

A P A

The Engineered Wood Association

PRODUCT GUIDE



**PERFORMANCE
RATED PANELS**

APA

The Engineered Wood Association

DO THE RIGHT THING RIGHT™

Wood is good. It is the earth’s natural, energy efficient and renewable building material.

Engineered wood is a better use of wood. It uses less wood to make more wood products.

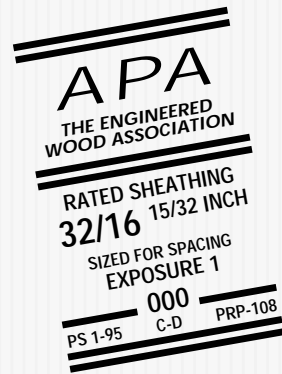
That’s why using APA trademarked I-joists, glued laminated timbers, laminated veneer lumber, plywood and oriented strand board is the right thing to do.

A few facts about wood.

- **We’re not running out of trees.** One-third of the United States land base – 731 million acres – is covered by forests. About two-thirds of that 731 million acres is suitable for repeated planting and harvesting of timber. But only about half of the land suitable for growing timber is open to logging. Most of that harvestable acreage also is open to other uses, such as camping, hiking, hunting, etc.
- **We’re growing more wood every day.** American landowners plant more than two billion trees every year. In addition, millions of trees seed naturally. The forest products industry, which comprises about 15 percent of forestland ownership, is responsible for 41 percent of replanted forest acreage. That works out to more than one billion trees a year, or about three million trees planted every day. This high rate of replanting accounts for the fact that each year, 27 percent more timber is grown than is harvested.
- **Manufacturing wood is energy efficient.** Wood products made up 47 percent of all industrial raw materials manufactured in the United States, yet consumed only 4 percent of the energy needed to manufacture all industrial raw materials, according to a 1987 study.
- **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.

Material	Percent of Production	Percent of Energy Use
Wood	47	4
Steel	23	48
Aluminum	2	8

Wood. It’s the right product for the environment.



NOTICE:
The recommendations in this guide apply only to panels that bear the APA trademark. Only panels bearing the APA trademark are subject to the Association’s quality auditing program.

APA Performance Rated Panels are structural wood panels that conform to performance-based standards. Most APA-trademarked Oriented Strand Board (OSB) and composite panels, as well as many grades of plywood panels, are performance-rated.

The performance-based standards for these panels provide product performance baselines, such as load-carrying capacity, for designated end uses. The primary end uses are sheathing, flooring and siding. Performance standards differ from typical prescriptive manufacturing standards by defining how a product must perform in one of these designated applications rather than how it must be made.

This brochure from APA – The Engineered Wood Association describes performance standards for structural wood panels and the compositions of different types of APA panels that bear the Performance Rated designations of APA RATED SHEATHING, APA RATED STURD-I-FLOOR, and APA RATED SIDING. It also describes the typical applications where Performance Rated Panels are used.

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PERFORMANCE STANDARDS: DEFINITIONS AND HISTORY

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 end use.

The wood products industry is by no means 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.

Why Performance Standards?

APA Performance Standards were born out of necessity – answering changes in wood resources, manufacturing, and construction trends.

In the early days of plywood manufacture, every mill worked with the same species and technology. Manufacturing techniques didn't vary much from mill to mill. APA's quality assurance program was geared toward this uniformity in manufacturing. To produce panels under APA's prescriptive standards, a member mill used wood of a certain species, peeled it to veneer of a prescribed thickness, then glued the veneers together in a prescribed manner using the approved adhesives.

Keeping In Step With Technology and Resources

As technology changed, mills started using a broader range of species and different manufacturing techniques. By the mid-1960s, APA was maintaining and cross-referencing three major product standards and several minor ones.

With the development of Product Standard PS 1-66, the three standards were combined into one. And, for the first time, Span Ratings were incorporated in the standard. The Span Rating concept would later be used as a basis for the development of APA Performance Standards.

Maximizing the Resource

At the same time, there was growing concern over efficient use of forest resources. Working in cooperation with the U.S. Forest Service, APA tested panels manufactured with a core of compressed wood strands and traditional wood veneer on the face and back for use in structural applications. By using cores of wood strands, manufacturers were able to make more efficient use of the wood resource and use a broader range of species. Today, these panels are called composite panels or COM-PLY®.

In the course of the research on composite panels, performance standards were developed that led to APA's system of Performance Rated Panels. Soon, manufacturers were making structural panels composed entirely of wood strands. Most current production of these panels is referred to as oriented strand board, or OSB.

THE PERFORMANCE STANDARD ADVANTAGE

Performance standards provide several advantages:

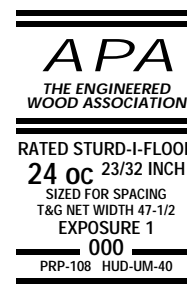
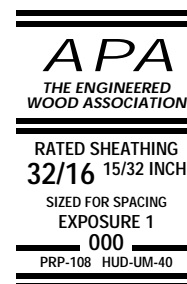
- They provide a common baseline for all panel types. All panels, regardless of manufacturing method, must meet the same minimum performance criteria to receive a Span Rating.

- Panel producers have more freedom to use innovative manufacturing technology. As long as the finished product meets performance standards, a variety of species and manufacturing methods may be used.

- More efficient use of resources is encouraged. Innovative manufacturing techniques use greater percentages of each log, and allow for the utilization of a wide range of species.

- Because performance standards are directed toward the end use, builders, engineers, and architects are assured that the panel satisfies the requirements of the job at hand.

Throughout decades of product and standard development, one fact has remained unchanged: the APA trademark on a wood structural panel signifies that the manufacturer subscribes to recognized, industrywide standards and APA's rigorous quality auditing program. The APA trademark is still the premier mark of quality.



APA PERFORMANCE RATED PANEL COMPOSITIONS

Plywood

Plywood is the original structural wood panel. It is composed of thin sheets of veneer, or plies, arranged in layers to form a panel. Plywood may have an even number of plies, but it always has an odd number of layers, each layer consisting of one or more plies, or veneers.

In plywood manufacture, a log is turned on a lathe and a long knife blade peels the veneer. The veneers are clipped to a suitable width, dried, graded, and repaired if necessary. Next the veneers are laid up in cross-laminated layers. Sometimes a layer will consist of two or more plies with the grain running in the same direction, but there will always be an odd number of layers, with the face layers typically having the grain oriented parallel to the long dimension of the panel.

Adhesive is applied to the veneers which are to be laid up. Laid-up veneers are then put in a hot press where they are bonded to form panels.

Wood is strongest along its grain, and shrinks and swells most across the grain.

By alternating grain direction between adjacent layers, strength and stiffness in both directions are maximized, and shrinking and swelling are minimized in each direction.

Oriented Strand Board

Panels manufactured of compressed wood strands or wafers have been marketed with such names as waferboard and oriented strand board. Today, all

APA nonveneer wood structural panels are manufactured with oriented strands or wafers, and are commonly called oriented strand board (OSB).

OSB is composed of compressed strands arranged in layers (usually three to five) oriented at right angles to one another. The orientation of layers achieves the same advantages of cross-laminated veneers in plywood. Since wood is stronger along the grain, the cross-lamination distributes wood's natural strength in both directions of the panel. Whether a panel is composed of strands or wafers, all APA manufacturers orient the material to achieve maximum performance.

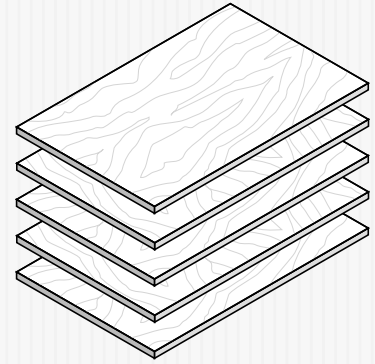
Most OSB sheathing panels have a non-skid surface on one side for safety on the construction site.

COM-PLY®

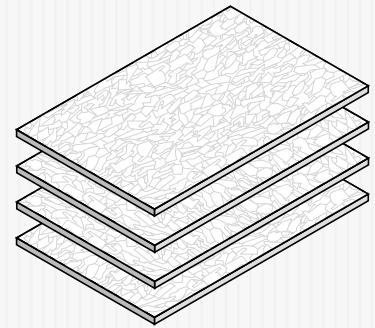
COM-PLY is an APA product name for composite panels that are manufactured by bonding layers of wood fibers between wood veneer. By combining wood fibers with conventional veneer, COM-PLY panels allow for more efficient resource use while retaining the wood grain appearance on the panel face and back.

COM-PLY panels are manufactured in a three- or five-layer arrangement. A three-layer panel has a wood fiber core and a veneer face and back. The five-layer panel has a wood veneer crossband in the center and veneer on the face and back. When manufactured in a one-step pressing operation, voids in the veneers are filled automatically by the particles or strands as the panel is pressed in the bonding process.

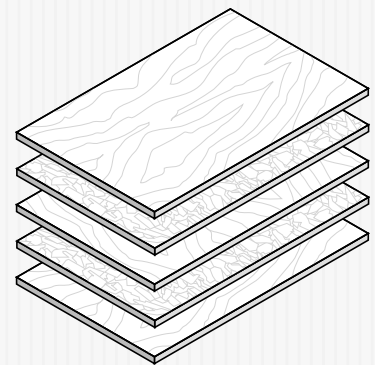
PLYWOOD



ORIENTED STRAND BOARD



COM-PLY®



PERFORMANCE RATED PANELS FOR FLOORS, WALLS, AND ROOFS

APA Performance Rated Panels are rated for three end uses: single-layer flooring, exterior siding, and sheathing for roofs, floors and walls. The categories are further broken down into exposure durability classifications (resistance to moisture exposure), and an additional sheathing category (Structural I) denoting additional strength in the cross-panel direction and in racking.

In order to qualify for a particular end use, panels must be submitted for testing and meet performance criteria in three critical areas: structural performance, physical properties and glue bond durability.

Panels are typically classified in one of two exposure durability classifications:

- **Exterior** panels have a fully waterproof bond and are designed for applications subject to permanent exposure to the weather or to moisture.

- **Exposure 1** panels have a fully waterproof bond and are designed for applications where long construction delays may be expected prior to providing protection. Approximately 95 percent of Performance Rated Panels are manufactured with this designation.

APA Rated Sheathing is rated for use as subfloor, wall or roof sheathing. It is used in a myriad of construction and miscellaneous applications where strength and stiffness are required. For outdoor use, be sure to select panels with an Exterior exposure classification.

Rated Sheathing is also available as APA Rated Sheathing/Ceiling Deck, where one surface has an overlay, texturing or grooving.

Common thicknesses for sheathing panels are 5/16, 3/8, 7/16, 15/32, 1/2, 19/32, 5/8, 23/32, and 3/4 inch.

- **Structural I** is a designation applied to APA Rated Sheathing where enhanced racking and cross-panel strength properties are of maximum importance. Structural I panels are typically used in demanding applications such as structural diaphragms and panelized roofs.

- **APA Rated Wall Bracing** is intended for wall sheathing applications where only conventional bracing is required. Such panels often have other attributes of interest to the specifier, such as special fire resistance.



APA Rated Sturd-I-Floor is a combined subfloor/underlayment single-layer flooring for use under carpet and pad. It can be used in place of separate subfloor and underlayment layers. The panel surface has extra resistance to punch-through damage. Panels are available with square or tongue-and-groove (T&G) edges.

T&G panels are typically 47-1/2 inches wide; check with local suppliers. Where resilient flooring such as vinyl will be used, an additional layer of thin, sanded underlayment is recommended. APA Rated Sturd-I-Floor is available in both

Exterior and Exposure 1 in thicknesses of 19/32, 5/8, 23/32, 3/4, 7/8, 1, and 1-1/8 inch.



APA Rated Siding is available as both panel and lap siding. Panel siding may be applied over sheathing or directly over studs in Sturd-I-Wall (single wall) application. APA panel siding is available in a variety of surface textures and patterns, including Texture 1-11, rough sawn, reverse board and batten, channel groove, and brushed. Panels are available in 4 x 8, 4 x 9, and 4 x 10-foot dimensions.

Lap siding is available in lengths of up to 16 feet and widths of up to 12 inches.

APA Rated Siding is manufactured in thicknesses of 11/32, 3/8, 7/16, 15/32, 1/2, 19/32, and 5/8 inch.



PERFORMANCE TESTING

Field data and laboratory testing were used to develop the APA Performance Standards for APA Performance Rated Panels. Once a mill's panels have qualified for the Performance Rated Panel trademark, APA's quality auditors check the mill's quality-control program by selecting panels at random for tests. Specified quality-assurance tests are run daily, weekly and quarterly.

There are three basic criteria for qualifying wood-based panel products under APA performance standards: structural adequacy, dimensional stability and bond durability. Wood-based products qualifying as APA Rated Siding are also evaluated for surface characteristics, including ability to accept different kinds of finishes.

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. The tests evaluated a panel's ability to perform to the expected and necessary level for the end-use application or market.

Not all performance tests apply to all panels and their applications, but a partial list of typical tests includes:

- **Linear expansion.** Measurements are taken between brass eyelets installed in the panel to test dimensional change due to moisture.
- **Racking.** A wall section of dimension lumber and structural panels is built and tested. A hydraulic jack applies lateral force to one corner, and deflection and ultimate load on the wall are measured.



- **Uniform load.** A panel is applied to joists. The unit is sealed to permit a vacuum to be drawn beneath the panel. Atmospheric pressure then provides a uniform load. Deflection at a specified load is measured. A proof load for strength is also applied.
- **Concentrated static load (APA Rated Sturd-I-Floor and Sheathing).** Load is applied through a one- or three-inch diameter disc mid-span between joists at a panel edge. Deflection and ultimate load are measured.
- **Concentrated static load (APA Rated Siding).** The end of a one-inch diameter rod is pushed into the panel, and the indentation measured.
- **Impact resistance.** A bag of steel shot weighing 30 or 60 pounds, depending on span, is dropped on the panel mid-span between joists, to determine impact load performance.
- **Hard-body impact loads (APA Rated Siding).** A steel ball is dropped on the panel from several feet, and the indentation measured to determine surface toughness.
- **Direct fastener withdrawal.** Nails are driven into the panel, then the force needed to pull them out is measured.
- **Lateral fastener strength.** A nail is driven through the panel, and through a hole in a steel block behind the panel. Force is then applied to move the panel laterally.
- **Surface profile (APA Rated Siding).** The decorative surface on the exposed siding face is measured before and after going through moisture cycles to determine stability.
- **Peel test (APA Rated Siding).** A strip of cheese cloth is painted on the decorative surface of a siding panel. After it dries, the force required to peel it off is measured to test the suitability of the siding's surface to accept paint and stain.

SPAN RATINGS

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.

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 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.). Those with roof Span Ratings of less than 24 may be used vertically or horizontally over studs at 16 inches 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.

Horizontal edges of all wall sheathing must be blocked when panels are used as bracing.

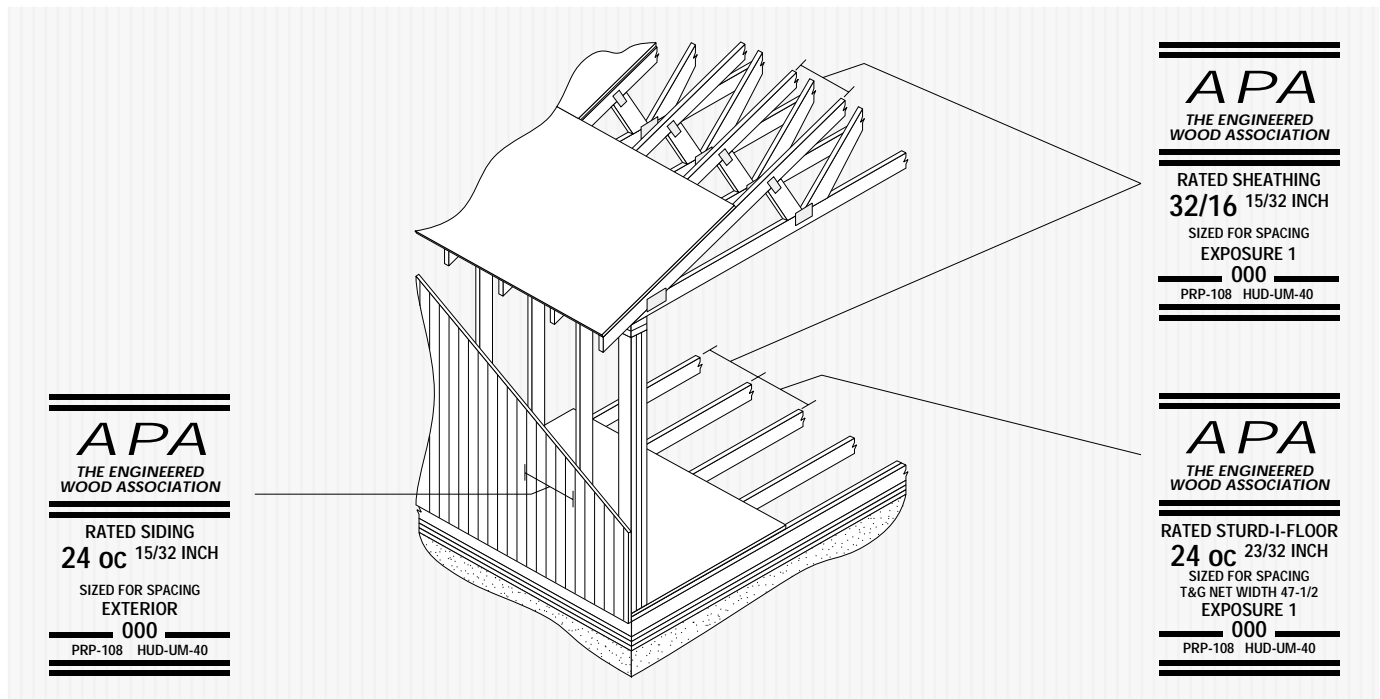
APA Rated Sturd-I-Floor panels are designed specifically for single-floor (combined subfloor-underlayment) applications under carpet and pad and are manufactured with Span Ratings of 16, 20, 24, 32, and 48 oc.

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). Veneer-faced APA Rated Siding panels may be applied horizontally over studs 24 inches o.c., provided horizontal joints are blocked.

Spacing supports precisely at Span Ratings will meet minimum code requirements. For structures that will exceed minimum code requirements, space supports closer than the recommended Span Ratings.

Allowable uniformly distributed live load at maximum span for APA Rated Sturd-I-Floor and APA Rated Sheathing is 100 psf for floors plus 10 psf dead load (65 psf total load for Sturd-I-Floor 48 o.c.) and 30 psf for roofs (35 psf for Rated Sheathing 48/24 or greater) 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 *Design/Construction Guide: Residential & Commercial* for these live load levels.



ENGINEERED APPLICATIONS

Engineering design capacities for APA Rated Sheathing and APA Rated Sturd-I-Floor are given in APA Technical Note N375.

Some grades of veneered panels are manufactured under the detailed manufacturing specifications or under the performance testing provisions of *Voluntary Product Standard PS 1-95 for Construction and Industrial Plywood*, and *Voluntary Product Standard PS 2-92, Performance Standard for Wood-Based Structural-Use Panels*, developed cooperatively by the structural panel industry and the U.S. Department of Commerce. The PS 1 and PS 2 grade conformance, where applicable, is given in the lower portion of the APA trademark.

Design stresses and section properties for plywood conforming to PS 1, including sanded panels, are given in APA's *Plywood Design Specification*, Form Y510. Design capacities for performance-rated APA Rated Sheathing and APA Rated Sturd-I-Floor wood structural panels conforming with PS 1 and PS 2 are given in APA's *Design Capacities of APA Performance Rated Structural-Use Panels*, Technical Note N375.

For specific construction grade and installation recommendations, see APA's *Design/Construction Guide: Residential & Commercial*, Form E30.

Industrial use guides on bins, slave pallets and other materials handling applications are also available. Request information from APA headquarters, or from the nearest regional field office listed on the back cover, or visit APA's website at www.apawood.org.



PANEL SIZE AND SPACING

Square-edge Performance Rated Panels are typically manufactured 48 by 96 inches, with a plus 0, minus 1/8-inch tolerance. Tongue-and-groove Sturd-I-Floor panels are 48 inches wide, but net width installed is typically 47-1/2 inches.

Recommended spacings between panels are 1/8 inch at end and edge joints, except where otherwise indicated by the manufacturer.

The simple precaution of properly installing the panels with correct spacing will help reduce complaints and callbacks, especially on roofs.



CODE RECOGNITION

Recognition of panels conforming to PS 1 and PS 2 is contained in each of the model building codes.

They are:

- Building Officials and Code Administrators International (BOCA), promulgators of the *National Building Code*.
- The International Conference of Building Officials (ICBO), promulgators of the *Uniform Building Code*.
- The Southern Building Code Congress International (SBCCI), promulgators of the *Standard Building Code*.

The National Evaluation Service, sponsored jointly by the three agencies, recognizes the APA Performance Standard PRP-108 in report number NER-108. Recognition of APA as an accredited quality assurance agency is set forth in report number NER-QA397. As always, both of the reports are subject to re-examination, revisions and possible cancellation.

ORDERS AND SPECIFICATIONS

To order APA Performance Rated Panels, designate the thickness, APA trademark, grade, Span Rating, exposure durability classification, dimensions and number of pieces. For example:

- 15/32" APA Rated Sheathing, 32/16, Exposure 1, 48" x 96", 100 pcs.
- 23/32" APA Rated Sturd-I-Floor, 24 o.c., Exposure 1, 48" x 96", 100 pcs.
- 19/32" APA Rated Siding, 303-18-S/W*, 16 o.c. Exterior, 48" x 96", 100 pcs.

Standard dimensions for structural panels are 48" by 96", but others are available. Some mills manufacture plywood to 10-foot lengths or longer, and nonveneer panels can be furnished in some parts of the country to lengths of 28 feet. Check local availability.

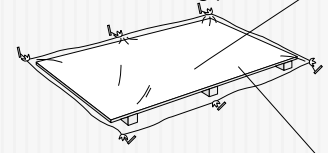
STORAGE AND HANDLING

Follow these simple guidelines to protect panels before and during construction:

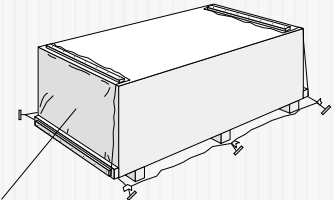
- Select high, dry ground for the storage site.
- Stack panels on a level platform supported with 4 x 4 stringers or other blocking.
- Lay stringers or boards on top to keep an air space between the panels and the covering.
- Keep covering away from sides and bottom, to permit air flow.
- If panels are to be stored for more than a day or two, cut metal strapping bands so swelling of panels does not cause compression of edges.

PANEL STORAGE

Build platform of cull panel and scrap lumber 4x4s for stacking panels.

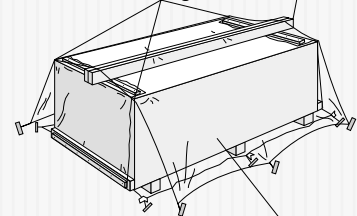


Stretch plastic film over platform to block passage of ground moisture.



Nail film to top panel and drape over ends for protection against driving rain. Weight lower end with 2x4.

Lay two 2x4s on top of stack. Pad corners with rags.



Stretch film over stack and secure to tie-down stakes.

When handling, avoid dropping panels on edges. Splintered or chipped edges or corners will not affect the structural integrity of the panel, but can add to man-hours required for installation, especially when tongue-and-groove edges are damaged.

Once installed, protect panels by applying a temporary covering and by enclosing the structure and installing finish flooring, siding and roofing as soon as possible.

* Face grade is one of several that can apply to plywood Rated Siding 303.

SUMMARY

Development of performance standards brings four major advantages to manufacturers, specifiers, architects and users of structural panels:

- Performance standards permit more-efficient use of natural resources by expanding the range of panel composition and configuration. Abundant wood species which do not lend themselves to use under traditional prescriptive standards may now be used in structural panels.
- Performance standards encourage manufacturing and product innovation, since manufacturers are freed from prescriptive requirements. This innovation helps assure the future availability of adequate supplies of manufactured wood products at affordable cost.
- APA performance standards establish baseline criteria for qualifying new products and provide a means for their recognition by building codes. Plus, extensive qualification testing and ongoing quality auditing assures the user that the product will perform in its intended end use.
- Finally, performance standards, along with descriptive APA panel trademarks simplify the specification, identification and use of structural wood panels in strong, safe building construction.

APA: THE MARK OF QUALITY

The APA trademark appears only on products manufactured by APA member mills and is the manufacturer's assurance that the product conforms to the standard shown on the trademark. That standard may be an APA performance standard, the *Voluntary Product Standard PS 1-95 for Construction and Industrial Plywood* or *Voluntary Product Standard PS 2-92, Performance Standard for Wood-Based Structural-Use Panels*.

APA's services go far beyond quality testing and inspection. Research 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 panel products.

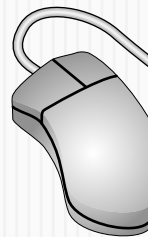
APA field representatives in most major cities are available to assist with panel selection and application, and to provide general information on APA panels. To reach your field representative, call one of the regional offices listed on the back of this brochure.

For additional information on structural wood panel construction systems, contact APA – *The Engineered Wood Association*, P.O. Box 11700, Tacoma, Washington 98411-0700. For a complete listing of available literature, request the *Publications Index*, Form B300.

MORE INFORMATION ONLINE

Visit APA's website at www.apawood.org for more information on engineered wood products, wood design and construction, and technical issues and answers.

Online publication ordering is also available through the website.





PERFORMANCE RATED PANELS P R O D U C T G U I D E

We have field representatives in most major U.S. cities and in Canada who can help answer questions involving APA trademarked products. For additional assistance in specifying APA engineered wood products, get in touch with your nearest APA regional office. Call or write:

WESTERN REGION

7011 So. 19th St. ■ P.O. Box 11700
Tacoma, Washington 98411-0700
(253) 565-6600 ■ Fax: (253) 565-7265

EASTERN REGION

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U.S. HEADQUARTERS AND INTERNATIONAL MARKETING DIVISION

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www.apawood.org

PRODUCT SUPPORT HELP DESK

(253) 620-7400
E-mail Address: help@apawood.org

(Offices: Antwerp, Belgium; Bournemouth, United Kingdom; Hamburg, Germany; Mexico City, Mexico; Tokyo, Japan.) For Caribbean/Latin America, contact headquarters in Tacoma.

The product use recommendations in this publication are based on APA – The Engineered Wood Association's continuing programs of laboratory testing, product research, and comprehensive field experience. However, because the Association 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. Because engineered wood product performance requirements vary geographically, consult your local architect, engineer or design professional to assure compliance with code, construction, and performance requirements.

Form No. F405L/Revised December 1999/0200

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