

A P A

The Engineered Wood Association

INDUSTRIAL USE GUIDE



INDUSTRIAL PANEL SELECTION GUIDE

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.

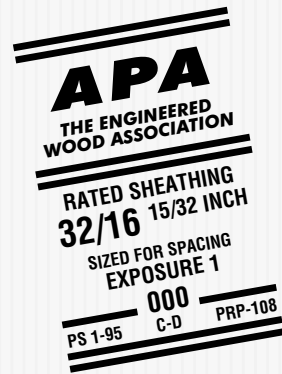
That’s why using APA trademarked plywood, oriented strand board and APA EWS glued laminated timbers is the right thing to do.

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.

Plywood has been widely used in industrial applications since its introduction in 1905. For decades industrial users have fabricated barricades, bins, crates, containers, shelves and countless other manufactured items out of plywood. And as new engineered wood products such as oriented strand board (OSB) and composite panels were developed, industrial users adopted those materials, as well.

But until now, application and specification guidelines for industrial uses of wood structural panels have been hard to find. APA's *Industrial Panel Selection Guide* allows industrial users to select panel products by precisely identifying the characteristics required for specific applications.

The system also gives specifiers the chance to generate new panel grades that may not be comparable with currently available typical construction grades. APA's *Industrial Panel Selection Guide* gives industrial users the opportunity to partner with suppliers and APA member mills to create new panel products designed to meet the requirements of specific users and specific applications.

For engineering and design information relating to industrial applications, see the list of APA titles on Page 27.

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SPECIFYING APA PANELS FOR INDUSTRIAL APPLICATIONS

Specifying the right panel grade is the first step in a successful application. With proper specification, APA panels provide excellent performance at a competitive cost. Understanding the types of panel products available is crucial to a successful specification.

APA Panels may be manufactured in one of three ways – as plywood, oriented strand board (OSB), or composite panels. All three types of APA panels are available in a wide range of grades with a variety of characteristics.

Plywood

Plywood is the original wood structural panel. It is composed of thin sheets of veneer, or plies, arranged in layers. Plywood always has an odd number of layers, each consisting of one or more veneers. The layers are cross-laminated, with the wood grain running in alternating directions in adjacent layers. Cross-lamination maximizes strength and stiffness and minimizes the potential for swelling and shrinking.

OSB

OSB is made of compressed strands of wood arranged in layers (usually three to five) oriented at right angles. The orientation of layers provides the same advantages as the cross-lamination of layers of veneer in plywood. Most OSB panels are smooth on one side and screen-textured for slip-resistance on the other side.

Composite

Composite panels (often referred to as APA COM-PLY®) are manufactured by compressing small pieces of wood fiber between wood veneers. Combining these two forms of wood fiber allows efficient use of the timber resource and retains the characteristics of wood grain on the face and back of the panels.

APA Industrial Series Numbers

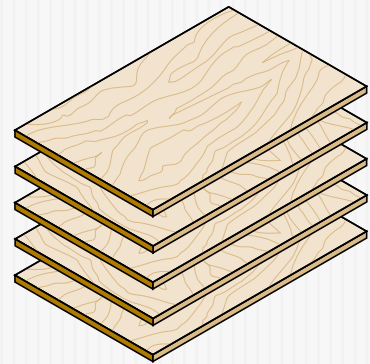
Each of the three panel types can be identified by their Industrial Series Numbers, which appear in the trademark stamp (following page). These numbers identify only the type of panel, not the grade or specific panel characteristics. The panel grades and characteristics are identified by the Industrial Category Index (ICI), which is described on the following page. The ICI is more critical to industrial specifiers than the Industrial Series Number. However, the Industrial Series Number may be helpful if a specific panel type is required for an application. The series numbers for the three panel types are:

Plywood – APA Series 1-700

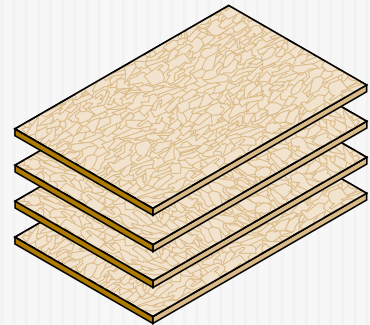
Composite – APA Series 1-800

OSB – APA Series 1-900

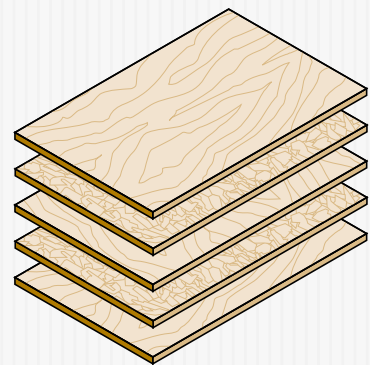
PLYWOOD



OSB



COMPOSITE



USING THIS GUIDE

The four worksheets in this brochure will help you identify the APA Industrial Category Index (ICI) required for specific applications through the use of panel Characteristic Numbers.

APA Industrial Category Index

The Industrial Category Index is a series of four numbers that appear in the APA trademark stamp. Each number relates to specific panel characteristics in one of four categories. The first number relates to panel face characteristics, the second to panel back characteristics, the third to first crossband characteristics and the fourth to inner layer characteristics. Individually, these numbers are referred to as Characteristic Numbers. When they appear collectively, in sequence, they are called the ICI. For industrial specifiers, the ICI is the most important piece of information in the trademark stamp.

Trademark stamps that contain the ICI may appear as dual stamps that include construction grade information, or as single stamps without construction grade information.

To determine the Industrial Category Index for an application, fill out the four worksheets on pages 9, 11, 13 and 15. One worksheet is provided for each of the four categories of characteristics listed above. The worksheets consist of a series of questions that are answered either “yes” or “no.” Separate columns are provided for plywood/composite panels and OSB. If the answer to a question is “yes,” circle the numbers in the columns to the right of the question. A

“no” answer requires no action. Some applications may allow the specifier to choose between plywood composite panels or OSB. Other applications may preclude OSB.

The worksheets are printed on a specially coated paper that makes them reusable. Use a non-permanent felt tipped pen to write on the worksheets. Erase them with tissues, napkins, paper towels or a cloth.

SAMPLE WORKSHEET

WORKSHEET #1

PANEL FACE CHARACTERISTICS

Application: _____

Date: _____

Question	Circle numbers in columns at right if answer is “Yes”	Characteristic Number	
		Plywood/Composite	OSB
1	Is a high density overlay (HDO) required?	14	–
2	Is a medium density overlay (MDO) required?	13	–
3	Is a “best” face required?	9	4
4	Must splits/voids be 3" wide or less?	1	4
5	Must splits/voids be 1-1/2" wide or less?	3	4
6	Must splits/voids be 1/2" wide or less?	5	4
7	Must splits/voids be 1/4" wide or less?	6	4
8	Must splits/voids be 1/16" wide or less?	9	4
9	Must knots be 2" wide or less?	2	4
10	Must knots be 1-1/2" wide or less?	3	4
11	Must knots be 1" wide or less?	4	4
12	Must knot holes be 3" wide or less?	1	4
13	Must knot holes be 2" wide or less?	2	4

FIGURE 1

APA TRADEMARKS



Characteristic Numbers

The individual numbers in the ICI and on the worksheets (ranging from 0 to 14) are the Characteristic Numbers. They represent specific characteristics and together form the *minimum* ICI needed to meet the performance requirements for panel face, back, first crossband and inner layers.

Once all of the questions are answered, determine the highest circled numbers on each worksheet and write them in the space provided at the bottom of the page. The two highest numbers on each worksheet (one for plywood/composite and one for OSB) are the only ones that matter because, as explained above, they represent the specific characteristics and together form the minimum ICI needed to meet the performance requirements for the application.

On the fourth worksheet, write in the highest numbers from all four sheets, in order, in the space provided. These numbers, collectively, are the Industrial Category Index. For example, if the highest circled numbers are 7 on the first worksheet (panel face characteristics), 1 on the second (panel back characteristics), 3 on the third (first crossband characteristics), and 1 on the fourth (inner layer characteristics), the ICI for the panel is 7-1-3-1. The panel grade needed for the application can be precisely identified by referring to the APA Panel Translator Chart on Page 19, or by referring to the Characteristics Locator Charts on Pages 20 through 23. Separate locator charts are provided for plywood/composite panels and OSB. A detailed example of how to use the worksheets is provided on Page 16.

Specifying Custom APA Industrial Panels

If a panel with the ICI required for an application is not available as one of the common APA panel construction grades, contact your supplier, an APA member mill or APA. It may be possible to manufacture custom panels that meet the ICI for certain applications.

Specifying Substitute Panels

The Industrial Panel Selection Guide makes it easy to evaluate and specify substitute panels. Because the ICI identifies *minimum* acceptable characteristics, any panel with Characteristic Numbers in *each* category equal to or greater than the original numbers may be substituted. For instance, if an application calls for a panel with an ICI of 10-10-3-3, a panel with an ICI of 10-10-9-9 would also work. A panel with a ICI of 10-9-9-9 however, would be unacceptable because the second number (back characteristics) is lower than the second number in the originally specified ICI.

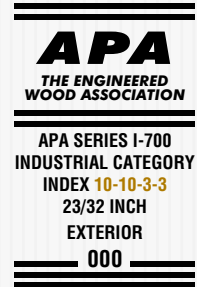
In general, lower numbers in the ICI correspond to a lower standard grade, which may be more economical.

Special Requirements

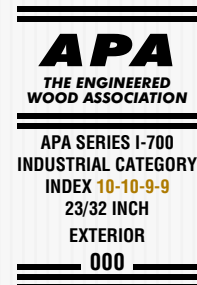
The last question on each worksheet asks about special requirements that are not listed.

If you have a question about an application that requires special characteristics, you or your supplier may contact APA at one of the addresses or phone numbers listed on the back of this publication.

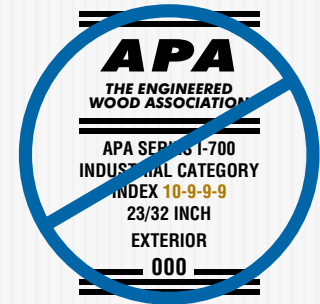
ORIGINAL SPECIFICATION



ACCEPTABLE SUBSTITUTE



UNACCEPTABLE SUBSTITUTE



APA PANEL CHARACTERISTICS

As mentioned above, panel characteristics can be divided into four categories: panel face, back, first crossband, and inner layers.

This section gives information on each of the four categories that will help the specifier complete the worksheets.

Surface Characteristics (Face and Back)

The first and second numbers in the ICI describe panel face and back characteristics, respectively. Surface requirements for a specific application may be different for the face and back of a panel, but the range and type of characteristics available for both surfaces are virtually identical.

APA panels can be manufactured with a wide variety of surface character-

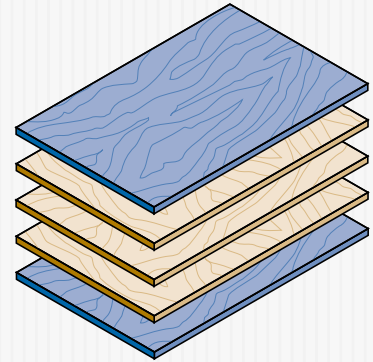
istics ranging from unimproved D-grade veneer, to screen textured OSB, and overlays too numerous to provide a complete list here. Some of the most common surface treatments are discussed below.

Overlaid Surfaces

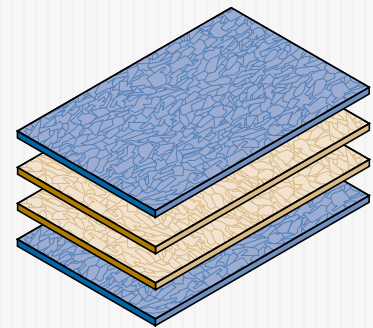
Medium density overlay (MDO) and high density overlay (HDO) are two of the most widely available overlays. MDO panels may be manufactured in either a one-step or two-step process. In the two-step process, the veneer is sanded before the overlay is applied, resulting in a smoother finish. Other common overlays include tempered hardboard, metal, fiberglass, polyethylene and other plastics.

The table below is provided to assist in determining the type of overlay, if any, that may be required for a specific application.

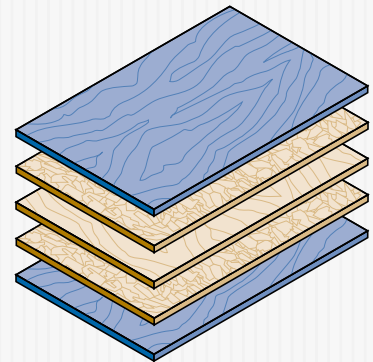
PLYWOOD



OSB



COMPOSITE



TYPICAL OVERLAYS AND REASONS FOR SPECIFYING THEM

Reason for Specifying	Overlay
Chemical and abrasion resistance	HDO, tempered hardboard, polyethylene and other plastics
Distribution of loads	Tempered hardboard, metal, polyethylene and other plastics
Distribution of wheel loads	Tempered hardboard, polyethylene and other plastics
Ease of cleaning	HDO, metal, fiberglass, polyethylene and other plastics
Enhanced application and performance of paints and stains	MDO
FDA approved substrate	MDO (with proper paint)
Fine appearance	HDO, MDO (2-step), fiberglass
Low porosity	HDO, fiberglass, metal, polyethylene and other plastics
Low surface friction	HDO, fiberglass, metal, polyethylene and other plastics
Moisture resistance	HDO, fiberglass, metal, polyethylene and other plastics
Puncture resistance	Tempered hardboard, metal, fiberglass, polyethylene and other plastics
Structural enhancement	Metal, fiberglass
Weather resistance	HDO, MDO, tempered hardboard, metal, fiberglass, polyethylene and other plastics

Best surfaces

Best surfaces are smooth and free of major defects. Voids up to 1/16 inch are permitted. Best surface panels with A-grade veneer are fully sanded (typically 80 grit or better). Best surface panels with B-grade veneer allow 5 percent sander skips (typically 60 grit or better). Best surfaces are commonly available only on plywood or composite panels. Some best surface panels may have hardwood face plies.

Best surfaces typically provide excellent performance for:

- Application of high pressure laminates.
- Application of structural adhesives.
- Improved appearance.
- Low abrasiveness (especially for bag-in-box and slave pallet systems).
- Low surface friction.
- Painting or stenciling.
- Thickness variation of 3 percent or less.
- Application of special coatings.

Panels with overlaid and best surfaces are “high-end” products. Not all industrial applications will require the characteristics these surfaces provide. For applications that require the strength and stiffness afforded by wood structural panels without the special characteristics of overlaid and best surface panels, better or standard surfaces may be more cost efficient.

Better surfaces

Panels with better surfaces may have small knotholes or splits, but are free of major defects. They are available as fully sanded, touch-sanded, or unsanded panels. Touch-sanding is a sizing operation and does not provide the same smooth surface or thickness tolerances as a fully sanded panel. Better surface panels are available as plywood, OSB or composite panels.

Panels with better surfaces typically provide good performance for:

- Agricultural bins and storage boxes.
- Air and water baffles.
- Air ducts and plenums.
- Boat components.
- Boxcar and truck liners.
- Core material for overhead doors.
- Furniture frames and components.
- Impact resistance.
- Mezzanine decks.
- Painting or stenciling.
- Shelves and rack decks.
- Slave pallets for bagged or boxed goods.
- Slipsheets.
- Solid deck pallets.
- Storage tanks and bins.

Standard surfaces

When strength and stiffness are more important than appearance or smoothness, standard surface panels may be a good choice. Standard surfaces are available on plywood, OSB and composite panels. Standard surface panels are typically not sanded.

Panels with standard surfaces typically provide good performance for:

- Damage repair materials and temporary shelters.
- Barricades and sight barriers.
- Building and storage bin liners.
- Crates and shipping containers.
- Furniture frames and components.
- Granular storage bins.
- Pallet blocks.
- Security barriers and screens.
- Utility shelves and racks.
- Slave pallets for rugged in-service conditions.
- Slipsheets.
- Solid deck pallets.
- Temporary latrines.
- Structural framing for boats (encapsulated in fiberglass)

Use Worksheet #1 below to determine Characteristic Numbers for panel face. Use Worksheet #2 on page 11 to determine Characteristic Numbers for panel back.

WORKSHEET #1

PANEL FACE CHARACTERISTICS

Application: _____

Date: _____

Question	Circle numbers in columns at right if answer is "Yes"	Characteristic Number	
		Plywood/Composite	OSB
1	Is a high density overlay (HDO) required?	14	-
2	Is a medium density overlay (MDO) required?	13	-
3	Is a "best" face required?	9	4
4	Must splits/voids be 3" wide or less?	1	4
5	Must splits/voids be 1-1/2" wide or less?	3	4
6	Must splits/voids be 1/2" wide or less?	5	4
7	Must splits/voids be 1/4" wide or less?	6	4
8	Must splits/voids be 1/16" wide or less?	9	4
9	Must knots be 2" wide or less?	2	4
10	Must knots be 1-1/2" wide or less?	3	4
11	Must knots be 1" wide or less?	4	4
12	Must knot holes be 3" wide or less?	1	4
13	Must knot holes be 2" wide or less?	2	4
14	Must knot holes be 1-1/2" wide or less?	3	4
15	Must knot holes be 3/4" wide or less?	4	4
16	Will panels be cut into strips less than 8" and used in stressed applications?	9	4
17	Are minor thickness variation and sander skips acceptable?	7	7
18	Will face be subject to small diameter wheel loads?	5	4
19	Must face be fairly smooth? (60 grit or better)	7	7
20	Must face be very smooth? (80 grit or better)	10	8
21	Is an unsanded, unrepaired face OK?	1	4
22	Is thickness tolerance critical?	8	8
23	Is an attractive appearance after finishing important?	8	8
24	Is maximum finish/coating durability important?	12	-
25	Is abrasion resistance required?	11	-
26	Is chemical resistance required?	14	-
27	Will a standard high-pressure laminate be applied to panel face?	7	7
28	Will face be covered with a thin laminate?	9	8
29	Will panels be used in wet or exterior applications? (plywood only recommended)	3	N/R
30	Are there any special requirements not listed? (e.g. special machining, special overlays, use in hostile environments, preservative treating, wood species requirements)	*	*

First numbers of ICI (highest circled numbers)

* = Other requirements: (specify) _____

- = Not applicable

N/R = Not recommended

Panel Face and Back Characteristics

The range and type of characteristics available on panel faces and panel backs are virtually identical. Back characteristics may include a wide variety of overlays, a full range of veneer grades, and pressed surface or screen-textured OSB. Descriptions of back characteristics as well as some of the applications they're suited to are listed on pages 7 and 8.

WORKSHEET #2

PANEL BACK CHARACTERISTICS

Question	Circle numbers in columns at right if answer is "Yes"	Characteristic Number	
		Plywood/Composite	OSB
1	Is a high density overlay (HDO) required?	14	-
2	Is a medium density overlay (MDO) required?	13	-
3	Is a "best" back required?	9	4
4	Must splits/voids be 3" wide or less?	1	4
5	Must splits/voids be 1-1/2" wide or less?	3	4
6	Must splits/voids be 1/2" wide or less?	5	4
7	Must splits/voids be 1/4" wide or less?	6	4
8	Must splits/voids be 1/16" wide or less?	9	4
9	Must knots be 2" wide or less?	2	4
10	Must knots be 1-1/2" wide or less?	3	4
11	Must knots be 1" wide or less?	4	4
12	Must knot holes be 3" wide or less?	1	4
13	Must knot holes be 2" wide or less?	2	4
14	Must knot holes be 1-1/2" wide or less?	3	4
15	Must knot holes be 3/4" wide or less?	4	4
16	Will panels be cut into strips less than 8" and used in stressed applications?	9	4
17	If panel must be sanded, are minor sander skips acceptable?	7	7
18	Will back be subject to small diameter wheel loads?	5	4
19	Must back be fairly smooth? (60 grit or better)	7	7
20	Must back be very smooth? (80 grit or better)	10	8
21	Is an unsanded, unrepaired back OK?	1	4
22	Is an attractive appearance after finishing important?	8	8
23	Is maximum finish/coating durability important?	12	-
24	Is abrasion resistance required?	11	-
25	Is chemical resistance required?	14	-
26	Will a standard high-pressure laminate be applied to panel back?	7	7
27	Will back be covered with a thin laminate?	9	8
28	Will panels be used in wet or exterior applications? (plywood only recommended)	3	N/R
29	Are there any special requirements not listed? (e.g. special machining, special overlays, use in hostile environments, preservative treating, wood species requirements)	*	*

Second numbers of ICI (highest circled numbers)

* = Other requirements: (specify) _____

- = Not applicable

N/R = Not recommended

First Crossband Characteristics

The first crossband is the layer of veneer immediately beneath the face in plywood panels. Although OSB and composite panels by definition do not have crossbands, for the sake of simplicity this brochure refers to the layer of material beneath the face of all three panel types as the crossband. The third number in the ICI describes first crossband characteristics. Although the first crossband is not visible, it can be important to overall panel performance. First crossband characteristics fall into the three categories described below.

Best crossbands

Panels with best crossbands have strict limitations on allowable defects. Splits may be no more than 1/8 inch wide and no more than 48 inches long. Voids may be no greater than 1/16 inch in diameter.

Panels with best crossbands typically provide excellent performance for:

- Application of high pressure laminates.
- Edge banding.
- Nailing, screwing, stapling, riveting and gluing along panel edges.
- Cut-up or cut-to-size operations.
- Puncture resistance (concentrated loads).

Better crossbands

Panels with crossbands in this category may provide performance similar to best crossband panels. Splits up to 1 inch wide and 8 feet long are permitted. Voids up to 2 inches in diameter are permitted. Panels with better crossbands may be less suitable for banding, nailing, screwing, riveting and gluing along

the edge, and for application of high pressure laminates than panels with best crossbands. The presence of limited voids and splits in the crossband typically has little or no effect on other applications.

Because of their construction, OSB and composite panels meet better crossband specifications.

Panels with better crossbands typically provide good performance for:

- Cut-up or cut-to-size operations.
- Puncture resistance.

NOTE: APA recommends specifying panels with better or best crossbands if the panel will be subject to point loads or small wheel loads in service.

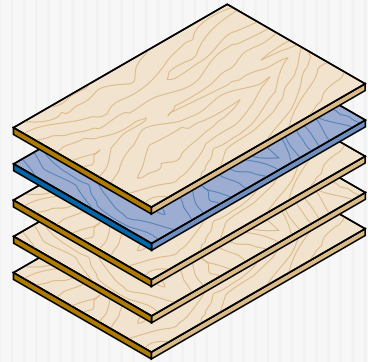
Standard crossbands

Voids in standard crossbands may be as large as 3 inches in diameter. Splits up to 1 inch wide and 8 feet long are permitted. Panels with standard crossbands may be specified for applications where panel edge, exposure and surface requirements are less critical.

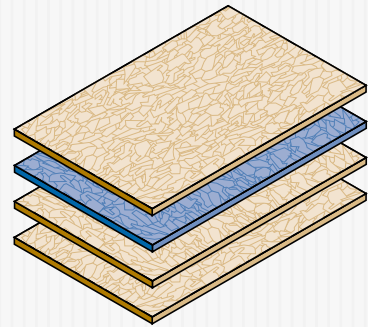
Panels with standard crossbands typically provide good performance for:

- Air ducts.
- Utility cabinets.
- Crates and bins.
- Upholstered furniture framing.
- Shelves and racks.
- Slave pallets.
- Solid deck stringer-type pallets.
- Structural framing for boats (encapsulated in fiberglass).
- Storage tanks.
- Temporary structures.

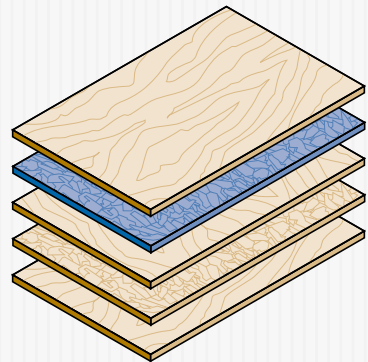
PLYWOOD



OSB



COMPOSITE



WORKSHEET #3

FIRST CROSSBAND CHARACTERISTICS

Question	Circle numbers in columns at right if answer is "Yes"	Characteristic Number	
		Plywood/Composite	OSB
1	Is puncture resistance required on face?	4	6
2	Will face be subject to small diameter wheel loads?	4	6
3	Will fasteners be inserted into panel face?	3	6
4	Will panel be cut into strips less than 8" in any direction?	4	6
5	Will panel be cut into strips less than 12" in any direction?	3	6
6	Will panel be cut into strips less than 24" in any direction?	2	6
7	Must splits/voids beneath face be 3" wide or less?	1	6
8	Must splits/voids beneath face be 2" wide or less?	2	6
9	Must splits/voids beneath face be 1-1/2" wide or less?	3	6
10	Must splits/voids beneath face be 1" wide or less?	4	6
11	Must splits/voids beneath face be 3/4" wide or less?	5	6
12	Must splits/voids beneath face be 1/2" wide or less?	6	6
13	Must splits/voids beneath face be 1/8" wide or less?	9	6
14	Are splits/voids unimportant?	1	6
15	Will a standard high-pressure laminate be applied to panel face?	4	6
16	Will panel be covered with a thin laminate on face?	6	6
17	Will panel be covered with a thin laminate on back?	6	6
18	Will panel be covered with hardboard on face?	3	6
19	Will panels be used in wet or exterior applications? (plywood only recommended)	3	N/R
20	Are there any special requirements not listed? (e.g. preservative treating, jointed inner plies, special wearing surfaces)	*	*

Third numbers of ICI (highest circled numbers)

* = Other requirements: (specify) _____

N/R = Not recommended

Inner Layer Characteristics

Any portion of a panel not previously identified as a face, back, or crossband shall be defined as an inner layer. Like the first crossband, the inner layers are important when panels are nailed, screwed, stapled, riveted, glued or banded on the edges. The ability to hold fasteners through the face and back also is affected by the characteristics of the inner layers. APA panels may be manufactured with several different types of inner layers.

Best inner layers

Best inner layers permit splits no more than 1/8-inch wide and 8 feet long. Voids may be no greater than 1/16 inch in diameter.

Best inner layer panels typically provide excellent performance for:

- Banding, nailing, screwing, stapling, doweling, riveting or gluing along panel edges.
- Cut-up or cut-to-size operations.
- Puncture resistance.

Better inner layers

Panels with better inner layers may provide performance similar to best inner layer panels. Splits up to 1 inch wide and 8 feet long are permitted. Voids up to 2 inches in diameter are permitted. Panels with better inner layers may be less suitable than best inner layer panels for applications that require banding, nailing, screwing, stapling, riveting, doweling and gluing along panel edges.

Panels with better inner layers typically provide good performance for:

- Cut-up or cut-to size operations.
- Puncture resistance.
- Edge fastening.

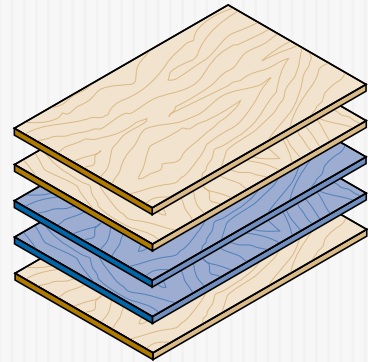
Standard inner layers

Voids as large as 3-1/2 inches in diameter are permitted. Splits up to 1 inch wide and 8 feet long are permitted. Panels with standard inner layers may be an economical alternative for applications where panel edge, exposure, surface and appearance requirements are less critical.

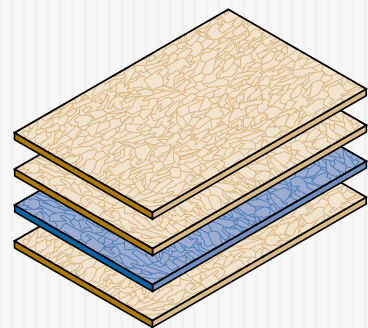
Panels with standard inner layers typically provide good performance for:

- Air ducts.
- Cabinets.
- Crates and bins.
- Shelving and racks.
- Slave pallets.
- Solid deck stringer-type pallets.
- Structural framing for boats (encapsulated in fiberglass).
- Storage tanks.
- Temporary structures.

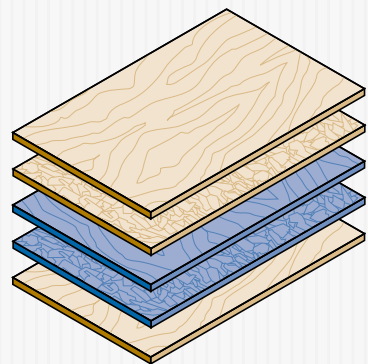
PLYWOOD



OSB



COMPOSITE



WORKSHEET #4

INNER LAYER CHARACTERISTICS

Question	Circle numbers in columns at right if answer is "Yes"	Characteristic Number	
		Plywood/Composite	OSB
1	Is puncture resistance required on back?	4	6
2	Will back be subject to small diameter wheel loads?	4	6
3	Will fasteners be inserted into back?	3	6
4	Will fasteners be inserted into edges?	7	6
5	Will panel be edge banded?	4	6 ⁽¹⁾
6	Will panel be cut into strips less than 8" in any direction?	4	6
7	Will panel be cut into strips less than 12" in any direction?	3	6
8	Will panel be cut into strips less than 24" in any direction?	2	6
9	Must splits/voids beneath back be 2" wide or less?	2	6
10	Must inner layer splits/voids be 2" wide or less?	2	6
11	Must splits/voids beneath back be 1-1/2" wide or less?	3	6
12	Must inner layer splits/voids be 1-1/2" wide or less?	3	6
13	Must splits/voids beneath back be 1" wide or less?	4	6
14	Must inner layer splits/voids in be 1" wide or less?	4	6
15	Must splits/voids beneath back be 3/4" wide or less?	5	6
16	Must inner layer splits/voids be 3/4" wide or less?	5	6
17	Must splits/voids beneath back be 1/2" wide or less?	6	6
18	Must inner layer splits/voids be 1/2" wide or less?	6	6
19	Must splits/voids beneath back be 1/8" wide or less?	9	6
20	Must inner layer splits/voids be 1/8" wide or less?	9	6
21	Are splits/voids unimportant?	1	6
22	Will a standard high-pressure laminate be applied to panel back?	4	6
23	Will a thin laminate be applied to back?	6	6
24	Will hardboard be applied to back?	3	6
25	Will panels be used in wet or exterior applications? (plywood only recommended)	3	N/R
26	Are there any special requirements not listed? (e.g. preservative treating, jointed inner plies, special wearing surfaces)	*	*

Fourth numbers of ICI (highest circled numbers)

* = Other requirements: (specify) _____
 N/R = Not recommended
 (1) Proprietary grades of OSB are available with special inner-layer characteristics designed to enhance fastener performance. Contact your APA supplier or your field representative for further information.

INDUSTRIAL CATEGORY INDEX

PLYWOOD or COMPOSITE PANELS
 (Highest numbers from all four worksheets, in order) = - - -

OSB PANELS
 (Highest numbers from all four worksheets, in order) = - - -



SAMPLE SPECIFICATION

The following sample specification demonstrates how to use the worksheets to identify the ICI of APA panel products and how to specify products for your supplier.

A grocery store chain is building a new warehouse. The facility will have an automated storage and retrieval system with unit-load retrieval towers and robot carriers. The slave pallets for the system will be made with APA panels. The plant engineers gave the purchasing agent the following information:

- 1) Cardboard boxes will be used on the slave pallets (a solid, fairly smooth surface is needed – face voids up to 3/4 inch are acceptable).
- 2) The pallet must be reversible.
- 3) Overlays are not necessary.
- 4) Thickness tolerance is not critical.

What is the ICI of the panel required for the slave pallet panels?

Beginning with worksheet #1 (Panel Face Characteristics), we find that questions 4, 5, 12, 13, 14, 15, 17 and 19, are answered “yes.” The highest circled Characteristic Number, in both the plywood/composite and OSB columns, is 7. Therefore, the *first number in the ICI is 7.*

As the slave pallet must be reversible, the Panel Back Characteristics are the same as the face, *making it unnecessary to fill out worksheet #2. Therefore 7 is also the second number in the ICI.*

EXCERPT FROM WORKSHEET 1

3	Is a "best" face required?	9	4
4	Must splits/voids be 3" wide or less?	①	④
5	Must splits/voids be 1-1/2" wide or less?	③	④
6	Must splits/voids be 1/2" wide or less?	5	4
7	Must splits/voids be 1/4" wide or less?	6	4
8	Must splits/voids be 1/16" wide or less?	9	4
9	Must knots be 2" wide or less?	2	4
10	Must knots be 1-1/2" wide or less?	3	4
11	Must knots be 1" wide or less?	4	4
12	Must knot holes be 3" wide or less?	①	④
13	Must knot holes be 2" wide or less?	②	④
14	Must knot holes be 1-1/2" wide or less?	③	④
15	Must knot holes be 3/4" wide or less?	④	④
16	Will panels be cut into strips less than 8" and used in stressed applications?	9	4
17	Are minor thickness variation and sander skips acceptable?	⑦	⑦
18	Will face be subject to small diameter wheel loads?	5	4
19	Must face be fairly smooth? (60 grit or better)	⑦	⑦
20	Must face be very smooth? (80 grit or better)	10	8

Only question 14 on the third worksheet (first crossband characteristics) received a "yes" answer. *The third Characteristic Number is 1 for plywood and composite panels, and 6 for OSB.*

EXCERPT FROM WORKSHEET 3

14	Are splits/voids unimportant?	①	⑥
----	-------------------------------	---	---

Similarly, only question 21 on the fourth worksheet (inner layer characteristics), was answered "yes," making the *fourth Characteristic Number 1 for plywood and composite panels, and 6 for OSB.*

EXCERPT FROM WORKSHEET 4

21	Are splits/voids unimportant?	①	⑥
----	-------------------------------	---	---

The application requires a plywood or composite panel with an ICI of 7-7-1-1 or an OSB panel with an ICI of 7-7-6-6 (OSB).

INDUSTRIAL CATEGORY INDEX

PLYWOOD or COMPOSITE PANELS (Highest numbers from all four worksheets, in order)	=	⑦	-	⑦	-	①	-	①
OSB PANELS (Highest numbers from all four worksheets, in order)	=	⑦	-	⑦	-	⑥	-	⑥

Selecting APA Panel Products

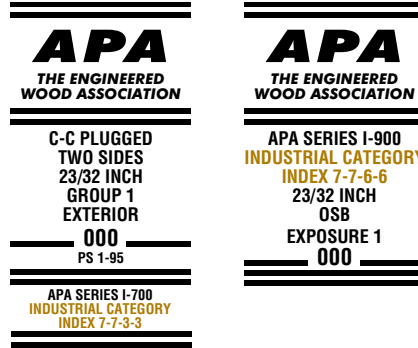
The APA Panel Translator Chart on Page 19 shows that the available construction grade panels with the lowest acceptable ICI for this application are Structural I, C-C Plugged and Touch Sanded (two sides) Exterior, or C-C Plugged and Touch Sanded (two sides) Exterior. Both are available only as plywood or composite panels, with an actual ICI of 7-7-3-3 or 7-7-4-4 depending on how they are manufactured. Either grade will work regardless of how it is manufactured.

No commonly available construction grade of OSB meets the ICI of 7-7-6-6 (OSB) required for the application, although it may be possible to custom manufacture an OSB panel with an ICI of 7-7-6-6 (OSB).

Possible substitute panels can be identified using the Characteristics Locator Charts on Pages 20 through 23.

The APA Industrial Category Index is found exclusively in the trademark stamps of panels manufactured by APA member mills. To assure accurate specification of panels for industrial applications, insist on the APA trademark.

Note: Plugged, Touch Sanded, and Sturd-I-Floor panels are commonly manufactured with tongue and groove edges. Specify "square edge" if tongue and groove edges are not wanted.



APA PANEL TRANSLATOR CHART

APA Industrial Category Index	Typical Construction Grade(s)
14-14-9-9	Marine/Special Exterior HDO (Two sides)
14-14-7-7	A-A HDO (Two sides)
	B-B HDO (Two sides)
13-13-9-9	Marine/Special Exterior MDO (Two Sides) Two Step
13-9-3-3	B-B MDO (One Side) Two Step
12-12-3-3	B-B MDO (Two Sides) One Step
12-9-9-9	Marine/Special Exterior MDO (One Side) One Step
12-9-3-3	B-B MDO (One Side) One Step
10-10-9-9	A-A Marine
10-10-3-3	A-A Exterior
10-9-9-9	A-B Marine
10-9-3-3	A-B Exterior
10-3-3-3	A-C Exterior
9-9-9-9	B-B Marine
9-9-3-3	B-B
9-3-3-3	B-C
7-7-4-4 or 7-7-3-3	Structural I C-C Plugged and Touch Sanded (Two Sides) Exterior
	C-C Plugged and Touch Sanded (Two Sides) Exterior
7-6-6-6 (OSB) or 7-4-6-6 (OSB)	Structural I OSB Sturd-I-Floor
	OSB Sturd-I-Floor
7-3-4-3 or 7-3-3-3	Structural I C-C Plugged and Touch Sanded (One Side) Exterior
	Structural I Plywood Sturd-I-Floor Exterior
	C-C Plugged and Touch Sanded (One Side) Exterior
	Plywood Sturd-I-Floor Exterior
	Underlayment Exterior
7-1-4-1 or 7-1-3-1	Structural I C-D Plugged and Touch Sanded (One Side) Exposure I
	Structural I Plywood Sturd-I-Floor Exposure I
	C-D Plugged and Touch Sanded (One Side) Exposure I
	Plywood Sturd-I-Floor Exposure I
4-6-6-6 (OSB) or 4-4-6-6 (OSB)	Underlayment Exposure I
	Structural I OSB Sheathing Exposure I
3-3-3-3	OSB Sheathing Exposure I
	Structural I C-C Exterior
3-3-1-1	C-C Exterior
	Structural I C-D-C Exposure I
3-1-1-1	C-D-C Exposure I
	C-D Exposure I
1-1-1-1	D-D Exposure I

PLYWOOD/COMPOSITE PANELS CHARACTERISTICS LOCATOR CHART

FACE CHARACTERISTICS

Surface	Characteristic Number	Characteristic	Typical Grade Description
Overlaid Surface	14	HDO	
	13	MDO 2-Step	Sanded prior to overlay
	12	MDO 1-Step	Overlay over unsanded veneer
	11	Tempered Hardboard MDF	
Best Surface	10	A-Sanded	100% Sanded (typically 80 grit or better)
	9	B-Sanded	5% sander skips allowed (typically 60 grit or better)
Better Surface	8	C-Plugged Full Sanded	5% sander skips allowed (typically 60 grit or better)
	7	C-Plugged Touch Sanded	Unlimited sander skips allowed (typically 60 grit or better)
	6	C-Plugged Unsanded	
	5	Knotty-Plugged Touch Sanded	
Standard Surface	4	Tight-C Unsanded	
	3	C-Face Unsanded	
	2	High-D Unsanded	
	1	D-Face Unsanded	
Other Requirements	0		

BACK CHARACTERISTICS

Surface	Characteristic Number	Characteristic	Typical Grade Description
Overlaid Surface	14	HDO	
	13	MDO 2-Step	Sanded prior to overlay
	12	MDO 1-Step	Overlay over unsanded veneer
	11	Tempered Hardboard MDF	
Best Surface	10	A-Sanded	100% Sanded (typically 80 grit or better)
	9	B-Sanded	5% sander skips allowed (typically 60 grit or better)
Better Surface	8	C-Plugged Full Sanded	5% sander skips allowed (typically 60 grit or better)
	7	C-Plugged Touch Sanded	Unlimited sander skips allowed (typically 60 grit or better)
	6	C-Plugged Unsanded	
	5	Knotty-Plugged Touch Sanded	
Standard Surface	4	Tight-C Unsanded	
	3	C-Face Unsanded	
	2	High-D Unsanded	
	1	D-Face Unsanded	
Other Requirements	0		

Industry Standard Items

PLYWOOD/COMPOSITE PANELS CHARACTERISTICS LOCATOR CHART

FIRST CROSSBAND CHARACTERISTICS

First Crossband	Characteristic Number	Void Limit**	Gap Limit	Typical Grade Description
Best Crossband	9	1/16"	1/8" x 48"	Marine Grade
Better Crossband	8	1/16"	1/2" x 48"	B-Grade
	7	1/2"	1/2" x 48"	C-Plugged
	6	Minimal	Minimal	Composite core
	5	3/4"	3/4" x 48"	Tight-C*
	4	1"	1" x 48"	High-C*
	3	1-1/2"	1" x 48"	C-Grade*
	2	2"	1" x 48"	High D
Standard Crossband	1	3"	1" x 48"	D-Grade
Other Requirements	0			

INNER LAYER CHARACTERISTICS

Inner Layer	Characteristic Number	Void Limit	Gap Limit	Typical Grade Description
Best Inner Layer	9	1/16"	1/8" x 48"	Marine Grade
Better Inner Layer	8	1/16"	1/2" x 48"	B-Grade
	7	1/2"	1/2" x 48"	C-Plugged
	6	Minimal	Minimal	Composite core
	5	3/4"	3/4" x 48"	Tight-C*
	4	1"	1" x 48"	High-C*
	3	1-1/2"	1" x 48"	C-Grade*
	2	2"	1" x 48"	High D
Standard Inner Layer	1	3-1/2"	1" x 48"	D-Grade
Other Requirements	0			

*Splits/voids may be limited to 3/8" if "Jointed inner plies" are specified as on "Other Requirement."

**Splits/voids measured across grain.

OSB CHARACTERISTICS LOCATOR CHART

FACE CHARACTERISTICS

Surface	Characteristic Number	Characteristic	Typical Grade Description
Overlaid Surface⁽¹⁾	14		
	13		
	12		
	11		
Best Surface	10		
	9		
	8	Sanded Face	
Better Surface	7	Touch-sanded Face	
Standard Surface	6	Screen Textured Face	
	5		
	4	Pressed Face	
	3		
	2		
	1		
Other Requirements	0		

BACK CHARACTERISTICS

Surface	Characteristic Number	Characteristic	Typical Grade Description
Overlaid Surface	14		
	13		
	12		
	11		
Best Surface	10		
	9		
	8	Sanded Back	
Better Surface	7	Touch-sanded Back	
Standard Surface	6	Screen Textured Back	
	5		
	4	Pressed Back	
	3		
	2		
	1		
Other Requirements	0		

(1) See APA supplier for proprietary OSB overlaid products.

OSB CHARACTERISTICS LOCATOR CHART

FIRST CROSSBAND CHARACTERISTICS

First Crossband	Characteristic Number	Characteristic	Description
Better Crossband	9		
	8		
	7		
	6	Standard Density	
	5		
	4		
	3		
	2		
	1		
Other Requirements	0		

INNER LAYER CHARACTERISTICS

Inner Layer	Characteristic Number	Characteristic	Description
Better Inner Layers	9		
	8		
	7		
	6	Standard Density	
	5		
	4		
	3		
	2		
	1		
Other Requirements	0		

GLOSSARY OF TERMS

Back

The lower-grade side of any veneer-faced panel that has outer plies of different veneer grades. For example, the back of an A-C panel is the side with the C-grade outer ply. (See Face.)

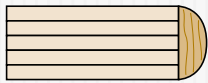
Cross-lamination

In plywood, cross-lamination is the practice of orienting the grain of alternating layers of veneer at 90 degrees. In OSB, alternating layers of wood strands are also oriented at 90 degrees. Cross-lamination provides strength and stiffness across both the width and length of the panel and helps reduce shrinking and swelling.

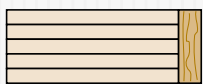
Edge banding

Any piece of wood, metal, plastic or other material affixed to a panel edge to provide protection or improve appearance.

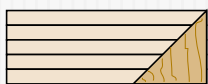
EDGE TREATMENTS



Butt edging. Keep edges square; use matching strip of solid wood.



Butt edging. Keep edges square; use matching strip of solid wood.



"Mitered" butt edging. Use glue and brads to fasten strips.

Exposure 1

Exposure 1 panels have a fully waterproof bond and are designed for applications where long construction delays may be expected prior to providing protection, or where high moisture conditions may be encountered in service. Exposure 1 panels are made with the same exterior adhesives used in Exterior panels. However, because other compositional factors may affect bond performance, only Exterior panels should be used for permanent exposure to the weather.

Exterior

Exterior panels have a fully waterproof bond and are designed for applications subject to permanent exposure to water or moisture.

Face

The highest-grade side of any veneer-faced panel that has outer plies of different veneer grades. Also, either side of a panel where grading rules draw no distinction between faces. For example, the face of an A-C panel is the side with the A-grade outer ply. Both sides of an A-A or B-B panel are referred to as faces.

HDO

High Density Overlay. Exterior plywood finished with a resin-impregnated fiber overlay to provide extremely smooth, hard surfaces that need no additional finishing. HDO has high chemical and abrasion resistance properties. The overlay material is bonded to both sides of the panel and is an integral part of the panel face and back. HDO typically provides excellent performance for concrete forms, cabinets, highway signs, acid tanks, and countertops.

High pressure laminates

Decorative laminated plastic sheets which consist of papers, fabrics, or other core materials that have been laminated at high pressures, using thermosetting condensation resins as binders. Surface finishes range from high gloss smooth to fully textured or embossed. Laminates can be made in a wide range of solid colors and printed patterns.

Industry standard items

Readily available panel product features defined by industry standards PS 1-95, PRP 108 or PS 2-92, which are geared primarily toward construction applications.

Jointed crossband

Crossband veneer with square, machined edges. Gaps between pieces of crossband and inner ply veneer shall not exceed 3/8 inch and the average of all gaps in the panel shall not exceed 3/16 inch.

Knotholes

Voids created when a knot drops out of veneer. Size measured across grain.

Knots

Natural growth characteristic of wood, caused by a branch base imbedded in a tree trunk.

Marine grade

Panels manufactured with the same glueline requirements as Exterior panels but with more restrictive species and veneer quality requirements. Marine grade typically provides excellent performance in marine applications where bending is required, such as boat hulls.

MDF

Medium density fiberboard. A compressed fiberboard of 25 - 50 lbs per cubic foot density. Manufactured for a wide range of uses including construction and furniture.

MDO

Medium Density Overlay. Exterior plywood finished with an opaque, resin-treated fiber overlay. MDO has a smooth surface ideal for painting. MDO typically provides excellent performance for siding and other outdoor applications, built-ins, signs, displays and furniture.

OSB

Oriented Strand Board. Structural wood panels manufactured from reconstituted, mechanically oriented wood strands bonded with resins under heat and pressure. Oriented strand material may be produced as the center layer of composite panels, or may be cross laminated in layered panels. OSB panels typically have a screened or textured non-skid surface on one side, or can be sanded.

Overlay

Any factory-applied material bonded to one or both sides of a panel. May include resin treated fiber (see HDO, MDO), fiberglass, plastic, metal, hardboard, etc. Only HDO and MDO are typically applied by panel manufacturers. Other overlays are generally applied by a secondary manufacturer.

Panel grade

May refer to the letter-graded quality of face and back veneers used in plywood manufacture (see veneer grades), or to panels manufactured for specific construction applications, e.g., Underlayment. May also refer to APA Performance Rated Panels®, such as APA Rated Sheathing, APA Rated Siding, or APA Rated Sturd-I-Floor.

Plug

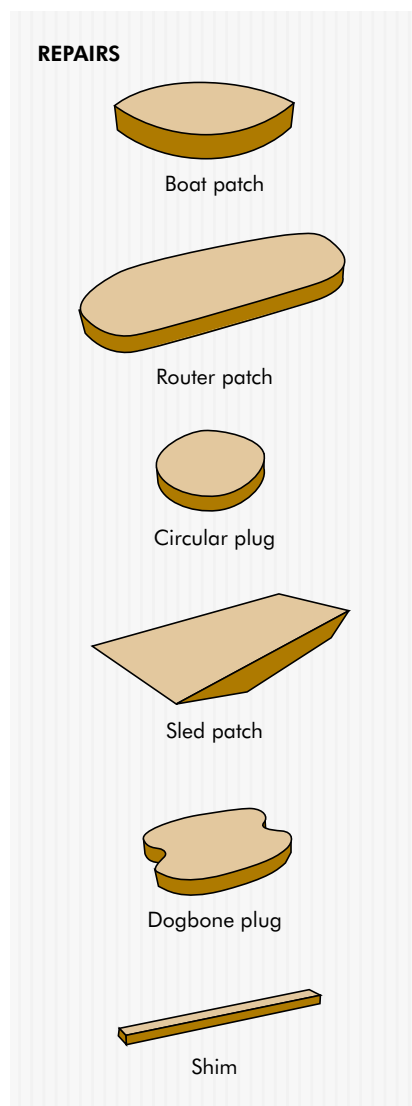
See repairs.

Pressed face/back

One of the surface textures available on OSB. Pressed face/back OSB panels have a relatively smooth, low-friction surface (see screen textured).

Repairs

Any patch, plug or shim in a veneer. A patch or plug may be made of wood or a synthetic material of fiber and resin used to fill openings and provide a smooth, level surface. A shim is a long, narrow wood or synthetic repair not more than 3/16 inch wide.



Sanded panels

Plywood panels factory-sanded for smoothness and appearance. Sanded panels typically provide excellent performance for furniture, cabinets, doors, fences, signs, etc.

Sander skips

On sanded and touch-sanded surfaces, areas missed during sanding. No sander skips are permitted on A grade faces. Five percent sander skips are permitted in B grade faces. Touch sanded panels allow unlimited sander skips due to the fact that touch sanding is a sizing operation and is not meant to create a smooth surface (see touch-sanding).

Screen textured

One of the surface textures available on OSB. Screen textured panels provide traction/slip resistance (see pressed back/face).

Sheathing (APA Rated Sheathing®)

Panel designed and manufactured specifically for application to studs, rafters or joists in residential or light frame construction.

Special wearing surface

A surface overlay applied to a panel face or back to increase resistance to surface abrasion. May include HDO, MDO or other typical overlays.

Standard density

The typical density of OSB when manufactured to meet industry standards. Custom densities may be specified for special-ordered OSB panels.

Structural I

Panel grade for applications that require maximum shear properties and cross-panel strength characteristics. Structural I panels may be manufactured as plywood or OSB.

**Sturd-I-Floor®
(APA Rated Sturd-I-Floor®)**

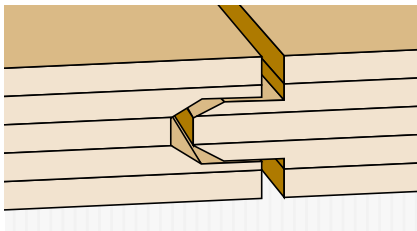
A grade of APA Performance Rated Panel designed and manufactured for use in subfloor applications in residential and light commercial construction. Typically has tongue and groove edges.

Tight Knots

Knots formed when the branches are living at the time they are surrounded by the trunk. The tissue of tight knots is continuous with the tissue of the main stem and is unlikely to drop out of the veneer.

Tongue & Groove (T&G) edges

A system of jointing in which the rib or tongue of one member fits exactly into the groove of another. APA panels with tongue and groove edges are particularly efficient at transferring loads across joints. Specification should state “square edges” if tongue and groove is not desired for industrial application.



Touch-sanding

An operation in which panels are sized to uniform thickness by light surface sanding during manufacture.

Underlayment

A panel designed for installation directly beneath nonstructural finish flooring, such as tile, vinyl or carpeting. Plywood underlayment provides a smooth surface and excellent puncture and indentation resistance.

Veneer grades

Categories of veneer quality based upon natural growth characteristics and repairs. See chart on below for specific veneer grades and descriptions.

Voids

An opening in veneer or a gap between two pieces of veneer.

Vinyl Film Overlay

Vinyl film overlays, made of polyvinyl chloride (PVC), are used for decorative surfacing and may be either clear or

solid color. Vinyl films are divided into six categories: 2 mil reverse printed rigid film; semirigid clear film; sandwich film; solid color film, thermoformed overlay films, and wrapping films. Additional information on vinyl films is available from the Laminating Materials Association, phone (201) 664-2700.

GENERAL DESCRIPTION OF VENEER GRADES FOR INDUSTRIAL PANELS

A	Smooth, paintable. Not more than 18 neatly-made repairs permitted, boat, sled or router type. Repairs must be parallel to grain and may be wood or synthetic.
B	Solid surface. Shims, plugs, sled or router repairs and occasional tight knots to 1 inch across grain permitted. Wood or synthetic repairs permitted. Some minor splits permitted.
C Plugged	Improved C veneer with splits limited to 1/8 inch width and knotholes or other open defects limited to 1/4 x 1/2 inch. Occasional tight knots to 1-1/2 inch. Wood or synthetic repairs permitted. Admits some broken grain.
Knotty-Plugged	Multiple tight knots to 1 inch. Knotholes or other open defects limited to 1/2 inch across grain. Wood or synthetic repairs permitted. Discoloration and sanding defects that do not impair strength permitted. Limited splits allowed. Stitching permitted. Normally used for face or back only.
Tight C	Tight knots to 1 inch. Knotholes to 3/4 inch across grain. Wood or synthetic repairs permitted. Discoloration and sanding defects that do not impair strength permitted. Limited splits allowed.
High C	Tight knots to 1-1/2 inch. Knotholes to 1 inch. Commonly used as a first crossband behind thin face or back plies to prevent “punch through” failures.
C	Tight knots to 1-1/2 inch. Knotholes to 1-1/2 inch. Wood or synthetic repairs permitted. Discoloration and sanding defects that do not impair strength permitted. Limited splits allowed. Stitching permitted.
High D	Tight knots to 2 inches, limited in number. Knotholes to 2 inches, limited in number. Wood or synthetic repairs permitted. Discoloration and sanding defects that do not impair strength permitted. Limited splits allowed. Stitching permitted.
D	In outer layers, knots and knotholes to 3 inches wide across grain. In inner layers, tight knots are permitted, and knotholes to 3-1/2 inches in some panel grades. Limited splits are permitted. Stitching permitted. Not appropriate for panels used in permanent wet or exterior applications.

ABOUT APA

APA – *The Engineered Wood Association* is a nonprofit trade association whose member mills produce approximately 70 percent of the structural wood panel products manufactured in North America.

Founded in 1933 as the Douglas Fir Plywood Association and widely recognized today as the foremost authority in the structural wood panel industry, APA performs numerous functions and services on behalf of panel product users, specifiers, dealers, distributors, schools and universities and other key groups.

Among the most important of these functions is quality inspection and testing. APA trademarks appear only on products manufactured by APA member mills and signify that panel quality is subject to verification through APA audit – a procedure designed to assure manufacture in conformance with APA performance standards or *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 maintains five quality testing laboratories in key producing regions and a 37,000-square-foot research center at Association headquarters in Tacoma, Washington.

But quality validation is only one of APA's many functions. The Association also:

- Operates the most sophisticated program for basic panel research in the world.
- Maintains an international network of field representatives to assist panel product users, specifiers, dealers, distributors and other segments of the trade.
- Conducts informational buyer and specifier seminars and provide dealer and distributor sales training.
- Publishes a large inventory of publications on panel grades, applications, design criteria and scores of other topics.
- Advertises and publicizes panel product systems and applications in national trade and consumer magazines.
- Works to secure acceptance of structural wood panel products and applications by code officials, insuring agencies and lending institutions.

- Develops and maintains performance and industry product standards.
- Conducts in-depth market research and development programs to identify and penetrate new panel markets in the U.S. and abroad.
- Works in conjunction with other wood product industry organizations on solutions to problems of common concern.

Always insist on panels bearing the mark of quality – the APA trademark. Your APA panel purchase or specification is your highest assurance of quality. It is also an investment in the many trade services and programs that APA undertakes on your behalf.

For More Information

APA has several brochures to help industrial users make the most of the panel products manufactured by APA member mills. The titles listed below may be of particular interest.

Membership and Product Directory, Form K815
Lists all APA member mills and the products they manufacture. Includes key sales personnel.

Grades and Specifications, Form J20
Complete Guide to Product Standard PS 1 and APA proprietary grades, plus standard architectural specifications.

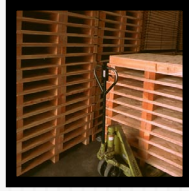
Transport Equipment, Form G210
Describes ways APA panels can be used to fabricate a wide range of transportation equipment including truck, trailer and container bodies and liners. Also includes information on estimating allowable design loads for fasteners.

Containers and Bins, Form X235
Describes APA bin designs and proprietary containers available from several manufacturers.

Materials Handling, Form M200
Descriptions, specifications and fabrication instructions for pallets, pallet bins, liquid tanks and bins, crating and shelving.

Slave Pallets, Form S225
Includes description of slave pallet features, grade specifications and design recommendations.

Contact one of the APA offices listed on the back of this brochure to request any of the above titles.



INDUSTRIAL PANEL SELECTION GUIDE

INDUSTRIAL USE GUIDE

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:

U.S. HEADQUARTERS AND INTERNATIONAL MARKETING DIVISION

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



www.apawood.org

PRODUCT SUPPORT HELP DESK

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

(Offices: Bournemouth, United Kingdom;
Mexico City, Mexico; Tokyo, Japan.)

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.

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APA

The Engineered Wood Association

