf/minute (1.20 ± 0.048 kPa/minute) to 50 psf/minute (2.39 kPa/minute) and remove the load.
- Allow the specimen to recover for one minute ± 5 seconds and record the final deflection relative to the framing.
- Calculate the residual deflection as the difference between the initial and final deflections.
- Following the measurement of the residual deflection, reapply the load at a rate of 25 ± 1 psf/minute (1.20 ± 0.048 kPa/minute) until maximum load or the load specified in Table 2 is reached, whichever occurs first.
- When the specimen failure occurs (i.e., when the specimen reaches the maximum load), record the maximum load that causes the failure.

11.3. Siding Performance Under Hard-Body Impact Loads

11.3.1. General

This method covers a procedure for determining the performance of siding products under hard-body impact loads, such as foot kicks, hailstones, or hammer blows to a vertical wall. Residual indentation and puncture resistance are measured. Siding panels are subjected to hard-body impact loads applied through a 2-lbf (8.9-N) steel ball, 2-3/8 inches (60.3 mm) in diameter.

11.3.2. Equipment

Supports. The framing member shall be supported in order not to deflect under the applied loads. The support conditions shall include all wall framing elements, including top and bottom plate.

Impact Ball. The steel ball shall be 2-3/8 inches (60.3 mm) in diameter, and shall weigh 2 lbf (8.9 N).

Loading Device. An apparatus shall be designed suitable for holding and releasing the impact ball from predetermined heights.

Measuring Rod. A measuring rod graduated in 6-inch (152-mm) increments and equipped with a sliding pointer shall be used to measure the drop height of the impact ball.

Deflection Gage. A deflection gage shall be mounted rigidly to a tripod. The legs of the tripod shall rest on the siding immediately above the framing members. The deflection gage shall have a range exceeding the maximum anticipated deflection, have a maximum error of plus or minus 1 percent, and be graduated to 0.001 inch (0.025 mm).

11.3.3. Specimen Preparation

Samples shall be selected that are representative of the product being evaluated. A specimen can usually be made from a single panel, or for lap siding products, assembled from a number of boards to simulate typical installation conditions.

Length. Specimen length parallel to the main framing members shall conform to the intended application.

Width. Specimen width perpendicular to the main framing members shall conform to the center-to-center spacing anticipated in service. Specimen width shall be equal to the minimum number of spans permitted or recommended for the product used in its intended application, multiplied by the center-to-center spacing of the framing members.

Conditioning. Siding products shall be subjected to wetting prior to testing to simulate typical in-service conditions and tested wet.

Wetting. Siding shall be exposed to a continuous water spray for seven days applied to the top surface of the siding at a rate such that this surface is kept continually wet. The siding shall be positioned within 30 degrees of vertical so as to preclude water ponding on it or immersion of any portion.

11.3.4. Test Procedure

The hard-body impact load shall be applied 4 inches (102 mm) either side of mid-length to an outside span. If the siding product is a lap product, the hard-body impact load shall be applied at mid-width of a single lap located at 4 inches (102 mm) either side of mid-length of the specimen. The hard-body impact load shall not be applied to a span which has been previously tested for soft-body impact resistance. The hard-body impact load shall be applied midway between the framing members if the siding product is not grooved. If the siding product is grooved, the hard-body impact load shall be applied to a groove nearest to the midpoint between framing members.

The specimen shall be tested in accordance with the following procedure:

- Take an initial reading at the impact point relative to the framing.
- Drop the ball at the test location on the top surface of the specimen in 6-inch (152-mm) increments.
- After the 24-inch (610-mm) drop, allow the specimen to recover for one minute ± 5 seconds and measure the residual indentation relative to the framing at the load point.
- Calculate the residual indentation as the difference between the initial and final deflections.
- Following the measurement of the residual indentation, continue successive drops from additional 6-inch (152-mm) height increments until a visible fracture occurs at the bottom of the specimen or the load specified in Table 3 is reached, whichever occurs first.
- When the specimen failure occurs (i.e, when visible fracture occurs at the bottom of the specimen), record the height of the drop that causes the failure.

11.4. Siding Performance Under Soft-Body Impact Loads

11.4.1. General

This method covers a procedure for determining the performance of siding products under soft-body impact loads, such as a person running or falling against a vertical wall. Residual indentation and load-carrying capacity are measured. Siding panels are subjected to soft-body impact loads applied through a 30-lbf (0.133-kN) leather shot bag.

11.4.2. Equipment

Supports. The framing members shall be supported in order not to deflect under the applied loads. The support conditions shall include all wall framing elements, including top and bottom plates.

Drop Bag. The drop bag shall be constructed in accordance with ASTM E661.

Measuring Rod. A measuring rod graduated in 6-inch (152-mm) increments and equipped with a sliding pointer shall be used to measure the drop height from the bottom of the bag.

Deflection Gage. A deflection gage shall be mounted rigidly to a tripod. The legs of the tripod shall rest on the siding immediately above the framing members. The deflection gage shall have a range exceeding the maximum anticipated deflection, have a maximum error of plus or minus 1 percent, and be graduated to 0.001 inch (0.025 mm).

11.4.3. Specimen Preparation

Samples shall be selected that are representative of the product being evaluated. A specimen can usually be made from a single panel, or for lap siding products, assembled from a number of boards to simulate typical installation conditions.

Length. Specimen length parallel to the main framing members shall conform to the intended application.

Width. Specimen width perpendicular to the main framing members shall conform to the center-to-center spacing anticipated in service. Specimen width shall be equal to the minimum number of spans permitted or recommended for the product used in its intended application, multiplied by the center-to-center spacing of the framing members.

Conditioning. Siding products shall be subjected to wetting prior to testing to simulate typical in-service conditions and tested wet.

Wetting. Siding shall be exposed to a continuous water spray for seven days applied to the top surface of the siding at a rate such that this surface is kept continually wet. The siding shall be positioned within 30 degrees of vertical so as to preclude water ponding on it or immersion of any portion.

11.4.4. Test Procedure

The soft-body impact load shall be applied at mid-length to an outside span. If the siding product is a lap product, the soft-body impact load shall be applied at mid-width of a single lap located at mid-length of the specimen. The soft-body impact load shall be applied midway between the framing members.

The specimen shall be tested in accordance with the following procedure:

- Take an initial reading at the impact point relative to the framing.
- Drop the shot bag at the test location on the top surface of the specimen in 6-inch (152-mm) increments.
- After the 12-inch (305-mm) drop, allow the specimen to recover for one minute ± 5 seconds and measure the final deflection relative to the framing at the load point.
- Calculate the residual deflection as the difference between the initial and final deflections.
- Following the measurement of the residual deflection, the soft-body impact test shall be continued at 6-inch (152-mm) drop increments until the bag falls through the specimen or the load specified in Table 4 is reached, whichever occurs first.
- When the specimen failure occurs (i.e., when the bag falls through the specimen), record the height of the drop that causes the failure.

11.5. Fastener-Holding Performance

11.5.1. General

Tests are made to measure the resistance of a nail pull-through the siding panel. The procedure develops data that may be compared to other siding panels, but does not produce joint design information. Nail head pull-through loads are measured.

11.5.2. Specimen Preparation

Nail Head Pull-Through Loads. Test specimens shall be of convenient size (at least 3 inches by 6 inches or 76 mm by 152 mm). Nail size and type shall be as required. Nails shall be driven through the siding panel at right angles to the face. Grooved panels shall be nailed through the underlap. Nail penetration shall be such that the nail head lies flush with the panel face. A backing is used to prevent the nail from tearing away the back during driving. All nails shall be driven immediately prior to mechanical testing. Siding specimens shall be tested in the dry (as-received) condition and following seven days of wetting on one side.

Conditioning. Prior to wet testing, the specimen shall be subjected to seven days of wetting on one side as specified in ASTM E661 and tested wet.

11.5.3. Test Procedure

Nail Head Pull-Through Loads. Nail head pull-through tests shall be made on nails driven through the thickness of the siding panel to measure resistance to nail head embedment in a plane normal to the face.

Method of loading shall be in accordance with ASTM D1037 Section 15.5.

The specimen shall be loaded continuously throughout the test by uniform motion of the movable head of the testing machine at a rate of 0.20 inch (5.1 mm) per minute.

11.6. Wall Performance Under Racking Loads

11.6.1. General

The general provisions of Sections 14 and 15 of ASTM E72 for wall racking are followed.

11.6.2. Specimen Preparation

Test specimens are prepared as in ASTM E72. An additional vertical deflection gage is positioned in the lower right corner of the wall (Fig. 7, ASTM E72) to record crushing of the lower plate.

Stud framing is Douglas-fir or southern pine stud grade, with a moisture content of 15 percent or less. Nail size and spacing is as specified in Table 6 of this standard. The specimens shall also be tested in the dry (as received) condition and following the wetting cycle defined in ASTM E72.

11.6.3. Test Procedure

Load shall be applied continuously at a uniform rate. The rate of loading shall be chosen such that the 1-times test load shall be reached in not less than 2 minutes. The loading rate for the subsequent loading cycles shall be the same as the 1-times test load cycle.

Deflection measurements are recorded as the wall is being loaded. At least 10 sets of uniformly spaced deflection readings are taken prior to failure to establish the load-deformation curve. At 1-times and 2-times the test load, as specified in Table 6 of this standard, the load is removed and the wall is allowed to recover for 5 minutes. At 2.5-times the test load, the dial gages are removed and the wall is loaded to failure.

Deflections are reported after removing panel uplift, base slip and crushing components from the total deflection measurement. Ultimate load shall be recorded.

11.7. Buckling Performance Measured On A Large-Scale Wall

11.7.1. General

This large-scale wall procedure evaluates buckling performance of siding when exposed to one-sided wetting.

11.7.2. Specimen Preparation

A lumber frame measuring at least 8 feet (2438 mm) by 12 feet (3658 mm) is constructed using dimension lumber. The frame construction simulates the intended end use of the siding panel, so the support spacing and other construction details will vary.

Siding is applied in the as-received conditions. Panel siding shall be applied to the wall so as to completely cover the framing. For lap siding, the test wall shall be clad with at least six rows of material with at least one butt joint in each row. Siding direction relative to supports, end and edge spacing, nail spacing and all other fabrication details shall be carefully maintained according to the application recommendations for the particular end use of the panels.

11.7.3. Test Procedure

A continuous water spray is then applied to the top surface for 21 consecutive days.

Following wetting, buckling between supports is measured along at least three horizontal profiles. For siding panels, the buckling between studs is measured along horizontal profiles at 2, 4 and 6 feet (610, 1219, 1829 mm) from the top of the wall. Buckling is also measured at any other horizontal location showing maximum distortion. For lap siding, the buckling between studs is measured along at least three horizontal profiles showing maximum distortion.

Buckling between supports is measured as the deviation from a straight line between adjacent supports.

Buckling measurements are made at equally spaced locations along each profile. At least six measurements are taken between each support in each profile. The upper 5 percent exclusion limit is determined on the population.

11.8. Overlay Performance On Engineered Wood Siding

11.8.1. General

This method describes procedures for determining the acceptability of overlays on siding. An overlay must have an adequate bond to the substrate for the expected life of the siding, must resist the effects of weathering (not crumble, craze or crack), must accept and hold a finish, and must be machinable.

11.8.2. Equipment

Pressure vessel: for saturating test specimens with water.

Oven: with forced air circulation.

Metal probe: The probe used shall measure 1/4 inch (6.4 mm) wide at the tip by 0.012 inch (0.305 mm) thick and shall taper in thickness to about 0.025 inch (0.64 mm) at 1/2 inch (12.7 mm) from the tip. The 1/4 inch (6.4 mm) width shall taper to a width of 5/8 inch (15.9 mm) at 1 inch (25.4 mm) from the end. The probe can be any convenient length. The end of the probe is to be squared off and not sharp so that when probing delaminations, fibers across the delaminated area will not be cut.

11.8.3. Specimen Preparation

Test 1 – Multiple Vacuum-Pressure-Dry Specimens: Specimens 6 inches (152 mm) by 6 inches (152 mm) are cut from the siding samples. Test specimens shall have no edge seal or protective coating.

Test 2 – Machining Specimens: Specimens approximately 12 inches (305 mm) by 12 inches (305 mm) or other size convenient for handling in the test are cut from the siding samples.

11.8.4. Test Procedure

Test 1 – Effect of Multiple Vacuum-Pressure-Dry Cycles on Overlay Performance: Subject specimens to three cycles of immersion in cold tap water in a pressure vessel under the following conditions. Draw approximately 25 inches (635 mm) of mercury vacuum and maintain it for 30 minutes. Then immediately apply 65–70 psi (448–483 kPa) of pressure for 30 minutes. Dry specimens for 20 hours at a temperature of 145 ± 5°F (63 ± 2.7°C) in an oven with forced circulation. This is one cycle.

After each cycle, 1) visually inspect the overlay for delamination and cracks, and 2) probe the edges of the overlay for delamination using a thin metal probe.

Test 2 – Effect of Machining on Overlay Performance: Subject each overlay specimen to all machining tests or use additional specimens as required. Follow good shop practice and use tools in good condition. After each operation, visually inspect the overlay for its ability to machine satisfactorily and mechanically probe the overlay for loss of cohesion or adhesion.

1. ***Sawing:*** Cut through the overlay with a table saw. Use a carbide-tipped general-purpose blade or suitable alternative in good condition.
2. ***Nailing:*** Drive nails of the size recommended by the manufacturer through the overlay. Back the specimens solidly during nailing.
3. ***Drilling:*** Power drill with a 1/4-inch-diameter (6.4-mm-diameter) machine bit through the overlay. Back the specimens solidly during the drilling.
4. ***Routing:*** Power rout a 1/2-inch-wide (12.7-mm-wide) groove through the overlay.

11.9. Siding Thickness

11.9.1. General

This method defines the procedure for determining siding thickness.

11.9.2. Specimen Preparation

The readings are taken on an as-received siding panel.

11.9.3. Test Procedure

For each siding panel, one thickness reading is taken mid-width on each siding edge such that the anvil does not touch the extreme edge. Measurements will be taken to the nearest ± 0.001 inch (0.025 mm) using a micrometer with 0.75 (0, +0.050)-inch-diameter or 19 (–0, +1.3)-mm-diameter anvils. The micrometer will apply a pressure of not less than 5 psi (34.5 kPa) or more than 10 psi (68.9 kPa) during measurement. The siding thickness shall be the average of four readings.

11.10. Large Siding Panel Bending

11.10.1. General

This test procedure provides basic data regarding full-size siding panel bending strength and stiffness. The general provisions of ASTM D3043 Method C are followed.

11.10.2. Specimen Preparation

Specimens are prepared according to ASTM D3043 Method C, except specimen size shall be 4 x 4-foot (1219 x 1219-mm) half-panels.

11.10.3. Test Procedure

The procedures of ASTM D3043 Method C are followed except specimens are tested for stiffness both along and across the major panel strength axes, and maximum bending moment is taken as required.

11.11. Linear Expansion and Thickness Swell

11.11.1. General

This test method provides a quick evaluation of a panel's dimensional stability (linear expansion and thickness swell) measured from oven-dry to vacuum-pressure soak.

11.11.2. Specimen Preparation

Test specimens are cut at least 3 inches (76 mm) wide by at least 12 inches (305 mm) long.

Specimens shall be selected to avoid large characteristics such as knotholes, knots, or splits in the outer veneers (when veneers are present), especially near the eyelet locations. Otherwise, normal grade features are included as they occur.

Fixed reference points which serve as measuring points on the centerline of each specimen are located 1 inch in from each end. Brass eyelets placed in pre-bored holes have been found to be suitable reference points. Use of the reference measuring points permits determination of linear expansion independent of any additional swelling that might take place at the exposed panel edge.

When thickness swell is a requirement, points shall be marked on the edges of each specimen for thickness swell evaluation. Thickness is measured according to Section 11.9, except as modified below.

11.11.3. Test Procedure

Specimens are oven dried at 217 ± 4°F (103 ± 2°C) for 24 hours or until constant weight is attained. Constant weight is assumed when two consecutive readings taken at least two hours apart agree within 0.2 percent.

After drying, each specimen is allowed to cool to approximately room temperature. The specimen is then placed in a flattening jig to remove any out-of-plane distortions, and the distance between gage points measured to the nearest 0.001 inch (0.025 mm) with a bar-type trammel equipped with a dial gage.

When thickness swell is a requirement, at least two thickness measurements are made with a ratchet type micrometer to the nearest 0.001 inch (0.025 mm) with the anvil edge flush with the specimen edge. The micrometer shall be as described in Section 11.9.

Following the pre-conditioned measurements, specimens are placed in a pressure cylinder, flooded with 65 ± 10°F (18 ± 5.6°C) tap water and subjected to a vacuum of 27 ± 2 inches (686 ± 51 mm) of mercury for one hour (time does not begin until full vacuum is achieved). Specimens are then subjected to two hours of pressure not to exceed 100 pounds per square inch (689 kPa). After wet exposure, specimens are removed from the cylinder and remeasured for length and thickness.

Expansion values are calculated as a percentage of the original pre-conditioned dimension, as given in the equation below:

$$\text{Percent change} = \frac{L_w - L_{pc}}{L_{pc}} \times 100 \qquad [1]$$

where: L_w = dimension saturated
L_{pc} = dimension pre-conditioned

The pre-conditioning procedure shall be documented in the test report.

11.12. Panel Moisture Content

11.12.1. General

This test procedure defines the method of determining panel moisture content by the oven-dry method according to the principles of ASTM D4442, Method B.

11.12.2. Specimen Preparation

From each siding panel, cut a specimen at least 2 inches from any edge using a 3-inch (76-mm) hole saw. Alternatively, a 3-inch (76-mm) by 3-inch (76-mm) square specimen shall be permitted for use if it is more convenient for the moisture content specimen preparation.

11.12.3. Test Procedure

The specimen weight is obtained (± 0.2 percent) and placed in a drying oven at 217 ± 4°F (103 ± 2°C) until constant weight is achieved. Constant weight is assumed when two consecutive readings taken at least two hours apart agree within 0.2 percent.

The moisture content is calculated as:

$$M = \frac{W_w - W_d}{W_d} \times 100 \qquad [2]$$

where: M = Moisture content (percent)
W_w = Initial weight (pounds, grams or similar units)
W_d = Oven-dry weight (pounds, grams or similar units)

APPENDIX A (NON-MANDATORY)

A1. History of Standard

In April 2008, the APA Standards Committee on Standard for Performance-Rated Engineered Wood Siding was formed to develop a national standard under the consensus processes accredited by the American National Standards Institute (ANSI). This national consensus standard, designated as ANSI/APA PRP 210-2008, is developed based on the *Manufacturing and Performance Standard for APA Rated Siding Panels*, as documented in the *Performance Standards and Qualification Policy for Structural-Use Panels*, APA PRP 108, which has been in use by the wood structural panel industry in North America since April 1980.

In 2013 through 2014, the ANSI/APA PRP 210-2008 was reviewed, revised, and approved by the Committee, and published as ANSI/APA PRR 210-2014.

The names of the ANSI/APA PRP 210 Committee members when the standard is published are as follows. The current list of the committee membership is available from the committee secretariat upon request.

NAME	AFFILIATION	
Mark Aucoin	Momentive Specialty Chemicals	
Christie Cordova	GP Wood Products LLC	Chair
Gary Ehrlich	National Association of Home Builders	
Ken Lau	Ainsworth Lumber Company	
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Tracy Naylor	Roseburg Forest Products Company	
Rick Nelson	Plum Creek Timber Company	
Lance Olson	Louisiana-Pacific Corporation	
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Mike Rudy	Swanson Group, Inc.	
Kurt Stochlia	ICC Evaluation Service, Inc.	
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Steve Verhey	TECO	Vice Chair
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A2. Commentary

A2.1. As specified in Section 6, all structural performance tests prescribed in Sections 6.1 through 6.4 should be conducted only when the specimens are wet even though the criteria are based on dry (as-received) conditions. It is the judgment of the committee that the structural performance of siding panels in wet conditions is more critical than that in dry conditions.

A2.2. Thickness swell of siding panels qualified in accordance with this standard should be evaluated only when the siding panel contains hardboard face, as specified in Section 10.1.(e), as it has been well-documented that the thickness swell of all-veneer panels is not a performance issue in most construction applications. Note that the hardboard face should meet the requirements of Class 1 of ANSI/AHA A135.4 in accordance with Section 5.2.

ANSI/APA PRP 210-2014
Standard for Performance-Rated Engineered Wood Siding

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