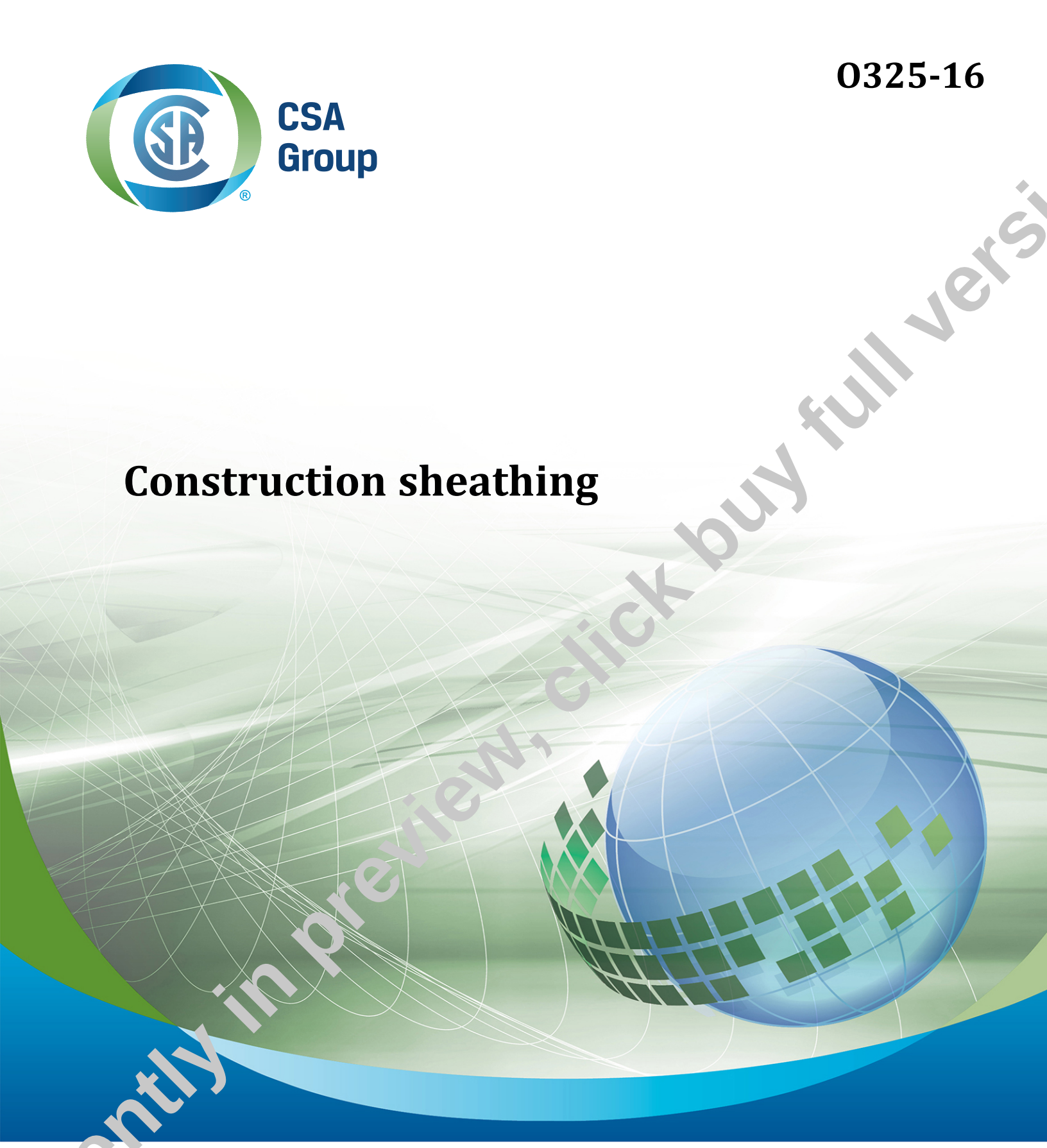
O325-16

Construction sheathing



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O325-16
Construction sheathing

CSA Preface

This is the second edition of CSA O325, *Construction sheathing*, which is an adoption, with Canadian deviations, of the NIST (National Institute of Standards and Technology) Voluntary Product Standard PS 2-10, *Performance Standard for Wood-Based Structural-Use Panels* (June 2011). It supersedes the previous edition published in 2007 as CSA O325 (adopted NIST PS 2-04).

The CSA Technical Committee on Wood-Based Panel Products believes that this adoption provides a suitable standard for Canadian manufacturers, engineers, building officials, and consumers. This CSA Group Standard provides requirements for Canadian applications in its Canadian deviations. In addition, by adopting NIST PS 2, with clearly identified Canadian deviations, the Committee has moved to eliminate market confusion regarding a number of subtle differences between the documents.

This Standard is a performance-based Standard. It was prepared to provide an alternative means of specifying wood-based panel products for selected applications in wood-frame construction. Rather than prescribing panel makeup, this Standard establishes the minimum physical, bond durability, and structural performance criteria appropriate for floor, wall, and roof sheathing in light frame construction. Minimum load-carrying capacity and maximum deflection levels at specified loads are established at standard framing member spacings of 400, 500, and 600 mm (16, 20, and 24 in), and for some applications at spacings of 800, 1000, and 1200 mm (32, 40, and 48 in). The marking system used in this Standard identifies the recommended use of products and the maximum framing member spacing at standard loads. The span mark corresponds to the recommended maximum spacing expressed in inches.

Technical differences between this Standard and NIST PS 2 are clearly listed as Canadian deviations. Unless otherwise specified in the Canadian deviations, the requirements of NIST PS 2 apply. In the opinion of the Technical Committee, these differences reflect considerations necessary to satisfy building code assumptions and do not represent discrepancies in required characteristics.

This Standard does not include engineering design values for construction sheathing, nor does it suggest methods for calculating such values. For information about design values for construction sheathing, consult CSA O86, *Engineering design in wood*.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was reviewed for Canadian adoption by the CSA Technical Committee on Wood-Based Panels, under the jurisdiction of the CSA Strategic Steering Committee on Construction and Civil Infrastructure, and has been formally approved by the Technical Committee.

Inquiries regarding this CSA Group Standard should be addressed to
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This Standard is subject to review five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line:

a) Standard designation (number);
b) relevant clause, table, and/or figure number;
c) wording of the proposed change; and
d) rationale for the change.

Canadian deviations

Note: *The scope and requirements of this Standard are fully described in NIST PS 2, except as provided in these Canadian deviations, which add to, replace, or delete provisions in NIST PS 2. The nature of the deviation is indicated in brackets below the referenced clause number. Whereas CSA Group divides its Standards into "clauses", NIST PS 2 uses the term "section". The term "section" is accordingly used in these Canadian deviations. Added sections and tables are designated by adding the letter A, B, C, etc., to the applicable NIST PS 2 section or table number and follow the applicable NIST PS 2 section or table (e.g., Section 2.1A follows Section 2.1 but precedes Section 2.2). Added text other than entire sections and tables follows the last sentence in the referenced section.*

1 Scope

[Add the following section]

1.1A

This Standard provides an alternative to, not a replacement of, other Standards for wood-based panels. The use of the term "construction sheathing" in this Standard is not intended to imply that panels conforming to other CSA Group Standards (e.g., CSA O121, CSA O151, CSA O153, and CSA O437 Series) are not construction sheathing panels.

2 Terminology

[Add the following sections]

2.1A Certification body

A third-party organization that provides a written assurance that a service, process, or product fulfills a specified requirement.

2.11A Qualified inspection and testing agency

An organization that meets the following definitions.

2.11A.1 Qualified inspection agency

A certification body recognized in accordance with ISO/IEC 17065.

2.11A.2 Qualified testing agency

A testing agency recognized in accordance with ISO/IEC 17025 within the scope of the referenced test methods within this Standard.

3 Reference publications

3.2 Other documents

[Add the following]

ISO/IEC (International Organization for Standardization/International Electrotechnical Commission)
17025:2005
General requirements for the competence of testing and calibration laboratories

17065:2012
Conformity assessment — Requirements for bodies certifying products, processes and services

NRCC (National Research Council Canada)
National Building Code of Canada, 2015

[Add the following section]

3.2A CSA Group Standards

Where reference is made to CSA Group publications, such reference shall be considered to refer to the latest edition and all amendments published to that edition. This Standard refers to the following publications, and the years shown indicate the latest editions available at the time of printing:

O86-14
Engineering design in wood

O121-08 (R2013)
Douglas fir plywood

O151-09 (R2014)
Canadian softwood plywood

O153-13
Poplar plywood

O437 Series-93 (withdrawn)
Standards on OSB and waferboard:

O437.0-93 (withdrawn)
OSB and waferboard

O437.1-93 (withdrawn)
Test methods for OSB and waferboard

O437.2-93 (withdrawn)
Evaluation of binder systems for OSB and waferboard

4 Classification

4.1.1.2 Exposure 1

[Add the following]

Panels classified as Exposure 1 [see Section 6.2.4.1(d)] are intended to satisfy the requirements for "Exterior Type" as specified in 9.3.2.4.1 c) of the *National Building Code of Canada*.

Note 1A: *Alternative criteria for panels of Exterior Type quality may be found in CSA O121, CSA O151, CSA O153, and CSA O437.0.*

5 Requirements

5.2 General requirements

5.2.2.1 Veneer

[Replace this section with the following]

5.2.2.1.1 Veneer quality

Except as permitted by Section 5.2.2.1.2, the veneer in plywood panels shall not contain any characteristic exceeding the following size limitations:

a) for solid characteristics such as knots: 50 mm (2 in) in maximum dimension measured across the grain;
b) for open characteristics such as knots or other holes: 40 mm (1-5/8 in) in maximum dimension measured across the grain;
c) for open characteristics such as splits, gaps, or wane: maximum dimension measured across the grain as follows:
   i) 40 mm (1-5/8 in) if less than 400 mm (16 in) long;
   ii) 30 mm (1-1/8 in) if less than 800 mm (32 in) long; and
   iii) 25 mm (1 in) if 800 mm (32 in) or more long;
d) for narrow or short face or back plies: 4 mm on one edge or one end by half the panel length or width, as appropriate; and
e) for narrow or short inner plies adjacent to face or back plies: 4 × 200 mm (3/16 × 8 in).

5.2.2.1.2 Permitted variations in veneer quality

Provided that plywood panels meet the requirements for bond durability and resistance to concentrated static and impact loads specified in Section 5, the following characteristics shall be permitted:

a) for solid characteristics such as knots: larger than 50 mm (2 in) but not exceeding 76 mm (3 in) in maximum dimension measured across the grain; and
b) for open characteristics such as knot, wane, or other holes: larger than 40 mm (1-5/8 in) but not exceeding 76 mm (3 in) in maximum dimension measured across the grain.

Plywood panels exhibiting characteristics within these limits shall not be rated with the Exterior bond classification.

[Add the following section]

5.2.3A Binders

Agents used for binding wood materials shall meet the requirements specified in Section 5.3.4 and shall provide equivalent or better resistance to chemicals (acid and alkali), temperature, and creep than thermosetting phenolic resin or isocyanate binder.

Notes:

1) *Binding systems for* OSB *and waferboard may be evaluated in accordance with CSA O437.2.*

2) *Health and environmental aspects should be taken into account in the selection of additives or alternative binders.*

5.3 Performance requirements

[Add the following paragraphs]

Plywood certified to CSA O121, CSA O151, or CSA O153 may be considered to have satisfied the performance requirements of Section 5.3, provided that performance is evaluated for concentrated loads and uniform loads in accordance with Sections 5.3.1.1 and 5.3.1.2, respectively.

Plywood certified to CSA O121, CSA O151, or CSA O153 shall be considered to satisfy, at a minimum, the bond performance requirements for Exposure 1 specified in Sections 5.3.3.1(b) and 5.3.3.2.

5.3.1.2 Uniform loads

[Add the following paragraph]

Sheathing panels with a Wall-16 rating shall have an average deflection of no greater than 6.8 mm at 1.20 kPa (0.267 in at 25 lbf/ft^2). Sheathing panels with a Wall-24 rating shall have an average deflection of no greater than 10.2 mm at 1.20 kPa (0.400 in at 25 lbf/ft^2). For Wall-16 and Wall-24, the panel strength axis shall be placed along the supports for testing, unless otherwise specified.

5.3.2.1 Dimensional stability

[Add the following paragraph]

Single floor [1F; see Table 8A(b)] panels tested according to the test procedure in Section 5.3.2.1(a) shall also be tested for thickness swell according to the method defined in Appendix GA of the Canadian deviations. Twenty test specimens taken from ten panels shall be evaluated. The thickness swell (24 h soak) shall not exceed 20% (average value for ten panels).

6 Qualification testing and mill specification

6.3 Mill specification

[Replace the last sentence in the second paragraph with the following]

These values or characteristics shall be used by mills and certification bodies (see Section 2.1A in the Canadian deviations) in conjunction with their quality assurance procedures and policies.

[Add the following section]

6.3.1.1A Plywood certified to CSA O121, CSA O151, or CSA O153

Plywood certified to CSA O121, CSA O151, or CSA O153 shall be evaluated only in accordance with Sections 6.3.2.1 and 6.3.3.1.

8 Trademarking and certification

[Replace Section 8 with the following]

8 Quality system and panel marking

8.1 Quality system

Construction sheathing panels shall be manufactured under a quality system that includes

a) in-plant production and quality control procedures; and
b) auditing of the in-plant procedures by a recognized inspection agency (see Section 2.11.1A).

Note: *CSA O86 stipulates that certification organizations (herein referred to as "recognized third party agencies") must ensure that reference values for bending strength and bending stiffness for Construction Sheathing OSB certified to this Standard are also consistent with the design values of CSA O86.*

8.2 Panel marking

8.2.1 General

All sheathing panels represented as complying with this Standard shall be identified with the marks specified in Sections 8.2.2 and 8.2.3 and in the manner specified in Sections 8.2.4 to 8.2.7.

Panel marks shown in Table 8A indicating compliance to this Standard shall be considered equivalent to the span ratings required by NIST PS 2. Their relationship is shown in Table 8B.

8.2.2 Required marks

All panels shall be marked with the following:

a) name or logo of the manufacturer;
b) mill identification number;
c) name or logo of the mill's certification body (if applicable);
d) date of manufacture or other mark from which the date of manufacture can be identified by the manufacturer on request;
e) designation "CSA O325";

   Note: *This designation is not intended to indicate that CSA Group has participated in the inspection and testing of the marked product.*
f) applicable bond classification;
g) applicable panel marks, as shown in Table 8A; and
h) nominal thickness in millimetres (see Table 8C for typical metric and imperial thicknesses).

8.2.3 Aligned face furnish

Mat-formed panels produced with aligned face furnish shall be marked to show the direction of face alignment in such a manner that the marking remains visible when the board is cut in the cross direction.

8.2.4 Location of marks

Marks required by Sections 8.2.2 and 8.2.3 shall be applied to either side of the panel.

8.2.5 Duplicate marks

Panels may be marked for more than one end use and span rating provided they satisfy the requirements of all end uses and span ratings marked.

8.2.6 Durability of marks

All panel marks specified in Section 8.2 shall not be rendered illegible by exposure to heat, light, moisture, or abrasion during normal handling and use. If a mark is on a label, the bond of the label to the board shall be resistant to removal in one piece by heat, moisture, or other nondestructive means.

8.2.7 Voiding of marks

Panels originally marked as conforming to this Standard but subsequently rejected for noncompliance shall have their original markings obliterated or be surface marked "REJECT — ALL OTHER MARKS VOID" or Shop panels (see definition of shop-cutting panel) shall be marked "Shop-cutting panel – all other [agency] marks void". This marking shall be placed next to, and be no less prominent than, the original marking.

[Add the following tables]

Table 8A
Panel marks for construction sheathing products
(See Sections 5.3.2.1, 8.2.1, and 8.2.2.)

(a) Panel marks

	Span marks					
	16	20	24	32	40	48
	Recommended framing member spacing, mm (in)					
End use mark	400 (16)	500 (20)	600 (24)	800 (32)	1000 (40)	1200 (48)
1F	1F16	1F20	1F24	1F32	*	1F48
2F	2F16	2F20	2F24	*	*	*
1R	1R16	1R20	1R24	1R32	1R40	1R48
2R	2R16	2R20	2R24	2R32	2R40	2R48
W	W16	W20	W24	*	*	*

* *Not covered by this Standard.*

Notes:

1) *Panel marks consist of an end use mark [see Table 8A(b)] followed by the appropriate span mark [see Table 8A(c)], e.g., 2F24 or W16.*

2) *Multiple panel marks may be used on panels qualified for more than one end use and span, e.g., 1R24/2F16, 2R48/2F24/1F24, or 2R32/1R24/2F16.*

(b) End use marks

End use mark	Assumed end use
1F	Single-layer flooring (combination subfloor/underlayment)
2F	Subflooring used with panel-type underlayment
1R	Roof sheathing used without edge support
2R	Roof sheathing used with edge support
W	Wall sheathing

(c) Span marks

Span mark	Support spacing (span), mm (in)
16	406.4 (16)
20	508.0 (20)
24	609.6 (24)
32	812.8 (32)
40	1016.0 (40)
48	1219.2 (48)

Note: *The span is the centre-to-centre spacing of supports based on assumed end use and framing member spacings normally found in light wood-frame construction. Where the spacing of framing members is greater than* 610 mm *(24 in), the framing member itself shall be designed for the expected loads using recognized engineering design procedures.*

Table 8B
Relationship between the panel marks in this Standard and the span rating systems used in NIST PS 2 and US commerce
(See Section 8.2.1.)

End use	Panel mark (CSA O325)	End-use Span rating (NIST PS 2)	Span rating index (NIST PS 2)*
Roof sheathing	1R16	Roof-16	16/0†
	1R20	Roof-20	20/0†
	2R24	Roof-24	24/0
	1R24	Roof-24	24/16
	2R32	Roof-32	32/16
	1R32	Roof-32	40/20†
	2R40	Roof-40	40/20
	1R40	Roof-40	48/32†
	2R48	Roof-48	48/24
	1R48	Roof-48	54/48†
	2R60 (not covered)	Roof-60	60/32†
Subflooring used with panel-type underlayment	2F16	Subfloor-16	32/16
	2F20	Subfloor-20	40/20
	2F24	Subfloor-24	48/24
	2F32 (not covered)	Subfloor-32	60/32†
	2F48 (not covered)	Subfloor-48	60/48†
Single-layer flooring (combination subfloor/ underlayment)	1F16	Single Floor-16	16 oc
	1F20	Single Floor-20	20 oc
	1F24	Single Floor-24	24 oc
	1F32	Single Floor-32	32 oc
	1F48	Single Floor-48	48 oc
Wall sheathing	W16	Wall-16	Wall-16 or 16/0
	W24	Wall-24	Wall-24, 24/0, or 24/16

* *The NIST PS 2 span rating system commonly used in US commerce is also indicated for reference. When a span rating designates both a roof and subfloor, the product shall be qualified both for the roof and subfloor requirements. PS 2 span rating marks may be shown in addition to the CSA O325 marks.*
† *Not typically produced.*

Table 8C
Relationship between panel mark and nominal thickness
(See Section 8.2.2.)

	Nominal thickness, mm (in)											
Panel mark (PS 2 span rating)	**7.5 (5/16)**	**9.5 (3/8)**	**11 (7/16)**	**12 (15/32)**	**12.5 (1/2)**	**15 (19/32)**	**15.5 (5/8)**	**18 (23/32)**	**18.5 (3/4)**	**22 (7/8)**	**25 (1)**	**28.5 (1-1/8)**
1R20 (Roof- 20)	P											
2R24 (24/0)		P	A	A	A							
1R24/2F16 (24/16)			P	A	A							
2R32/2F16 (32/16)				P	A	A	A					
2R40/2F20 (40/20)						P	A	A	A			
2R48/2F24 (48/24)								P	A	A		
1F16 (16 oc)						P	A					
1F20 (20 oc)						P	A					
1F24 (24 oc)								P	A			
1F32 (32 oc)										P	A	
1F48 (48 oc)												P

Legend:

P = the predominant nominal thickness for each panel mark

A = alternative thicknesses that may be available for each panel mark

Notes:

1) *Panel mark is known as span rating in NIST PS 2. Nominal thickness is referred to as Performance Category in NIST PS 2.*

2) *Typical metric thicknesses and their relationship to panel marks and equivalent imperial thicknesses are shown in this Table.*

3) *PS 2 span rating may be shown as additional span rating on panel meeting the requirements of CSA O325.*

4) *Panels marked as 2R32, 2R40, and 2R48 also satisfy the requirements of 1R24.*

9 Effective date and identification

[Delete this section]

10 Standing committee

[Delete this section]

[Add the following appendix]

Appendix GA (normative)
Thickness swell (24 h soak)

Notes:
1) *This appendix is a mandatory part of this Standard.*
2) *This test method is excerpted from Clause 5.3.4 of CSA O437.1.*

GA.1 Specimens

Test specimens shall conform to the following:

a) number = two per test panel; and
b) size = 150 × 150 mm. The thickness shall be measured to an accuracy of 0.05 mm at four points midway along each side 25 mm in from the edge of the specimen.

GA.2 Test

The measured specimens shall be conditioned in accordance with Clause 3.1.6 of CSA O437.1. Excess surface water shall be removed and the thickness remeasured at the four designated points on each specimen.

GA.3 Calculations and report

The thickness swell of the panel shall be calculated to the nearest 1% in accordance with the following formula:

$$T.S._{(24)} = \frac{t_{(24)} - t_{(o)}}{t_{(o)}} \times 100$$

where

$T.S._{(24)}$ = the thickness swell after 24 h soak (in per cent)

$t_{(24)}$ = the sum of the eight thickness measurements after the 24 h soak (in millimetres)

$t_{(o)}$ = the sum of the eight original thickness measurements (in millimetres)

Alternatively, thickness swell shall be calculated for each specimen, and averaged to the nearest 1% for the panel.

In both cases, the calculated value shall be reported as the thickness swell (24 h soak) of the panel.

CSA Technical Committee on Wood-Based Panels

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Voluntary Product Standard PS 2-10

Performance Standard for Wood-Based Structural-Use Panels

June 2011

U.S. Department of Commerce
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Abstract

This standard covers performance requirements, adhesive bond performance, panel construction and workmanship, dimensions and tolerances, marking, and moisture content of structural-use panels. Structural-use panels include structural plywood, oriented strand board (OSB), other mat-formed panels and composite panels. The standard classifies panels by bond classification, span rating, performance category and grade. It provides test methods, a glossary of trade terms and definitions, and a quality certification program whereby agencies inspect, sample, and test products for conformance to this standard. Information regarding industry practices for reinspection, a qualification flowchart, history of the standard, labeling and environmental attributes are provided in nonmandatory appendices.

Keywords

Adhesive bond classification; certification; construction sheathing; structural-use panel; dimensions and tolerances; marking; moisture content; oriented strand board; OSB; panel construction; performance requirements; span rating; mat-formed panel; performance category; structural plywood; test methods; voluntary standard; waferboard; wood-based panels.

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VOLUNTARY PRODUCT STANDARD PS 2-10

PERFORMANCE STANDARD FOR WOOD-BASED STRUCTURAL-USE PANELS

Effective June 1, 2011

(This standard, initiated by *APA – The Engineered Wood Association,* has been developed under the Procedures for the Development of Voluntary Product Standards for the U.S. Department of Commerce.)

1 SCOPE

1.1 This Voluntary Product Standard primarily establishes structural criteria for assessing the acceptability of wood-based structural-use panels for construction sheathing and single-floor applications and provides a basis for common understanding among the producers, distributors, and the users of these products. The standard does not address non-structural issues such as resistance to biological agents. Applications other than construction sheathing and single-floor sheathing may require additional engineering considerations that are not covered by this document.

1.2 This Standard covers the performance requirements, adhesive bond performance, panel construction and workmanship, dimensions and tolerances, marking and moisture content of structural-use panels.

1.3 This Standard includes test methods to determine compliance and a glossary of trade terms and definitions. A quality certification program is provided whereby qualified testing agencies inspect, sample, and test products for qualification under this Standard. Information regarding industry practices for reinspection is provided in Appendix A. A flowchart depicting the qualification process is provided in Appendix B. Information on the maintenance, history, and current edition of the Standard is provided in Appendix C. Recommended thickness labeling is provided in Appendix D. Information on labeling regulations from NIST Handbook 130 is provided in Appendix E. Information on environmental attributes of structural panels are provided in Appendix F and information on formaldehyde emissions is provided in Appendix G.

1.4 This Standard incorporates the International System of Units (SI) as well as customary units of measurement. The values given in SI units are the standard. The values given in parentheses are for information only. In conversion of customary units where exact placement is not an issue, such as nail spacing, approximate conversions to SI units are made to yield more easily recognizable numbers. In critical matters, such as panel thickness, exact conversions to SI units are made. For nominal customary units, actual dimensions in SI units are given.

1.5 Advisory notes in this Standard shall not be considered mandatory.

2 TERMINOLOGY

2.1 Composite panel

Any panel containing a combination of veneer and other wood-based material.

2.2 Delamination

For plywood or composite panels, delamination is a visible separation between plies or layers that normally receive adhesive at their interface and are firmly contacted in the pressing operation. Wood characteristics, such as checking, leafing, splitting and broken grain, are not to be construed as delamination.

2.3 Furnish

Wood-based material, such as flakes or strands, including applied resin, wax and other additives, as the primary constituent of mat-formed panels.