Architectural
Woodwork Standards

# SHEET PRODUCTS

SECTION 4

# SECTION 4
Sheet Products

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## COMPLIANCE REQUIREMENTS (continued)

# introductory information



## INTRODUCTION

Section 4 is the second "material" section. This section includes a wide range of sheet goods, Hardwood and Softwood Veneers, High Pressure Decorative Laminate, Overlays, Backers, Solid Surface, Solid Phenolic, Epoxy Resin, and Natural and Manufactured Stone. This section identifies common panel cores and panel surfaces referred to in subsequent product sections. It contains material rules specific to all of the sheet products the section covers.

Quality assurance can be achieved by adherence to the AWS and will provide the owner a quality product at competitive pricing. Use of a qualified Sponsor Member firm to provide your woodwork will help ensure the manufacturer's understanding of the quality level required. Illustrations in this Section are not intended to be all inclusive, other engineered solutions may be acceptable. In the absence of specifications; methods of fabrication are the manufacturer's choice. The design professional, by specifying compliance to the AWS increases the probability of receiving the product quality expected.

## PLYWOOD

The term "plywood" is defined as a panel manufactured of three or more layers (plies) of wood or wood products (veneers or overlays and/or core materials), generally laminated into a single sheet (panel).

## TYPES OF PANELS

There are a wide range of panel materials available for the fabrication of architectural woodwork.

Property and performance characteristics are influenced by the panel grade, panel thickness, and materials used for the core:

- Surface uniformity has a direct relationship to the performance of the face veneers.
- Dimensional stability relates to the effect of exposure to wide swings in temperature and relative humidity.
- Screw holding and bending strength are influenced by and should be considered in design engineering.

Architectural panels with applied decorative surface materials are made up of a variety of core types including: Particleboard, Medium Density Fiberboard (MDF), Veneer, Hardboard, Lumber, Combination and Agrifiber/Agrofiber.

## PRIMARY CORE MATERIALS

- **Industrial Grade Particleboard** - Sometimes referenced as composite core, is made of wood particles of various sizes that are bonded together with a synthetic resin or binder under heat and pressure.

  Medium Density Industrial Particleboard is used in the broadest applications of architectural woodwork. It is especially well suited as a core for veneers and decorative laminates.

  When used as panels without surface plies, the product is referred to as particleboard. When used as an inner core with outer wood veneers, the panel is referred to as particle core plywood.

  Industrial particleboard is commercially classified by "density," which is measured by the weight per cubic foot of the panel product.

  - Medium Density (M series) = generally between 40-50 pounds per $ft^3$ (640-800 kg per $m^3$).
  - High Density (H series) = generally above 50 pounds per $ft^3$ (800 kg per $m^3$).

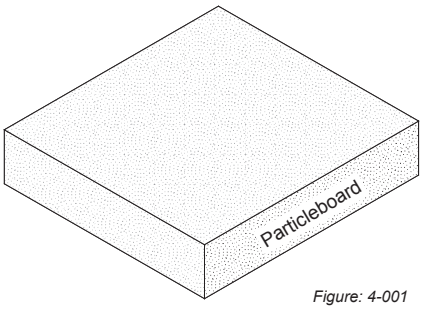


*Figure: 4-001*

- **Moisture resistant particleboard** - Some Medium Density Industrial Particleboard is bonded with resins more resistant to swelling when exposed to moisture. The most common grades are ANSI A-208.1 (latest edition) Type M-2-Exterior Glue and M-3-Exterior Glue.
- **Fire Retardant Particleboard** - Some Medium Density Industrial Particleboard has been treated during manufacture to carry a UL stamp for Class I flame spread rating (Flame spread 20, Smoke developed 450). Fire retardant Medium Density Fiberboard is also available.
- **Medium Density Fiberboard (MDF)** - Sometimes referenced as composite core, is made of wood particles reduced to fibers in a moderate pressure steam vessel, combined with a resin, and bonded together under heat and pressure.
- Due to the finer texture of the fibers used in manufacturing Medium Density Fiberboard (MDF) it is smoother than Medium Density Particleboard. The uniform texture and density of the fibers create a homogenous panel that is very useful as a core for paint, thin overlay materials, veneers and decorative laminates. MDF is among the most stable of the mat formed panel products. When used as an inner core with outer wood veneers, the panel is referred to as MDF core plywood.

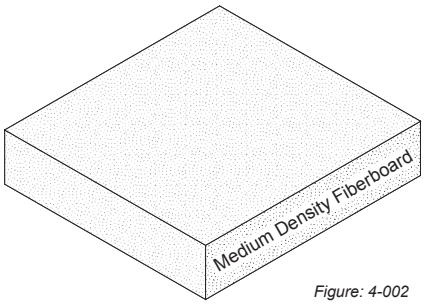


*Figure: 4-002*

- **Moisture Resistant Mdf -** Can be manufactured to meet the ANSI A-208.2 (latest edition) reduced thickness swell criteria.
- **Veneer** - Is separated into two groups according to materials and manufacturing:
  - **Hardwood Veneer** - Panels manufactured of hardwood veneers.
  - **Softwood Veneer** - Panels manufactured of softwood veneers.

  Hardwood or Softwood Veneers used as a core is not recommended in many areas of the AWS due to poor stability, but do have many other structural characteristics. It is recommended that veneer core panels be used only when they can be housed or in areas where warping in not a significant issue.

**PRIMARY CORE MATERIALS** (continued)

- **Veneer** (continued)

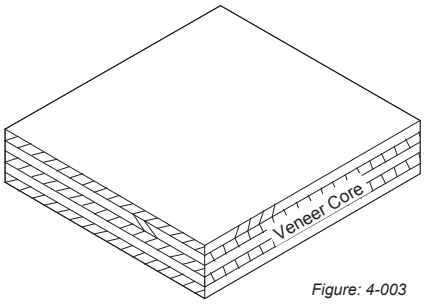


*Figure: 4-003*

What many think of as traditional "plywood", is a panel core made up of an odd number of plies, 3 or more (except when the center is constructed of two unidirectional plies), alternating layers of veneers, all less than 1/4" (6.4 mm) thick, pressed and glued into a single sheet. The two outside veneer layers are the Face and Back. The interior veneer bands are cross bands and parallel bands. The latter is sometimes referenced as centers. Veneer bands are layered at right angles to the adjoining veneer layer.

- **Hardboard** - Is defined as inter felted fibers consolidated under heat and pressure to a density of 500 kg per $m^3$ (31 pounds per cubic foot) or greater.

  Hardboard is available with either one side (S1S) or two sides (S2S) smooth.

  There are typically two types of hardboard core used by architectural manufacturers:

  - Standard (untempered).
  - Tempered, which is standard hardboard subjected to a curing treatment increasing its stiffness, hardness, and weight.

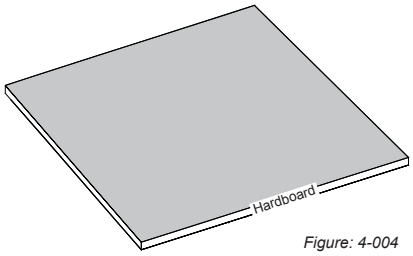


*Figure: 4-004*

- **Lumber** - Is where the center ply, called the "core" is composed of strips of lumber edge glued into a solid slab. This type is usually 5-ply, 3/4" (19 mm) thick, but other thickness from 1/2" (12.7 mm) to 1-1/8" (28.6 mm) are manufactured for special uses. There are three main types:

  - Staved - is where the core strips are random length and butt joined.
  - Full Length - is where the core strips are one piece in length.
  - Banded - is where the outside strips run full length and the others are random length. Banding may be the same species of lumber as the rest of the core, but it is usually matched to the face and might include all four edges. Banded plywood is typically produced for special uses, such as furniture, desk tops, and cabinet doors.

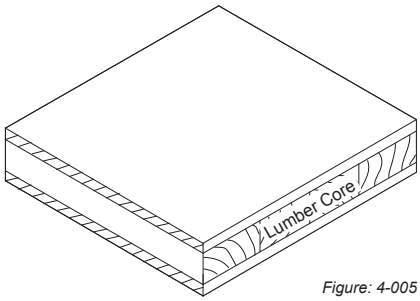


*Figure: 4-005*

- **Agrifiber/Agrofiber** - Panel products made from straw and similar fiber are appearing in the marketplace. Panels shall meet the performance characteristics of ANSI A208.1 or ANSI A208.2 standards.

  The characteristics of agrifiber/agrofiber core material performance vary by manufacturer, and are not included in the following table.

- **Combination** - A balanced hybrid blend of veneer and composition core materials offering some of the properties of both. Typically these cores have internal layers which are constructed of three or five plies of veneer or a center layer of wafer board (randomly oriented wafers) or other wood fiber which are sandwiched between thin laminations of a composite product like MDF, particleboard, hardboard, etc.

  Typically these products result in stronger, lighter weight, dimensionally stable panels with increased screw holding ability, and superior surface flatness. Combination panels shall meet the standards of particleboard or MDF as stated in this manual, density excepted.

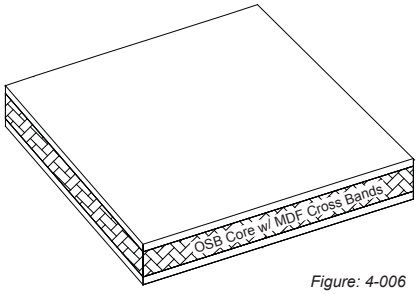


*Figure: 4-006*

- **Forming (Bendable) -** Assembled and/or machined cores made of hardboard, veneer, particleboard and/or MDF for radius work are manufactured under various trade names. When used for freestanding work these Forming Cores must be a balanced panel but if bound (restrained) the panel is not required to be balanced.
- **Solid Phenolic (SP)** - A composite of solid phenolic resins molded with a homogeneous core of organic fiber reinforced phenolic and one or more integrally cured surfaces of compatible thermoset nonabsorbent resins. SP has seen some use in recent years as wall surfacing, casework parts, and countertops.
- **Other Panel Material** - Shall meet the minimum performance characteristics of ANSI A208.1, ANSI A208.2 or ANSI/HPVA HP-1 (latest edition) standards.

  - Engineered Wood/Panel - Is a general term used to describe any wood or plant fiber composite panel. Such products as Particleboard, MDF, SCL and LVL are described as an engineered wood or plant fiber. Typically they are made from wood or plant fiber or wood pieces and have specific esthetic and physical attributes.

# introductory information

**PRIMARY CORE MATERIALS** (continued)

- **Other Panel Material** (continued)
  - **Bamboo** is a building material attracting much attention due to its quick replenishing and growing cycles as a green product. It is a grass product and not a true wood product. Due to its relatively new emergence in use as a building material, the performance evaluation as a stable and viable building material has not been established. The Architectural Woodwork Standards does not cover or endorse the use of bamboo and encourages the design professional to consult with Bamboo manufacturers and distributors as to its characteristics and viability as an architectural millwork product.

*Table: 4-007* **- CHARACTERISTICS OF CORE PERFORMANCE**

It is important for the reader to understand the difference between “flatness” and “dimensional stability” characteristics. Particleboard and MDF are the recommended cores for high pressure decorative laminate and wood veneer work because of their excellent flatness. Fair dimensional stability (expansion/contraction in panel size) is acceptable unless the product is exposed to wide swings in relative humidity, generally below 25% or above 55% with swings of more than 30 points.



| Core Type | Flatness (Warp Resistance) | Visual Edge Quality | Surface Uniformity | Dimensional Stability | Screw Holding Face | Bending Strength |
|---|---|---|---|---|---|---|
| **Particleboard, Medium Density** | Excellent | Good | Excellent | Fair | Fair | Good |
| **Particleboard, Moisture Resistant** | Excellent | Good | Good | Fair | Fair | Good |
| **Particleboard, Fire Retardant** | Excellent | Fair | Good | Fair | Fair | Good |
| **Medium Density Fiberboard (MDF)** | Excellent | Excellent | Excellent | Fair | Good | Good |
| **MDF, Moisture Resistant** | Excellent | Excellent | Excellent | Fair | Good | Good |
| **MDF, Fire Retardant** | Excellent | Excellent | Excellent | Fair | Good | Good |
| **Veneer** | Fair | Good | Fair | Excellent | Excellent | Excellent |
| **Lumber** | Good | Good | Good | Good | Excellent | Excellent |
| **Combination** | Good | Fair | Excellent | Good | Excellent | Excellent |

Various characteristics above are influenced by the grade and thickness of the core and specific gravity of the core species. Visual Edge Quality is rated before treatment with edgebands or fillers and Visual Edge Quality of lumber core assumes the use of “clear edge” grade. Surface Uniformity has a direct relationship to the performance of veneers placed over the surface. Dimensional Stability is usually related to exposure to wide swings in relative humidity. Screw Holding and Bending Strength are influenced by proper design and engineering.

**DECORATIVE FACE MATERIAL AND CONSTRUCTION BALANCE**

All panels may be used as cores for the application of decorative faces (e.g. veneer, plastic laminate) to the face and back. The whole is referred to as a panel. The parts being a core covered by a face and a balancing back. To achieve balanced construction, panels must be an odd number of layers (plies) symmetrical from the center line; e.g., inner plies, except the innermost middle ply, should occur in pairs, using materials and adhesives on both sides that contract and expand, or are moisture permeable, at the same rate.

A ply may consist of a single veneer, particleboard, medium density fiberboard, or hardboard. Each pair of inner plies should be of the same thickness and direction of grain at 90 degrees. Each ply of each pair is placed on opposite sides of the innermost ply or layer, alternating grain directions from the center out. (Particleboard and MDF do not have a specific grain orientation).
The thinner the facing material, the less force it can generate to cause warping. The thicker the core, the more it can resist a warping movement or force.

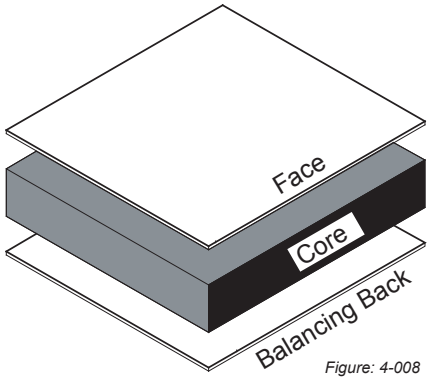

*Figure: 4-008*

**TYPES OF PLYWOOD PANELS:**

- **Particleboard Core**

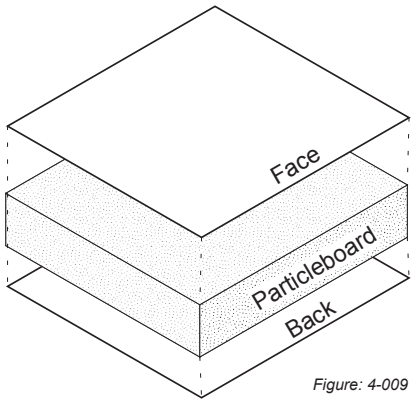


*Figure: 4-009*

- **Medium Density Fiberboard (MDF) Core**

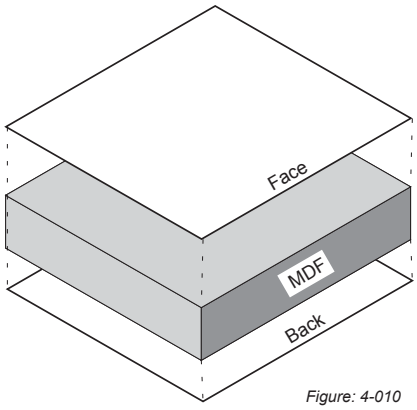


*Figure: 4-010*

- **Veneer Core**

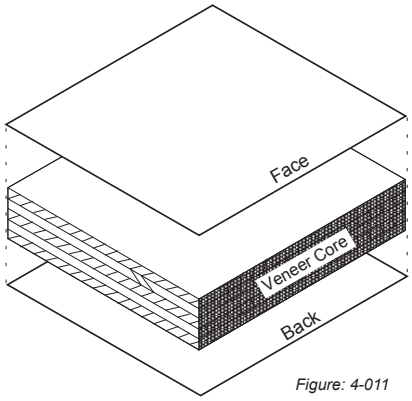


*Figure: 4-011*

- **Lumber Core**

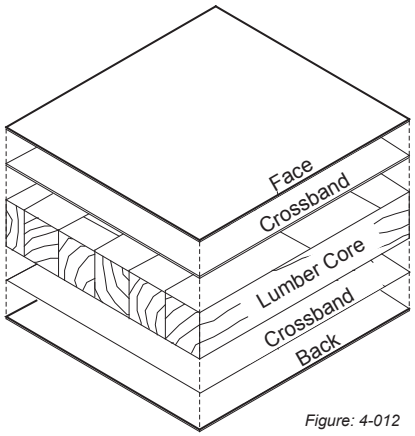


*Figure: 4-012*

- **Combination Core**

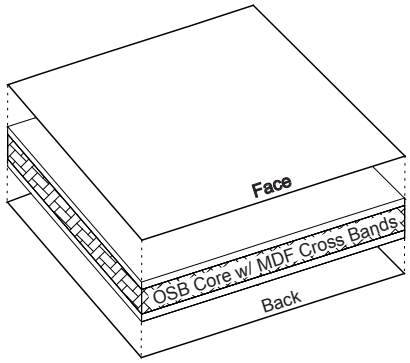


*Figure: 4-013*

**WOOD VENEERS**

Wood veneer is produced by veneer manufacturers in a variety of "industry standard" thicknesses. The slicing process is controlled by a number of variables. The thickness of the raw veneer has little bearing on the ultimate quality of the end product so long as show-through and sand-through is avoided.

- **Hardwood Veneer - Species**: Available in many domestic and imported wood species. Normally cut as plain sliced. Rift sliced and quarter sliced available in certain species at additional cost.
- **Softwood Veneer - Species**: Most common is Douglas Fir; Pines are available; other softwoods in limited supply. Most softwood veneer is Rotary cut. Plain sliced softwood veneer and "vertical grain" (quarter sliced) softwood veneer are limited in availability with long lead times and higher prices associated with special orders.

  Rotary-cut softwood sheets are typically manufactured in various grades referring to the appearance of the face, back, and interior plies of the sheet and are intended for exterior (with a fully waterproof glue line) or interior (with a moisture resistant, but not waterproof, glue line). Clear faces, free of patches, are not typically available.

- **Veneer Grain** might not match the grain of solid stock, and it might not accept transparent finishes in the same manner; additional finishing steps might achieve similar aesthetic value.
- **Figure** is not a function of a species grade, and special desires must be so specified.
- **Special Characteristics**, such as sapwood, heartwood, ribbon stripe, birdseye and comb grain, must be so specified.
- **Natural,** as a type of wood species selection, allows an unlimited amount of heartwood and/or sapwood within a face and is the default selection, unless specified otherwise.
- **Select Red or White** simply means all heartwood or all sapwood, respectively, and must be so specified.
- **Species**, such as Hickory, Pecan, Butternut, or Maple, may exhibit special character or figure and users are advised to thoroughly investigate the expected grain and color of these species.
- **Reconstituted Veneers** are logs that are first sliced into veneer leaves, the leaves may be dyed, then glued under pressure in a mold to produce a large laminated block. The laminated block is then sliced across the glue line to create a faux grain with a designed appearance that is highly repeatable. Not all pre-dyed veneers are colorfast, consult with manufacturer.

# introductory information



## SPECIALTY SHEET PRODUCTS

Plywood with textured faces, prefinished plywood, overlaid plywood, composition sheets, flame spread rated plywood, moisture resistant plywood, lead lined sheets, projectile resistant armor (bullet proofing), reconstituted veneers, bamboo sheets, acrylic sheets, or PVC sheets are the products of the individual manufacturer, and are covered by their manufacturer's specification - not by these standards.

## PANEL ADHESIVES

Are defined as:

- **Type I** Waterproof bond for limited exterior use (2 Cycle Boil Test plus Shear Test).
- **Type II** Water resistant bond for interior use (3 Cycle Soak Test).

## FIRE RETARDANCE

Sheets are available with various types of fire retardant treated core, such as veneer, lumber, particleboard, and mineral core.

Flame-spread rating will vary for different species of untreated face veneers on treated cores, directly with the density of the untreated face veneers; the higher the density, the higher the flame spread rating.

Refer to the latest edition of the Underwriters' Laboratories listings for various flame-spread ratings available bearing U.L. Labels.

## PHOTODEGRADATION

The effect on the appearance of exposed wood faces caused by exposure to both sun and artificial light sources is called photodegration. If an entire face is exposed to a light source, it will photodegrade somewhat uniformly and hardly be noticeable, whereas partially exposed surfaces or surfaces with shadow lines might show nonuniform photodegradation. Some woods, such as American Cherry and Walnut, are more susceptible than others, and extra care should be taken to protect against the effects of nonuniform photodegradation.

## OXIDATION

The effect on the appearance of exposed wood faces caused by exposure to atmosphere is called oxidation. This is analogous to browning reactions in freshly cut fruit; for instance, apples. Hardwoods can develop deep yellow to reddish brown discolorations on the surface of the wood when exposed to air immediately after sawing or peeling. These discolorations are especially noticeable on Cherry, Birch, Red Alder, Sycamore, Oak, Maple, and Sweet Gum. Some species, such as Alder, Oak, Birch, and Maple, develop these discolorations during air-seasoning. A related gray stain on several varieties of Southern Oaks also appears to be oxidative in nature. Proper selection, sanding, and finishing can minimize the effects of oxidation.

## VENEER CUTTING

The manner in which a log segment is cut with relation to the annual rings will determine the appearance of the veneer. When sliced, the individual pieces of veneer, referred to as leaves, are kept in the order in which they are sliced, thus permitting a natural grain progression when assembled as veneer faces. The group of leaves from one slicing is called a flitch and is usually identified by a flitch number and the number of gross square feet of veneer it contains. The faces of the leaves with relation to their position in the log are identified as the tight face (toward the outside of the log) and the loose face (toward the inside or heart of the log). During slicing the leaf is stressed on the loose face and compressed on the tight face. When this stress is combined with the natural variation in light refraction caused by the pores of the wood, the result is a difference in the human perception of color and tone between tight and loose faces.

## FOUR COMMON VENEER CUTS

- **Plain Slicing** (or Flat Slicing) - This is the slicing method most often used to produce veneers for architectural woodwork. Slicing is done parallel to a line through the center of the log. A combination of cathedral and straight grain patterns results, with a natural progression of pattern from leaf to leaf.

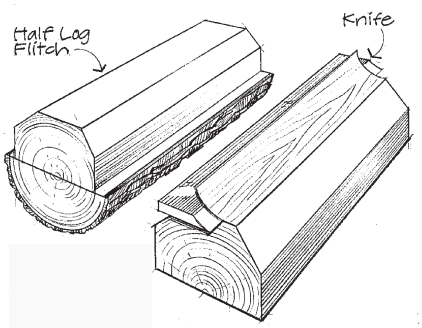


*Figure: 4-014*

- **Quarter Slicing** (or Quarter Cut) - Quarter slicing simulates the quarter sawing process of solid lumber, roughly parallel to a radius line through the log segment. In many species the individual leaves are narrow as a result. A series of stripes is produced, varying in density and thickness from species to species. "Fleck" (sometimes called flake) is a characteristic of this slicing method in Red and White Oak.

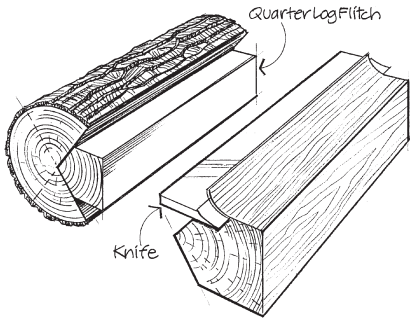


*Figure: 4-015*

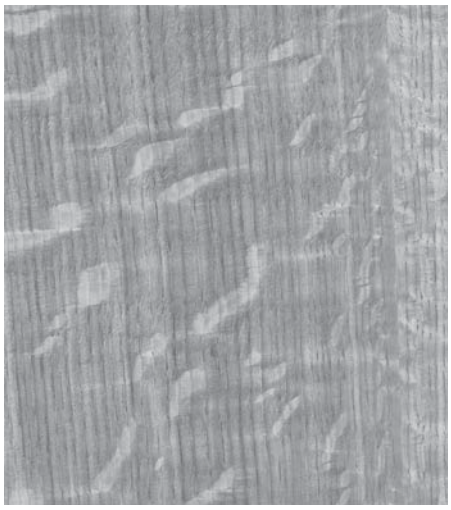

*Figure: 4-016*

- **Rift Slicing** (or Rift Cut) - Rift veneers are produced most often in Red and White Oak. Note that rift veneers and rift sawn solid lumber are produced so differently that a "match" between rift veneers and rift sawn solid lumber is highly unlikely. In both cases the cutting is done slightly off the radius lines minimizing the "fleck" (sometimes called flake) associated with quarter slicing.

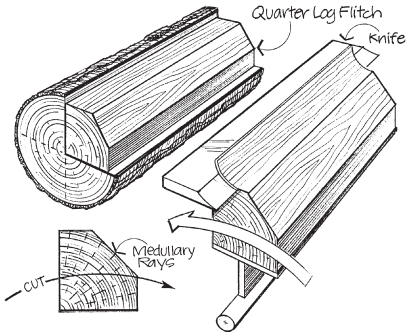


*Figure: 4-017*

- **Rotary Slicing** - The log is center mounted on a lathe and "peeled" along the general path of the growth rings like unwinding a roll of paper, providing a generally bold random appearance.

  When transparent finish is specified; rotary sliced hardwood veneers are sometimes specified for:

  - Wall Surfacing: Institutional panel faces.
  - Doors: Institutional flush door faces.
  - Cabinets: Semi-exposed (interior) surfaces and used in a limited way for exposed surfaces.

Some species may possess a special figure, for example birds eye, which is achieved by rotary slicing.

Careful consideration, specification, and communication are recommended when rotary cut is contemplated.

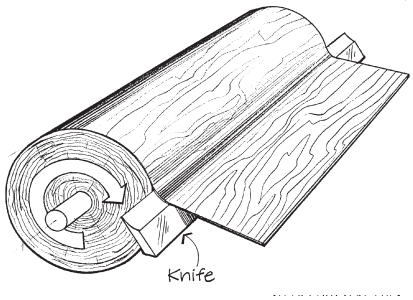


*Figure: 4-018*

*Table: 4-019* **- COMMON HARDWOOD VENEER SPECIES and CUTS**

| SPECIES | ROTARY | PLAIN SLICED | QUARTER SLICED | RIFT |
|---|---|---|---|---|
| Anigre | | ● | ● | |
| Ash | | ● | ● | |
| Beech | | ● | ● | |
| Birch | ● | ● | | |
| Cherry | | ● | ● | |
| Hickory | | ● | | |
| Lauan | ● | | ● | |
| Mahogany, African | | ● | ● | |
| Mahogany, American | | ● | ● | |
| Makore | | ● | ● | |
| Maple | ● | ● | ● | |
| Oak, Red | ● | ● | ● | ● |
| Oak, White | | ● | ● | ● |
| Pecan | | ● | | |
| Poplar | ● | ● | | |
| Sapele | | ● | ● | |
| Walnut | | ● | ● | |

# introductory information

*Table: 4-020* **- WOOD VENEER SPECIES -** General characteristics of selected species:

| WOOD VENEER SPECIES - General characteristics of selected species: | | | | | | |
|---|---|---|---|---|---|---|
| **SPECIES** | **CUT (1)** | **WIDTH TO** | **LENGTH** | **FLITCH SIZE** | **COST (2)** | **AVAILABILITY** |
| **Alder** | Plain Sliced | 12" (305 mm) | 10' (3048 mm) | Medium | Moderate | Moderate |
| **Anigre** | Plain Sliced | 12" (305 mm) | 10' (3048 mm) | Large | Moderate | Good |
| | Quarter Sliced | 8" (203 mm) | 12' (3658 mm) | Medium | High | Good |
| **Anigre, Figured** | Quarter Sliced | 8" (203 mm) | 12' (3658 mm) | Medium | Very High | Limited |
| **Ash, American** | Plain Sliced | 12" (305 mm) | 10' (3048 mm) | Large | Moderate | Moderate |
| | Quarter Sliced | 6" (153 mm) | 10' (3048 mm) | Medium | High | Moderate |
| **Ash, European** | Plain Sliced | 10" (254 mm) | 10' (3048 mm) | Medium | Moderate | Limited |
| | Quarter Sliced | 6" (153 mm) | 10' (3048 mm) | Small | Moderate | Moderate |
| **Beech, European** | Plain Sliced | 10" (254 mm) | 10' (3048 mm) | Large | Moderate | Good |
| | Quarter Sliced | 6" (153 mm) | 10' (3048 mm) | Medium | High | Good |
| **Birch, Natural** | Rotary | 36" (914 mm) | 10' (3048 mm) | Large | Low | Good |
| | Plain Sliced | 8" (203 mm) | 10' (3048 mm) | Small | Medium | Limited |
| **Birch, Select Red and White** | Rotary | 36" (914 mm) | 10' (3048 mm) | Large | Moderate | Good |
| | Plain Sliced | 8" (203 mm) | 10' (3048 mm) | Small | High | Limited |
| **Cedar, Western Red** | Plain Sliced | 18" (457 mm) | 10' (3048 mm) | Medium | Moderate | Limited |
| | Quarter Sliced | 8" (203 mm) | 10' (3048 mm) | Medium | Moderate | Limited |
| **Cherry, American (3)** | Plain Sliced | 12" (305 mm) | 12' (3658 mm) | Medium | Moderate | Good |
| | Quarter Sliced | 6" (153 mm) | 10' (3048 mm) | Small | High | Moderate |
| **Ebony** | Plain Sliced | 6" (153 mm) | 10' (3048 mm) | Very Small | Extreme | Very Limited |
| **Fir, Douglas (Vertical Grain)** | Quarter Sliced | 18" (457 mm) | 12' (3658 mm) | Large | Moderate | Good |
| **Hickory** | Plain Sliced | 12" (305 mm) | 12' (3658 mm) | Medium | Moderate | Good |
| | Quarter Sliced | 6" (153 mm) | 10' (3048 mm) | Small | Moderate | Moderate |
| **Jatoba** | Plain Sliced | 12" (305 mm) | 12' (3658 mm) | Medium | Moderate | Good |
| **Lacewood** | Quarter Sliced | 6" (153 mm) | 10' (3048 mm) | Small | High | Very Limited |
| **Lauan (4)** | Plain Sliced | 15" (381 mm) | 12' (3658 mm) | Medium | Moderate | Good |
| | Quarter Sliced | 8" (203 mm) | 10' (3048 mm) | Small | Moderate | Moderate |
| **Mahogany, African (5)** | Plain Sliced | 18" (457 mm) | 12' (3658 mm) | Large | Moderate | Good |
| | Quarter Sliced | 10" (254 mm) | 12' (3658 mm) | Medium | High | Moderate |
| **Mahogany, American (5) (Swietenia macrophylla CITES listed (6))** | Plain Sliced | 18" (457 mm) | 12' (3658 mm) | Large | Moderate | Very Limited |
| | Quarter Sliced | 10" (254 mm) | 12' (3658 mm) | Medium | High | Very Limited |
| **Makore** | Plain Sliced | 15" (381 mm) | 12' (3658 mm) | Large | Moderate | Moderate |
| | Quarter Sliced | 8" (203 mm) | 12' (3658 mm) | Medium | High | Limited |
| **Maple, American** | Rotary | 36" (914 mm) | 10' (3048 mm) | Large | Low | Good |
| | Plain Sliced | 12" (305 mm) | 12' (3658 mm) | Medium | Moderate | Good (2) |
| | Quarter Sliced | 6" (153 mm) | 10' (3048 mm) | Small | High | Limited |
| **Maple, Birds Eye** | Rotary | 24" (610 mm) | 10' (3048 mm) | Medium | Very High | Limited |
| **Meranti** | Plain Sliced | 18" (457 mm) | 12' (3658 mm) | Large | Moderate | Good |
| | Quarter Sliced | 10" (254 mm) | 12' (3658 mm) | Medium | High | Moderate |

*Table: 4-020* **- WOOD VENEER SPECIES** (continued)

| SPECIES | CUT (1) | WIDTH TO | LENGTH | FLITCH SIZE | COST (2) | AVAILABILITY |
|---|---|---|---|---|---|---|
| **Oak, English Brown** | Plain Sliced | 12" (305 mm) | 10' (3048 mm) | Medium | High | Limited |
| | Quarter Sliced | 8" (203 mm) | 10' (3048 mm) | Small | Very High | Limited |
| **Oak, Red** | Rotary | 36" (914 mm) | 10' (3048 mm) | Large | Low | Good |
| | Plain Sliced | 18" (457 mm) | 12' (3658 mm) | Large | Low | Good |
| | Quarter Sliced | 8" (203 mm) | 10' (3048 mm) | Medium | Moderate | Good |
| | Rift | 8" (203 mm) | 10' (3048 mm) | Medium | Moderate | Good |
| **Oak, White** | Plain Sliced | 12" (305 mm) | 12' (3658 mm) | Medium | Low | Good |
| | Quarter Sliced | 8" (203 mm) | 10' (3048 mm) | Small | Moderate | Good |
| | Rift | 8" (203 mm) | 10' (3048 mm) | Small | Moderate | Good |
| **Poplar** | Plain Sliced | 15" (381 mm) | 10' (3048 mm) | Medium | Low | Good |
| **Rosewood, American** | Plain Sliced | 10" (254 mm) | 10' (3048 mm) | Small | Very High | Very Limited |
| **Sapele** | Plain Sliced | 15" (381 mm) | 10' (3048 mm) | Large | Moderate | Good |
| | Quarter Sliced | 8" (203 mm) | 10' (3048 mm) | Medium | Moderate | Moderate |
| **Sycamore** | Plain Sliced | 15" (381 mm) | 12' (3658 mm) | Medium | High | Moderate |
| | Quarter Sliced | 8" (203 mm) | 10' (3048 mm) | Small | High | Limited |
| **Teak** | Plain Sliced | 12" (305 mm) | 12' (3658 mm) | Medium | High | Moderate |
| | Quarter Sliced | 5" (127 mm) | 10' (3048 mm) | Small | High | Limited |
| **Walnut (3)** | Plain Sliced | 15" (381 mm) | 12' (3658 mm) | Large | Moderate | Good |
| | Quarter Sliced | 6" (152 mm) | 10' (3048 mm) | Small | High | Moderate |
| **Wenge** | Plain Sliced | 10" (254 mm) | 10' (3048 mm) | Small | High | Limited |

(1) When only Plain Sliced is listed, the width dimension for quartered Cut is narrower.
(2) Seasonal factors may affect availability.
(3) Cherry, Walnut and certain other hardwood species are required to be specified by origin, such as American Cherry, American Walnut, or English Brown Oak, because they can be significantly different in color and figure.
(4) Lauan (White and Red), Tanguile, and other species are native to the Philippine Islands and are sometimes referred to as Philippine Mahogany; however, they are not a true Mahogany The generic term Mahogany should not be specified without further definition.
(5) Mahogany, American and African vary in color from a light pink to a light red, reddish brown to a golden brown or yellowish tan. Some Mahogany turns darker or lighter in color after machining. The figure or grain runs from plain sliced, plain stripe to broken stripe, mottled, fiddleback, swirl, and crotches.
(6) CITES, Convention on International Trade in Endangered Species or Wild Fauna and Flora.

**PRODUCT ADVISORY:**

Due to adverse reaction of some veneers laminated to fire rated (FR), ultra low emitting formaldehyde (ULEF or NAUF), medium density fiberboard (mdf) causing discoloration of the wood veneer even months after installation, major core manufacturers have issued disclaimers in the use of FR cores. They strongly suggest that use of FR ULEF mdf and particleboard cores should be done after testing compatibility of adhesives, wood veneer and cores. Any resulting discoloration with the use of these cores may be exempt in their warranties. Use of FR ULEF cores should only be considered after consultation with the board supplier.

# introductory information



## MATCHING ADJACENT WOOD VENEER LEAVES

It is possible to achieve certain visual effects by the manner in which the leaves are arranged. Matching of adjacent wood veneer leaves, as with the effect of different veneer cuts, can alter the appearance of a given panel or an entire installation. To create a particular appearance, the veneer leaves of a flitch are edge glued together in patterns.

Individual leaves of veneer in a sliced flitch increase or decrease in width as the slicing progresses. Thus, if a number of panels are manufactured from a particular flitch, the number of veneer leaves per panel face will change as the flitch is utilized. The manner in which these leaves are "laid up" within the panel requires specification.

Rotary cut veneers are difficult to match; therefore most matching is done with sliced veneers. The matching of adjacent veneer leaves must be specified. Special arrangements of leaves such as "diamond" and "box" matching are available. Consult your manufacturer for choices.

- **Book Matching** - A common match used in the industry. Every other piece of veneer is turned over so adjacent pieces (leaves) are opened like the pages of a book.

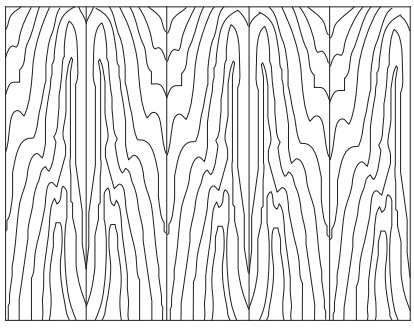

*Figure: 4-021*

Visual Effect - Veneer joints match, creating a symmetrical pattern. Yields maximum continuity of grain. When sequenced panels are specified, prominent characteristics will ascend or descend across the match as the leaves progress from panel to panel.

Barber Pole Effect in Book Match - Because the tight side and loose side of the veneer leaf faces alternate in adjacent pieces of veneer, they may accept stain differently, and this may result in a noticeable color variation. Book matching also accentuates cell polarization, causing the perception of different colors. These natural characteristics are often called barber pole, and are not a manufacturing defect.

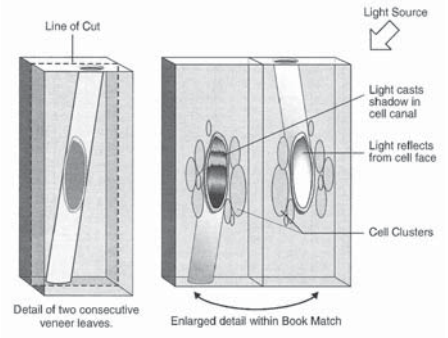


*Figure: 4-022*

- **Slip Matching** - Often used with quarter sliced and rift sliced veneers. Adjoining leaves are placed (slipped out) in sequence without turning, resulting in the same face sides being exposed.

Visual Effect - Grain figure repeats; but joints do not show visual grain match.

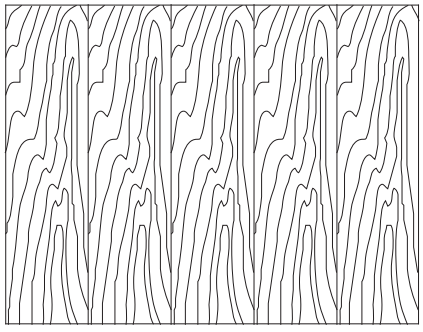

*Figure: 4-023*

The lack of grain match at the joints can be desirable. The relatively straight grain patterns of quartered and rift veneers generally produce pleasing results and a uniformity of color because all faces have the same light refraction.

- **Random Matching** - Veneer leaves are placed next to each other in a random order and orientation, producing a "board by board" effect in many species.

Visual Effect - Casual or rustic appearance, as though individual boards from a random pile were applied to the product. Conscious effort is made to mismatch grain at joints.

Degrees of contrast and variation may change from panel to panel. This match is more difficult to obtain than book or slip match, and should be clearly specified and detailed.

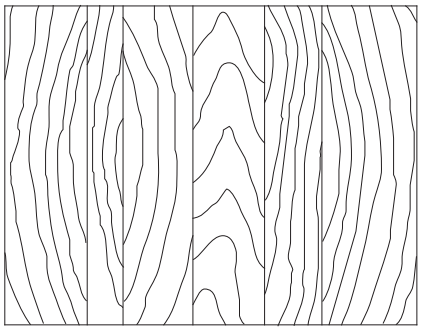

*Figure: 4-024*

- **End** or **Butt Matching** - Often used to extend the apparent length of available veneers for high wall panels and long conference tables.

Leaves are individually book (or slip) matched, first end to end and then side to side, alternating end and side.

Visual Effect - Yields best continuous grain patterns for length as well as width. Minimizes misalignment of grain pattern.

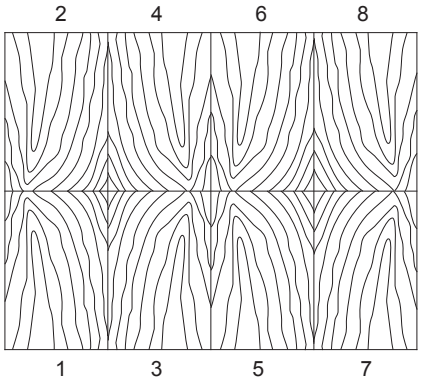


*Figure: 4-025*

**MATCHING WITHIN INDIVIDUAL PANEL FACES**

The individual leaves of veneer in a sliced flitch increase or decrease in width as the slicing progresses. Thus, if a number of panels are manufactured from a particular flitch, the number of veneer leaves per panel face will change as the flitch is utilized. The manner in which these leaves are "laid up" within the panel requires specification, and is classified as follows:

- **Running Match** - The panel face is made from components running through the flitch consecutively. Any portion of a component left over from a face is used as the beginning component or leaf in starting the next panel. **This method is the default for Custom Grade.**

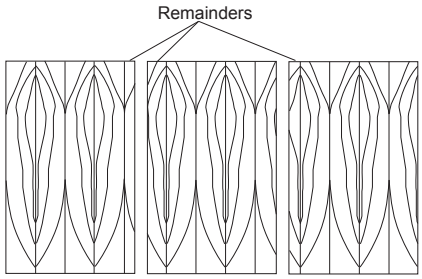


*Figure: 4-026*

- **Balance Match** - Each panel face is assembled from veneer leaves of uniform width before edge trimming. Panels may contain an even or odd number of leaves, and distribution may change from panel to panel within a sequenced set. While **this method is the default for Premium Grade,** it must be specified for other Grades, and it is the most common assembly method at moderate cost.

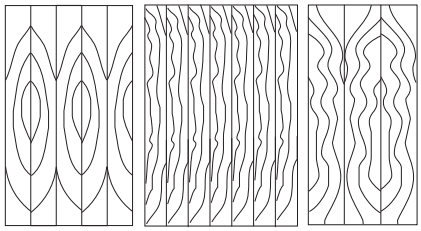

*Figure: 4-027*

- **Balance and Center Match** - Each panel face is assembled of an even number from veneer leaves of uniform width before edge trimming. Thus, there is a veneer joint in the center of the panel, producing horizontal symmetry. A small amount of figure is lost in the process. Considered by some to be the most pleasing assembly at a modest increase in cost over Balance Match.

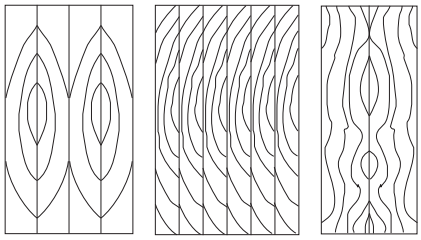

*Figure: 4-028*

- **Slip, Center, Book Match** - Each panel face is assembled of an even (four or more) number of veneer leaves. The veneer leaves are laid out as a slip matched panel face; then at the center, one half of the leaves are booked to the other half. Quarter and rift sliced veneers are generally used for this match, which allows for a pleasing balance of sweep and character marks.

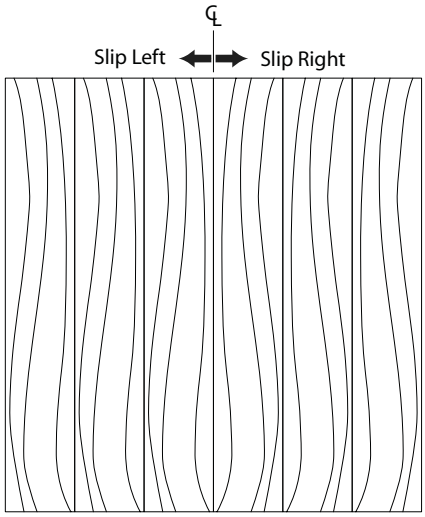


*Figure: 4-029*

# introductory information



## SPECIALTY OR SKETCH MATCHES OF WOOD VENEERS

There are regional variations in the "names" of the following veneer leaf matching techniques, drawn as squares for simplicity. It is strongly recommended that the design professional use both names and drawings to define the desired effect, using a rectangle, polygon, circle, ellipse, or other shape. Rift sliced, quarter sliced, and highly figured veneers are generally used for these speciality matches. The different matches of veneer cause the reflection of light to vary from adjoining leaves, bringing "life" to the panel. Due to the inherent nature of the layup process, alignment at corners might vary.

- **Sunburst Match** - is made of six or more veneer leaves cut at the appropriate angle with the grain radiating from the center. These veneer leaves are then book matched, assembled, and trimmed for final size.

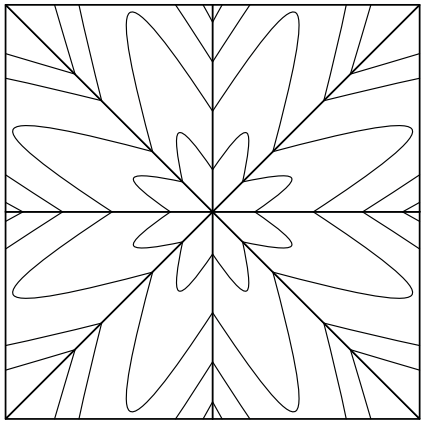

*Figure: 4-030*

- **Box Match** - is made of four leaves with the grain running parallel to the perimeter of the panel. The leaves are cut at the appropriate angle and end matched.

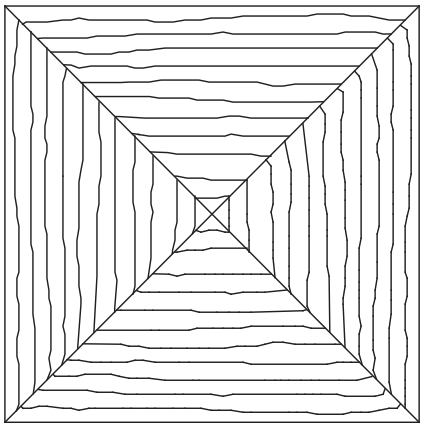

*Figure: 4-031*

- **Reverse or End Grain Box Match** - is made of four leaves with the grain running at right angles to the perimeter of the panel. The leaves are cut at the appropriate angle and book matched.

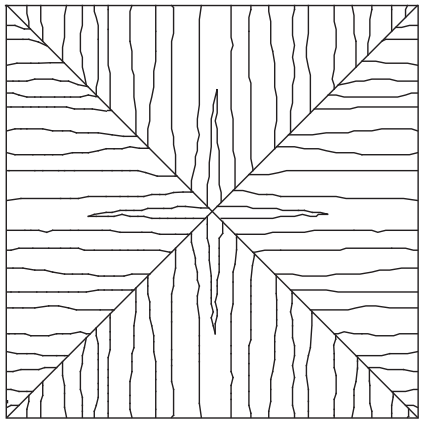

*Figure: 4-032*

- **Herringbone or V Book Match** - is one or more pairs of assembled slipped or booked leaves. Each assembled set of leaves is cut at generally 45 degrees to one edge of the panel. The assembled set of leaves is then end matched to the adjoining assembled set of leaves.

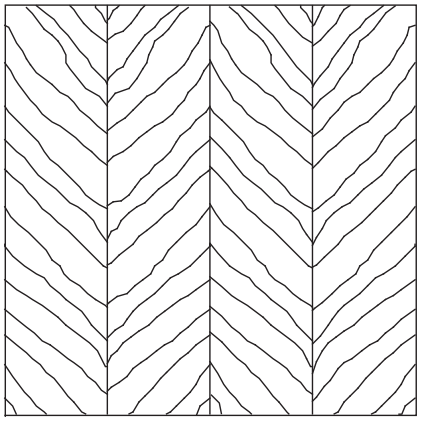

*Figure: 4-033*

- **Diamond Match** - is made of four leaves with the grain running 45 degrees to the perimeter of the panel and surrounding the center. The leaves are cut at the appropriate angle and end matched.

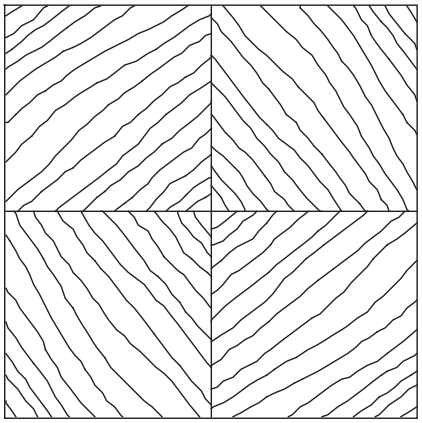

*Figure: 4-034*

- **Reverse Diamond Match** - is made of four leaves with the grain running 45 degrees to the perimeter of the panel and radiating from the center. The leaves are cut at the appropriate angle and book matched.

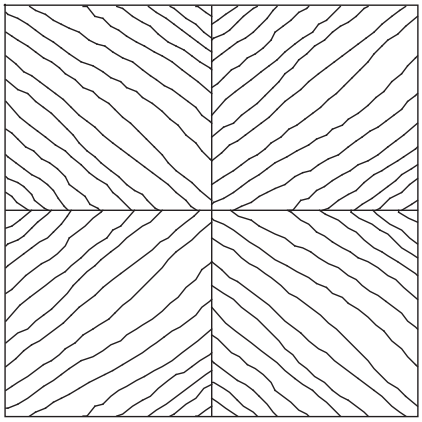

*Figure: 4-035*

- **Parquet Match** - is made by dividing the panel into multiple equal sized pieces and cutting the veneer to the same size. Each veneer leaf is joined at right angles to the adjoining piece of veneer.

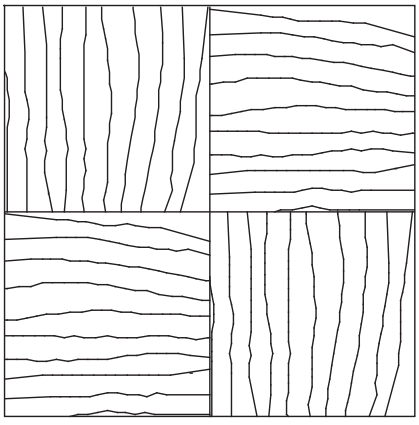

*Figure: 4-036*

- **Swing Match** - is made by dividing the panel into multiple paired sets. For each paired set, two leaves of veneer are cut at half the width of the set. One of these two veneer leaves is rotated 180 degrees and joined to the other. This pair is then adjoined to the other pairs assembled in the same way.

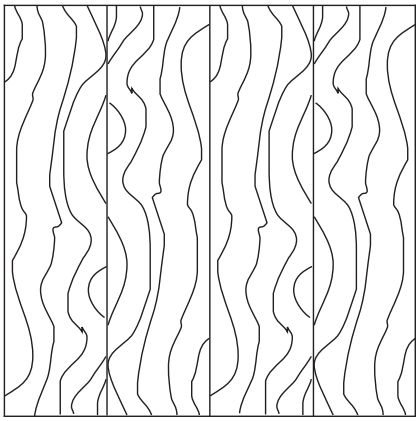

*Figure: 4-037*

- **Book** and **Butt Match** - is made by book matching highly figured veneer leaves (such as burl) 1, 3, 5, and 7 (set A) of the 8 leaf sequence. The remaining leaves 2, 4, 6, and 8 (set B) are also book matched. Set B is then flipped up and over the top end of set A, resulting in an end match.

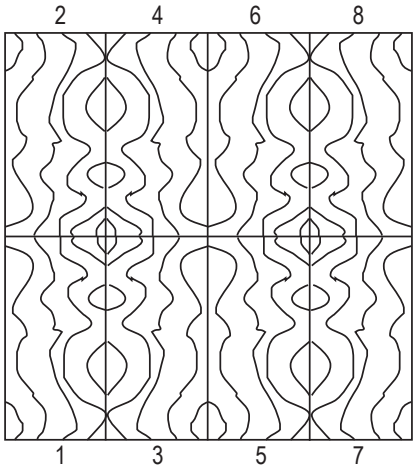


*Figure: 4-038*

**MATCHES BETWEEN PANELS**

- **Not Matched** - Veneered panels are generally manufactured without matching and may or may not be similar in grain and color.
- **Sequence Matched** - Veneered panels may be sourced and/or manufactured in sequence. These panels will be well matched for grain and color.
- **Sequence Matched & Custom Width** Generally veneered panels are manufactured in 4'x 8' and occasionally in 4'x 10' panels. The design professional may specify veneered sequence panels in custom width for the specific project and/or elevation. These panels will be well matched for grain and color.
- **Blueprint Matched** - The design professional may specify blueprint matched panels which will be custom sized height and width as well as sequencing for the specific project and/or elevation. These panels will be matched for grain and color.

# introductory information

## DECORATIVE LAMINATES, OVERLAYS, and PREFINISHED PANEL PRODUCTS

Decorative surfacing materials are often applied to wood product cores such as industrial particleboard, fiberboard, hardboard, etc. Terminology and definitions of these overlay products follow, broadly grouped as:

- **Medium Density Overlay (MDO)** - Pressed resin impregnated paper overlays, highly resistant to moisture, applied to suitable cores for both interior and exterior uses. The seamless panel face and uniform density furnishes a sound base for opaque finishes and paint.
- **High Density Overlay (HDO)** - Is a thermosetting phenolic resin impregnated, cellulose fiber overlay that provides a hard, smooth, uniformly textured surface of such character that further finishing is not necessary. Some evidence of underlying grain may appear.
- **Thermoplastic Sheet** - Semi rigid sheet or roll stock extruded from a nonporous acrylic/ polyvinyl chloride (PVC) alloy solid color throughout. Withstands high impact. Minor scratches and gouges are less conspicuous due to the solid color.
- **Vinyl Films** - Polyvinyl chloride (PVC) film, either clear or solid color, used extensively for decorative vertical surfaces in mobile homes, recreational vehicles, commercial panels and movable walls. Some films are available with scuff resistant top coatings.
- **High Pressure Decorative Laminate (HPDL)** - Is a stand alone product that can be laminated onto a core as the face of a sheet product or directly onto a structure as a covering. Decorative laminate is produced in a one step process by fusing together, under heat and pressure, multiple layers of kraft paper saturated with phenolic resin, together with a layer of melamine saturated decorative paper. The assembly offers resistance to wear and many common stains and chemicals. Common uses include casework exteriors, countertops, and wall paneling.

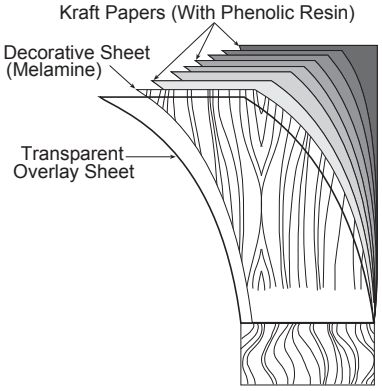


*Figure: 4-039*

Some decorative laminates utilize a white background paper to achieve the high fidelity, contrast, and depth of color in their printed patterns, which leaves a white line at the exposed edges of the laminate and can be extremely noticeable in darker colors.

- **Low Pressure Decorative Laminate (LPDL)** - Decorative thermally fused panels flat pressed from a thermoset polyester or melamine resin impregnated web. Most products are prelaminated to Industrial Particleboard or Medium Density Fiberboard cores when they arrive at the woodwork fabricator. Performance characteristics are similar to High Pressure decorative laminate except for the impact test.

  Thermally fused papers and foils are similar to that used in the manufacture of decorative laminate. Saturated with reactive resins and partially cured during manufacture to allow for storage and handling, the papers achieve final curing when they are hot press laminated to a core, providing a hard, permanent thermoset bond between the paper and the core.

  - Melamine - Impregnated papers, the most common, are noted for their hardness, scratch resistance, and color stability.
  - Polyester - Impregnated papers are noted for their chemical, stain, water, and impact resistance; color clarity; and machinability.

## COMMON HPDL TYPES

The basic types form the majority of applications of high pressure decorative laminate in North America are:

- **General Purpose (HGS and HGL)** Used for most horizontal applications, such as desk tops and self-edged kitchen countertops, “HG” laminates offer durability, resistance to stains, and resistance to heat.
- **Vertical (VGS and VGL)** A slightly thinner material, “VG” laminates are produced for areas which will receive less wear and impact than typical horizontal materials. They are an excellent choice for cabinet doors, the sides of casework, primarily decorative display shelves and vertical panels.
- **Post-forming (HGP and VGP)** Specifically for applications where a radiused surface is desirable, “P” laminates offer strong performance in both horizontal and vertical applications.

  A major advantage of formed surfaces on the exposed corners of casework and service counters is the edge’s resistance to chipping damage. Most chip damage occurs at sharp 90° corners. Surfaces are thermoformed under controlled temperature and pressure.
- **Cabinet Liner (CLS)** A thin vertical sheet, this type is designed for areas where the surface, which is not considered decorative, generally white or off white in color, but will need to withstand less wear, such as the inside surfaces of cabinets and closets.
- **Backing Sheet (BKL)** Backing materials are essential in the fabrication of decorative laminate clad surfaces to prevent warping and to protect against dimensional instability of both laminate and core in conditions of changing temperature and humidity. Backing sheets are non decorative, and both economical and effective in the creation of a successful application. Produced without a decorative face and available as standard (slightly thinner than decorative) or regrind (reclaimed decorative laminate with decorative sheet sanded off).

**COMMON HPDL TYPES** (continued)

- **Flame Retardant (HGF)** Some of these laminates are capable of providing flame retardant characteristics as determined by test methods required by the authority having jurisdiction. HGF is the most common type used.

  In summary, these common decorative laminate types have the limitations of high pressure decorative laminate:

  - They are for interior use only, and will not be successfully used outdoors or under heavy exposure to the ultraviolet rays of the sun.
  - They should not be used as cutting surfaces, because knives and other sharp tools will readily deface the surface and lower its other performance capabilities.
  - They should not be exposed to caustic chemicals, such as drain and toilet bowl cleaners, which can permanently etch the surface.
  - While they offer outstanding heat resistance, exposure to constant heat from a curling iron, an electric skillet or coffee pot, for example can harm the surface and may cause it to delaminate, discolor or blister.

**COLOR THROUGH DECORATIVE LAMINATES**

The interest in specifying solid color decorative laminates and the resurgence of interest in very pale pastels and neutral shades have caused increasing concern with the brown line visible at glued decorative laminate edges.

Color through decorative laminates were formulated specifically to provide light colors without this brown line.

Color through decorative laminate may be applied to cores in three basic ways:

- As sheets, to form a decorative face with a true monolithic look;
- As edge trims, to match a face of conventional decorative laminate or to accent a natural material such as wood or leather;
- As decorative inlays.

Color through decorative laminate is produced with multiple layers of decorative papers, rather than the decorative plus kraft composition of conventional laminate. As a result, this material is slightly stiffer and slightly more brittle when flexed.

Selection of adhesive should take into consideration that a visible glue line may detract. Adhesive should be untinted.

**SOLID PHENOLIC LAMINATES (SP)**.

High pressure decorative laminates are produced by several manufacturers in thicknesses adequate to preclude the use of a core (minimum 1/8" (3.2 mm).

Unlike conventional sheets, they may be drilled and tapped, and offer significant screw holding capacity.

Depending on thickness, these laminates may be used for many flat applications, such as toilet and dressing room partitions, workbenches, shelving, and table tops.

Panels are heavy for their size—an asset in sturdiness of the end application, but a factor which must be considered when planning for time and cost of labor and transportation as well as for support structures.

**STATIC-DISSIPATIVE LAMINATES**

High pressure decorative laminate is a good electrical insulator—in fact, it was for the specific purpose of electrical insulation that the product was originally developed.

HPDL does not store static electricity, and it is therefore a suitable material for use in hospital areas, i.e.: operating rooms, X-ray rooms, and computer room controlled environments where the accumulation and retention of static electricity must be avoided.

However, the growing need for work surfaces in areas such as electronic clean rooms, where electrostatic charges must be actively, continuously channeled away, has triggered the development of specifically conductive (static-dissipative) laminates such as: Anti Static, Static Dissipative and Conductive.

These HPDL sheets have a conductive layer enclosed in, or backing, the sheet. Connected to suitable grounding, they create a decorative, sturdy, practical work surface. Applications include electronic workbench tops and work areas around instrument monitoring devices, in lab testing environments, around photo equipment and on computer desktops.

Antistatic laminates are produced in a number of compositions, thicknesses, colors and patterns. Consult manufacturers' literature for details.

# introductory information



## CHEMICAL-RESISTANT DECORATIVE LAMINATES

Chemical resistant HPDL offers the familiar advantages of HPDL: resistance to wear, conductive and radiant heat, and impact; as well as ease in cleaning, color fastness, and relatively light weight. Although this product may resist some chemicals, depending on the testing methods of the individual manufacture's, it is the design professional's responsibility to select the appropriate material for the chemical resistance required.

These laminates may be applied on vertical as well as horizontal surfaces, to extend protection to cabinet doors and sides. And they may be post-formed for seamless edges.

Adhesives should be specified carefully. Edges which may be exposed to chemical attack should be glued with chemical-resistant adhesives. Formulation of chemical-resistant decorative laminate differs from producer to producer. Consult product literature to make sure the material you specify meets the needs of your projects.

They are available in varying thicknesses and a number of color and patterns depending on manufacturer.

## METAL-FACED LAMINATES

High pressure decorative laminates are produced with metal veneers and a backer of kraft paper and phenolic resin.

The material used for much of the metal laminates is interior-type anodized aluminum. Other materials, including copper and nickel alloys may be specified in various formats; however, some metals, such as stainless steel or plated metal, are not conducive to machining with woodworking equipment.

## FLAME SPREAD RATING of DECORATIVE LAMINATES

Safer materials for interiors are a primary concern for commercial and institutional design professionals across North America. The threat of fire and its concomitant hazard of smoke has created a critical need for interior materials that address this concern without aesthetic sacrifice.

Manufacturers of decorative laminate materials offer fire and smoke retardant grades for interior application. The addition of fire retardant does not affect the performance characteristics of decorative laminate; wear and stain resistance, ease of maintenance, and color stability remain very strong.

Rated high pressure decorative laminates are evaluated and certified according to ASTM-E-84 test procedures (cataloged as ASTM-E-84 Tunnel Test; and as Test No. 723 by Underwriters Laboratories, Inc. Similar Canadian testing is cataloged as CAN4-512-79).

With appropriate choices of core and adhesive, panels clad with fire-rated decorative laminate may be produced to comply with Class 1, I, or A, fire codes. Finished panels, already certified, may also be specified from some decorative laminate manufacturers.

Major applications of rated decorative laminate include door, wall, and wainscot cladding in corridors, stairwells, entries, and elevators; as well as surfacing on fixtures and casework. These materials are supplied in both horizontal and vertical types, in a wide range of colors and patterns.

They may not be post-formed; the special formulation that produces fire retardant is not compatible with heat forming.

Adhesive choice for fire-rated decorative laminate is important. As with many types of fire retardant particleboard, some PVA adhesives are incompatible with the fire-retardant chemical composition of the decorative laminate material. Resorcinol adhesives are best for both chemical compatibility and flame spread rating of the end product. Contact adhesives do surprisingly well in some cases. Verify test ratings with your decorative laminate manufacturer.

## NATURAL WOOD LAMINATES

An excellent example of the ongoing evolution of the high pressure decorative laminate process. Presently, natural wood laminates may be specified in two formats; both feature thin veneers of woods bonded under high pressure and heat to a core of kraft papers and phenolic resins. One process leaves the face of the wood untreated, and ready to finish. The other adds a protective face of melamine resin.

Performance characteristics vary with the presence or absence of the melamine resin. In both cases, the ease of cutting and bonding, as well as the wear resistance, improve in comparison to raw wood veneer. With the melamine face, the natural wood assumes much of the easy care and long wear properties of conventional high pressure decorative laminate.

Sequence matching of natural wood laminate panels is extremely limited; consult the laminate manufacturer.

## SPECIAL SHEET PRODUCTS

Included in this classification are special panel products such as lead lined panels for X-ray areas, bullet resistant panels, honeycomb core panels when light weight is a consideration, etc.

- **Lead Lined Panels** - Usually a sheet of lead of a specified thickness, to meet X-ray shield requirements, is laminated between 2 layers of core material. A decorative overlay and balancing sheet can then be applied as required.
- **Bullet Resistant Panels** - Available as steel plate, glass, polycarbonate, acrylic or fiberglass reinforced material which can offer protection against many available small arms fire, depending upon the thickness specified. These panels are usually built into the interior of the structure of the counter, teller's lines, judge's benches, etc.

### SOLID SURFACE

Is a manufactured, filled cast polymeric resin panel. The fillers enhance both its performance properties and aesthetics. With a homogeneous composition throughout its thickness, solid surface requires no finish coat and is capable of being fabricated with inconspicuous seams and repaired to its original finish. Products (and manufacturer's warranties) vary and should be fabricated according to manufacturer's recommendations, including the use of unique fasteners and adhesives. Many decorative inlays are available. Consult your manufacturer about performance issues, materials, colors, and patterns. To ensure color and pattern match it is suggested to use same batch material at adjacent sheets.



### OTHER PANEL PRODUCTS

Many new panel products are available, from recycled glass and epoxy impregnated metal shavings to plastic or acrylic panels created from a variety of natural and recycled materials. The options are wide spread and the sheer volume of products make it difficult to quantify. The AWS acknowledges these products and encourages design professionals to verify with individual product manufacturers that their products meet required performance standards. The AWS does not at present address these products.

### SPECIFY REQUIREMENTS FOR

- **UNIFORM COLOR**, certain finishing techniques might be required to achieve uniformity (see Section 5).
- **CHARACTERISTICS**, such as sapwood, heartwood, ribbon stripe, quarter sawn, rift sawn, or vertical grain.
    - Natural, Sapwood and Heartwood are color and cut subsets of Ash, Beech, Birch, Maple, and Poplar. (see HPVA table).
    - Natural as a type of wood species selection, allows an unlimited amount of heartwood and/or sapwood within a face.
    - Sapwood is all sapwood and is generally referred to for example as Select White for Maple and Birch.
    - Heartwood is all heartwood and is generally referred to for example as Select Red for Birch.
- **SPECIAL FIGURE** characteristics.
- **TYPE I WATERPROOF BOND** for limited non climate controlled interior or exterior use (compliant with 2 Cycle Boil and Shear Tests).
- **FLAME SPREAD** and/or smoke development ratings.
- **SPECIALITY SHEET PRODUCTS**, such as plywood with textured faces, prefinished plywood, overlaid plywood, composition sheets, flame spread rated plywood, moisture resistant plywood, lead lined sheets, projectile resistant armor (bullet resistant), reconstituted veneers, bamboo sheets, acrylic sheets, or PVC sheets which are the products of an individual manufacturer, are covered by their manufacturer's specification - not by these standards.

### RECOMMENDATIONS

- **VENEER CORE PANELS** should not be used for cabinet doors because they are likely to warp, and:
    - Rotary cut softwood sheets with clear faces, free of patches, are not typically available.
    - Formaldehyde emission regulations should be carefully researched before shipping product into an unfamiliar area.
- **CHECKING or WARPAGE** of wood veneered sheets can be avoided by proper environmental maintenance, such as being:
    - Protected from extremes in relative humidity and temperature.
    - Finished on both surfaces to retard moisture movement in and out of the panel.
    - Placed in locations that avoid directly facing air vents and/or radiant heat sources.
- **LAMINATION OVER EXISTING OVERLAYS**
    - The application of any thickness of HPDL over the top of existing HPDL is not permitted. Experience shows that the adhesion of the new laminate to the existing surface is very low, often resulting in delamination and failure of the glue line.
    - Likewise, the application of HPDL over existing thermoset decorative overlay (melamine) is strongly discouraged. Some fabricators report success by aggressively sanding the melamine surface, followed by applying sufficient contact adhesive and adequate pressure. Delamination is a defect. The risk of delamination is high. Specify or use this procedure with care.

For a complete AWS document, including compliance requirements, product information and more, contact us.

Contact Us