APA

Oriented Strand Board

PRODUCT GUIDE




Wood: The Natural Choice

Engineered wood products are among the most beautiful and environmentally friendly building materials. In manufacture, they are produced efficiently from a renewable resource. In construction, the fact that engineered wood products are available in a wide variety of sizes and dimensions means there is less jobsite waste and lower disposal costs. In completed buildings, engineered wood products are carbon storehouses that deliver decades of strong, dependable structural performance. Plus, wood's natural properties, combined with highly efficient wood-frame construction systems, make it a top choice in energy conservation.

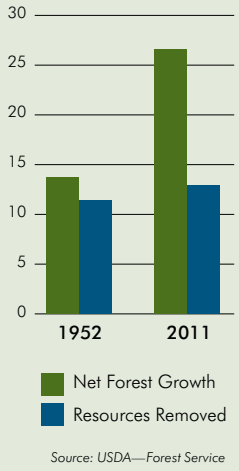
A few facts about wood:

We're growing more wood every day. For the past 100 years, the amount of forestland in the United States has remained stable at a level of about 751 million acres.[1] Forests and wooded lands cover over 40 percent of North America's land mass.[2] Net growth of forests has exceeded net removal since 1952[3]; in 2011, net forest growth was measured at double the amount of resources removed.[4] American landowners plant more than two-and-a-half billion new trees every year.[5] In addition, millions of trees seed naturally.

Manufacturing wood is energy efficient. Over 50 percent of the energy consumed in manufacturing wood products comes from bioenergy such as tree bark, sawdust, and other harvesting by-products.[6] Very little of the energy used to manufacture engineered wood comes from fossil fuels. Plus, modern methods allow manufacturers to get more out of each log, ensuring that very little of the forest resource is wasted.

U.S. Forest Growth and All Forest Product Removals

Billions of cubic feet/year



Source: USDA—Forest Service

Life Cycle Assessment measures the long-term green value of wood. Studies by CORRIM (Consortium for Research on Renewable Industrial Materials) give scientific validation to the strength of wood as a green building product. In examining building products' life cycles—from extraction of the raw material to demolition of the building at the end of its long lifespan—CORRIM found that wood had a more positive impact on the environment than steel or concrete in terms of embodied energy, global warming potential, air emissions, water emissions and solid waste production. For the complete details of the report, visit www.CORRIM.org.

Wood adds environmental value throughout the life of a structure. When the goal is energy-efficient construction, wood's low thermal conductivity makes it a superior material. As an insulator, wood is six times more efficient than an equivalent thickness of brick, 105 times more efficient than concrete, and 400 times more efficient than steel.[7]

Good news for a healthy planet. For every ton of wood grown, a young forest produces 1.07 tons of oxygen and absorbs 1.47 tons of carbon dioxide.

Wood is the natural choice for the environment, for design, and for strong, resilient construction.

1. United States Department of Agriculture, U.S. Forest Service, FS-979, June 2011; 2. FAO, UN-ECE (1996) North American Timber Trends Study. ECE/TIM/SP/9. Geneva; Smith et al. (1994), Forest Statistics of the United States, 1992. Gen. Tech. Rep. NC-168; 3. United States Department of Agriculture, U.S. Forest Service; FS-801 Revised September 2009; 4. U.S. Department of Agriculture, U.S. Forest Service, August 2014; 5. Forest Landowners Association, 2011; 6. U.S. Environmental Protection Agency, March 2007; 7. Produced for the Commonwealth of Australia by the Institute for Sustainable Futures, University of Technology, Sydney, 2010.

CONTENTS

Engineered to Perform

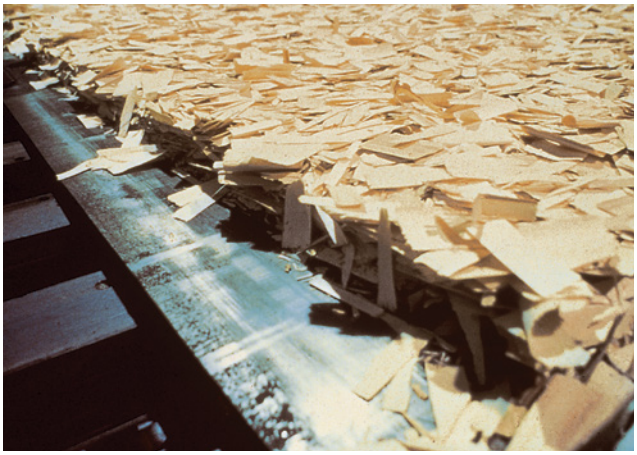
From squeak-free floors to solid wall and roof sheathing, oriented strand board (OSB) is shaping how the world builds. OSB is engineered for strength and designed for a variety of applications. OSB is a proven performer for many residential and nonresidential applications. Its high performance capabilities make OSB ideal for diverse markets, including materials-handling applications, the structural insulated panel industry, do-it-yourself projects, wood I-joist products, and industrial applications such as furniture and trailer liners.

This Product Guide from APA describes OSB's features, uses, quality assurance, and performance. APA began providing a quality assurance program for OSB in 1981 and has led the engineered wood industry in OSB research and quality programs ever since. The APA trademark is the manufacturer's assurance to you that the OSB panel is produced to APA's stringent requirements as well as to U.S. and Canadian standard requirements. The APA trademark also assures you that an OSB manufacturer is committed to quality.

PRODUCT FEATURES

OSB is made from real wood

OSB is manufactured in a cross-oriented pattern similar to plywood to create a strong, stiff structural panel. OSB is composed of thin rectangular-shaped wood strands arranged in layers at right angles to one another, which are laid up into mats that form a panel. OSB is bonded with water-resistant adhesives. Most panels are also treated with a sealant on the panel edges to guard against moisture penetration during shipment. As an added feature, panels are often textured on at least one side to provide a slip-resistant surface.



OSB uses the wood resource very efficiently, in part because sheathing panels can be made using smaller, younger fast-growing tree species, such as aspen and southern yellow pine. Plus, about 85–90 percent of a log can be used to make high quality structural panels, and the remainder—bark, saw trim, and sawdust—can be converted into energy, pulp chips or bark dust.

OSB manufacture

In the first phase of OSB manufacture, logs are debarked and cut to a uniform length. The logs are then turned into strands. The strands are dried with heat in a large rotating drum which is screened to grade for strands that are the correct size. Liquid or powder adhesive is applied to the dried strands and then transported in layers on a conveyer system to a forming line, where the layers are cross-oriented into mats. Face layer strands generally run along the panel, while core layer strands are randomly oriented or run across the panel. The mats are trimmed to a workable size and then moved to a press where the wood strands and adhesive are bonded together under heat and pressure to create a structural panel. Finally, the panels are cut to size. Panels can be manufactured in many sizes simply by altering the cutting pattern.

OSB is engineered to perform

Nearly four decades of laboratory tests and use in the field have proven that OSB is an excellent performer. Performance begins when the panel leaves the manufacturer. The panels remain flat and square during storage and transportation, so they arrive at the jobsite flat and easy to install; tongue-and-groove panels effortlessly fit together. Relative to their strength, OSB panels are light in weight and easy to handle and install. Frequently, the panels are textured or splatter-coated on one side to increase traction on the panel surface. This is especially useful when the panels are used for roof sheathing, because the textured surface provides better footing for workers. OSB is designed to withstand exposure to the weather during construction.

OSB's performance continues long after the panel is put to use. The panels exhibit excellent fastener-holding capability, even when nailed close to the panel edge. OSB resists deflection, delamination and warping because the wood and adhesives work together to create a strong, dimensionally stable panel. OSB panels are made of real wood, a natural insulator which provides excellent protection against heat loss and condensation. Many OSB panels are manufactured in large dimensions, minimizing the number of joints that can "leak" heat and admit airborne noise into the structure. In addition, the panels resist racking and shape distortion under high wind and earthquake forces.

QUALITY ASSURANCE

OSB panels that bear the APA trademark are manufactured under APA's rigorous quality assurance program, and are recognized by the U.S. and Canadian building codes, as well as many international building codes. Each panel is "performance rated," which means the panel meets the performance requirements necessary for its end-use applications.

Standards recognition in the United States

Most North American OSB panels are manufactured in conformance with the U.S. Department of Commerce Voluntary Product Standard PS 2. Panels similar to those described in the representative trademarks in Figure 1 are evaluated for their performance in specific end-use markets. Panel applications described in PS 2 include floors, walls and roofs. PS 2 is recognized in the International Building Code (IBC) and International Residential Code (IRC).

Standards recognition in Canada

Many North American OSB panels are manufactured in conformance to the requirements of CAN/CSA-O325 Construction Sheathing. The panel trademark shown in Figure 2 is representative of the marks APA applies to OSB manufactured in accordance with the Canadian standard. OSB panels manufactured to the CAN/CSA-O325 standard are recognized in the National Building Code of Canada and other provincial codes for use in floor, wall, and roof construction.

Performance standards

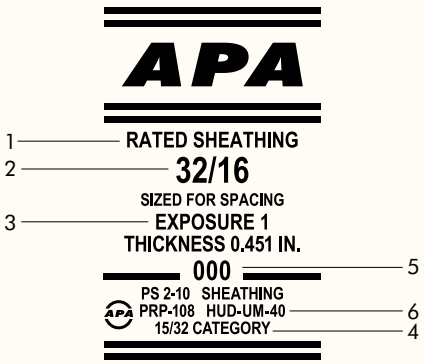
A performance standard sets performance requirements for a product based on that product's intended end use. The advantage of a wood structural panel performance standard is that it provides a common baseline of performance for all panel types, regardless of the manufacturing method. By placing emphasis on product performance rather than on manufacturing method, the consumer stands to benefit.

A performance standard sets requirements based on a panel's end use, while a prescriptive standard defines minimum manufacturing requirements. The objective of a performance standard is to provide flexibility in manufacturing, while assuring that a product will satisfy the requirements of the intended use.

Performance standards help to encourage more efficient use of resources because panel producers have more freedom to use innovative manufacturing techniques that use greater percentages of each log and allow for the utilization of a wide range of species.

FIGURE 1

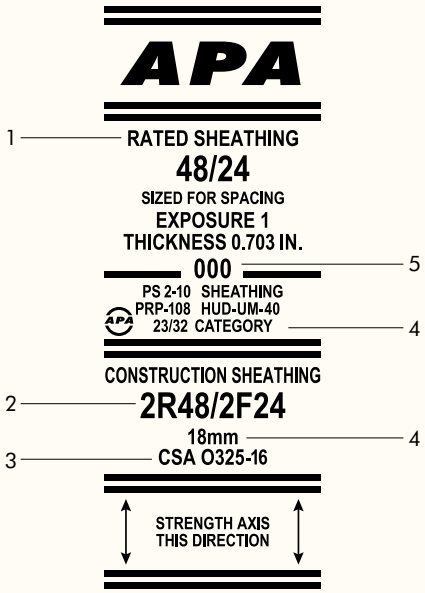
TYPICAL APA TRADEMARK



1 APA panel grade
2 Span Rating
3 Exposure durability classification
4 Performance category
5 Mill number
6 APA's performance-rated panel standard

FIGURE 2

TYPICAL APA TRADEMARK, CONFORMING TO CSA-O325



1 APA panel grade
2 Panel mark—Rating and end-use designation, Canadian standard
3 Canadian performance-rated panel standard
4 Performance category
5 Mill number

The wood products industry was not the first to use performance standards and testing. The electronics, automotive, and aircraft industries all use performance standards for a variety of parts and products. Panels manufactured under the performance standards are rated for three end uses: sheathing for floors, walls, and roofs (APA Rated Sheathing); single-layer flooring (APA Rated Sturd-I-Floor®); and exterior siding (APA Rated Siding).

The three basic criteria for qualifying OSB products under the performance standards are structural adequacy, dimensional stability, and bond durability. Performance criteria in each of these categories were established by building code requirements and through tests of panel products with known acceptance in the marketplace. These tests assure that panels possess the structural requirements necessary for uniform load, concentrated load, shear wall, diaphragm, and other demanding end-use applications. A partial list of typical tests includes: linear expansion, racking, uniform load, concentrated static load, impact resistance, direct fastener withdrawal and lateral fastener strength.

OSB APPLICATIONS AND COMMON SIZES

OSB is most commonly used for traditional applications such as sheathing for roofs and walls, subfloors, and single-layer flooring. Its superior performance has allowed OSB to gain popularity in a variety of other areas, including: structural insulated panels, the webs for wood I-joists, materials-handling applications, furniture, and a variety of do-it-yourself projects.

OSB panels manufactured in North America are typically 4 x 8 feet in size. Metric panel sizes are also available from some manufacturers in 1.25 x 2.50 meters. Panels for use as exterior siding are also available in narrow lap widths of 6 inches (152 mm) or 8 inches (203 mm), and 16-foot (4.88 m) lengths. Because OSB is typically manufactured in large sizes, many manufacturers can custom-make panels in almost any size by simply altering the cutting pattern. Most OSB manufacturers make oversized panels, up to 8 x 24 feet, which are typically used for panelized roof and wall systems, facers for structural insulated panels (SIPs), or modular floors. In operations where oversized panels can be handled, they provide the advantage of reducing the total number of panels required to do a job, and thus speed installation time and reduce construction cost.

OSB can be manufactured with square edges or with tongue-and-groove edges. Panel surface treatments may include texturing or sanding. Overlaid OSB for use as exterior siding also may be surface textured or grooved.

Bond classifications

APA-trademarked panels may be produced in two bond classifications, Exterior and Exposure 1. The bond classification relates to moisture resistance of the glue bond.

Exterior panels have bonds capable of withstanding repeated wetting and redrying or long-term exposure to weather or other conditions of similar severity.

Exposure 1 panels are suitable for uses **not** involving long-term exposure to weather. Panels classified as Exposure 1 are intended to resist the effects of moisture due to construction delays or other conditions of similar severity. Exposure 1 panels are made with the same exterior adhesives used in Exterior panels. However, because other panel compositional factors may affect bond performance, only Exterior panels should be used for long-term exposure to the weather.

OSB for sheathing

APA Rated OSB Sheathing is intended for subflooring, wall sheathing, and roof sheathing. APA Rated Sheathing/Ceiling Deck can also be made using OSB; it is made so that one surface has an overlay, texturing, or grooving.

Common thicknesses for sheathing panels are: 3/8 inch (9.5 mm), 7/16 inch (11.1 mm), 15/32 inch (11.9 mm), 1/2 inch (12.7 mm), 19/32 inch (15.1 mm), 5/8 inch (15.9 mm), 23/32 inch (18.2 mm), and 3/4 inch (19.0 mm).

OSB for flooring

APA Rated OSB Sturd-I-Floor is intended for single-layer flooring under carpet and pad. APA Rated Sturd-I-Floor panels often have tongue-and-groove edges.

Common thicknesses for flooring panels are: 19/32 inch (15.1 mm), 5/8 inch (15.9 mm), 23/32 inch (18.2 mm), 3/4 inch (19.0 mm), 7/8 inch (22.2 mm), 1 inch (25.4 mm), and 1-1/8 inches (28.6 mm).

OSB for industrial and do-it-yourself applications

OSB is also widely used in industrial applications. It can be used for mezzanine floors and shelving in commercial and industrial structures. OSB also is used in furniture, reels, trailer liners, recreational vehicle floors, roofs and components. Industrial specifiers are encouraged to talk with APA member mills about their particular panel needs.

SPAN RATINGS

Span Ratings for panels used in the United States

The Span Ratings in the trademarks on Performance Rated Panels denote the maximum permitted center-to-center spacing of supports, in inches, over which the panels should be installed in normal construction.

For APA Rated Sheathing and Sturd-I-Floor, the Span Rating applies when the long panel dimension is across supports, unless the strength axis is otherwise identified. The Span Rating for APA Rated Siding panels is for vertical installation; for lap siding, the rating applies with the long dimension across supports.

For APA Rated Sheathing, the Span Rating looks like a fraction, such as 32/16. The left-hand number denotes the maximum spacing of supports (in inches) when the panel is used for roof sheathing, and the right-hand number denotes the maximum on center spacing of supports when the panel is used for subflooring.

Sheathing panels with roof Span Ratings of 24 or greater may be used vertically or horizontally as wall sheathing over studs at 24 inches on center (o.c.).

APA Rated Sheathing may also be manufactured specifically for use as wall sheathing. These panels are identified with Span Ratings of Wall-16 or Wall-24.

APA Rated Sturd-I-Floor panels are designed specifically for single-floor (combined subfloor-underlayment) applications under carpet and pad and are manufactured with Span Ratings of 16, 20, 24, 32, and 48 oc.

APA Rated Siding is produced with Span Ratings of 16 and 24 oc. Both panels and lap siding may be used direct to studs or over non-structural sheathing (Sturd-I-Wall construction) or over nailable panel or lumber sheathing (double wall construction).

Building precisely at Span Ratings will meet minimum code requirements. For structures that will exceed minimum code requirements, specify panels with Span Ratings greater than the spacing of supports.

Allowable uniformly distributed live load at maximum span for APA Rated Sturd-I-Floor and APA Rated Sheathing is 100 psf live load for floors plus 10 psf dead load (65 psf total load for Sturd-I-Floor 48 oc) and 30 psf snow load for roofs plus 10 psf dead load. Higher live load levels can be achieved by placing supports closer than the maximum span indicated on the APA Rated Sheathing or Sturd-I-Floor trademarks. Refer to APA's *Engineered Wood Construction Guide,* Form E30, for these live load capacities.

Span Ratings for panels used in Canada

The Span Ratings in the trademarks on Performance Rated Panels denote the maximum recommended center-to-center spacing of supports, in inches, over which the panels should be installed. The Span Rating, as part of the panel mark, applies when the long panel dimension runs across the supports, unless the strength axis is otherwise identified.

PANEL MARKS FOR CONSTRUCTION SHEATHING PRODUCTS
Manufactured under Canadian Standard CAN/CSA-O325.0

TABLE 1

END-USE MARKS

For Panels Marked	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

TABLE 2

PANEL MARKS

	Span Marks					
	16	20	24	32	40	48
	Recommended Framing Member Spacing					
End Use Marks	400 mm (16 in.)	500 mm (20 in.)	600 mm (24 in.)	800 mm (32 in.)	1000 mm (40 in.)	1200 mm (48 in.)
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 in CSA-O325

Note: (1) Multiple panel marks may be used on panels qualified for more than one end use, e.g., 1R24/2F16/W24 or 2R48/2F24.

APA Rated Sheathing and APA Rated Sturd-I-Floor panels intended for use in Canada are marked with one or more Span Ratings to show maximum support spacings for subfloors, roofs, and/or walls. Span Ratings for floors and roofs include a number and letter to indicate the end use, followed by a two-digit number, or span mark, representing the maximum allowable span in inches. An "F" in the Span Rating represents floors, while the "R" signifies roofs. In the case of floors, the prefix "1" indicates that the panel is designed for use as a single-layer floor (no separate underlayment required under carpet and pad); a "2" indicates that an additional layer of panel-type underlayment is required. For example, 2F16 is a Span Rating for a two-layer subflooring system (subfloor with underlayment to be added), where supports are spaced a maximum of 16 inches on center.

For roofs, the prefix "1" indicates that no additional edge support is required at maximum span; a panel with a "2" will require edge support such as panel clips at maximum span. A Span Rating of 2R24, therefore, represents use for roof applications with panel clips where supports are spaced a maximum of 24 inches on center.

APA Rated Sheathing Span Ratings for walls include the letter "W" to identify end use followed by a two-digit number indicating the maximum support spacing. For example, a Span Rating of W16 appears on panels for use where the maximum spacing of wall framing members is 16 inches on center.

Building at the indicated Span Ratings will ensure that minimum code requirements are met. For structures that will exceed minimum code requirements, specify panels with Span Ratings greater than the spacing of supports.

Allowable uniformly distributed live load at maximum span for APA Rated Sturd-I-Floor and APA Rated Sheathing is 4.8 kPa (100 psf) for floors plus 0.5 kPa (10 psf) dead load (3.1 kPa [65 psf] total load for Sturd-I-Floor 1F48) and 1.4 kPa (30 psf) for roofs plus 0.5 kPa (10 psf) dead load. Higher live load levels can be achieved by placing supports closer than the maximum span indicated on the APA Rated Sheathing or Sturd-I-Floor trademarks. Refer to APA's *Engineered Wood Construction Guide,* Form E30, for these live load levels.

OSB STORAGE AND HANDLING

As with plywood, OSB panels require proper storage and handling. Always protect ends and edges, especially tongue-and-groove products, from physical damage. When moving bundles of panels with a forklift, place the bundles on pallets or lumber bunks to avoid damaging them with fork tines. When transporting panels on open truck beds, cover the bundles with a tarp.

Whenever possible, store the panels under a cover. Keep sanded or other appearance-grade panels away from high traffic areas. If moisture absorption is expected, cut the steel band on the bundles to prevent damage.

When storing panels outside, stack them on a level surface on top of stringers or other blocking. Use at least three stringers. Never leave panels in contact with the ground. Cover the stack with plastic or a tarp. Make sure the bundle is well ventilated to prevent mildew.

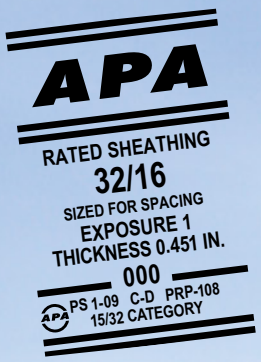
OSB AND FORMALDEHYDE

When specifying APA-trademarked engineered wood products, you can be sure the adhesives used in their manufacture are safe for both builders and occupants. OSB panels manufactured in accordance with Voluntary Product Standard PS 2 use phenol formaldehyde or diphenylmethane diisocyanate (MDI). Their unique chemistry makes these water-resistant adhesives highly durable and stable, resulting in low formaldehyde emissions.

In fact, large-scale chamber tests have shown that formaldehyde emission levels in wood structural panels are no higher than the levels found naturally in the environment. Indeed, because formaldehyde levels associated with phenolic resin-bonded products are so low, these products easily meet or have been exempted from the world's leading formaldehyde emissions standards and regulations, including the U.S. Department of Housing and Urban Development (HUD), the California Air Resources Board (CARB) Air Toxic Control Measure for Composite Wood Products, Japanese Agricultural Standards (JAS), and the EN 300 standard for European markets. For more information about phenol formaldehyde adhesives, refer to APA Technical Note: *Formaldehyde and Engineered Wood Products*, Form J330, available at apawood.org.

About APA

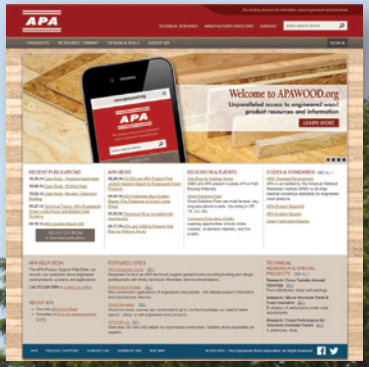
APA is a nonprofit trade association of and for structural plywood panel, glulam timber, wood I-joist, laminated veneer lumber and other engineered wood product manufacturers. Based in Tacoma, Washington, APA represents approximately 169 mills throughout North America, ranging from small, independently owned and operated companies to large integrated corporations.



Always insist on engineered wood products bearing the mark of quality—the APA trademark. Your APA engineered wood purchase is not only your highest possible assurance of product quality, but an investment in the many trade services that APA provides on your behalf. The Association's trademark appears only on products manufactured by member mills and is the manufacturer's assurance that the product conforms to the standard shown on the trademark.

For panels, the standard may be an APA performance standard, the Voluntary Product Standard PS 1, Structural Plywood, or Voluntary Product Standard PS 2, Performance Standard for Wood-Based Structural-Use Panels. Panel quality of all APA-trademarked products is subject to verification through APA audit.

APA's services go far beyond quality testing and inspection. Research, education, and promotion programs play important roles in developing and improving plywood and other panel construction systems, and in helping users and specifiers to better understand and apply engineered wood products. For more information on wood construction systems, contact APA, 7011 So. 19th St., Tacoma, Washington 98466, or visit the Association's website at www.apawood.org.



Oriented Strand Board Product Guide

We have field representatives in many major U.S. cities and in Canada
who can help answer questions involving APA trademarked products.
For additional assistance in specifying engineered wood products, contact us:

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The information contained herein is based on APA – The Engineered Wood Association's continuing programs of laboratory testing, product research, and comprehensive field experience. Neither APA, nor its members make any warranty, expressed or implied, or assume any legal liability or responsibility for the use, application of, and/or reference to opinions, findings, conclusions, or recommendations included in this publication. Consult your local jurisdiction or design professional to assure compliance with code, construction, and performance requirements. Because APA has no control over quality of workmanship or the conditions under which engineered wood products are used, it cannot accept responsibility for product performance or designs as actually constructed.

www.apawood.org

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REPRESENTING THE ENGINEERED WOOD INDUSTRY