Architectural Woodwork Standards

DOORS

SECTION 9
# Section 9: Doors

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Guide Specifications

Are available through the Sponsor Associations in interactive digital format including unique and individual quality control options.

The Guide Specifications are located at:

Architectural Woodwork Institute (AWI)
www.awinet.org

Architectural Woodwork Manufacturers Association of Canada (AWMAC)
http://awmac.com/aws-guide-specifications

Woodwork Institute (WI)
www.woodworkinstitute.com/publications/aws_guide_specs.asp
INTRODUCTION

Section 9 includes information on doors using flush and stile & rail construction with wood or HPDL faces and their related parts.

In the past manufacturers have relied on the natural strength of hardwood lumber and veneer to assure long term performance. Many new engineered wood products are now replacing traditional hardwoods; allowing cost reductions, improved production efficiency and allowing the manufacturers the ability to provide better doors.

However, there is a risk some nonconforming products will not perform as well. The materials and construction methods used determine how well a door will resist high use and abuse. With the introduction of engineered wood products this becomes more important. Wood products, whether natural or engineered, have a wide range of strength characteristics and it is important that the door material and construction method meets the performance criteria of the project requirements.

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 are acceptable. In the absence of specifications; methods of fabrication shall be of the manufacturer’s choice. The design professional, by specifying compliance to the AWS increases the probability of receiving the product quality expected.

EXTERIOR DOORS

Wood doors are not recommended for exterior use. Most flush doors no longer have extended exterior use warranties and some have no warranty at all. Refer to manufacturers’ written warranty for specifics.

Wood doors used in an exterior environment should be water repellent treated at the factory after manufacturing. They should be protected according to manufacturers’ requirements, which may include flashing of top, bottom and cut outs.

Additionally, they should be protected from the sun and other weather elements by overhangs, deep recesses, etc.

While wood stile and rail entry doors have performed well for centuries, the selection of a wood door places a burden on the owner to maintain the door by keeping it painted or sealed, protected from moisture, and properly adjusted in the opening. Medium density overlay faced doors are strongly recommended for severe exposure conditions and all surfaces should be primed with an exterior enamel primer, followed by a minimum of two additional coats of exterior enamel.

CODE and RULE REQUIREMENTS

The design professional shall be responsible for contract documents which clearly detail products which will comply with local or national applicable codes and rules including, but not limited to: positive pressure requirements and labeling; glass or glazing; prefitting and/or machining for hardware; prehanging and/or machining for weather stripping; priming, sealing and/or transparent finishing; and flashing and/or metal edge guards. The door manufacturer is often a valuable assistant in these matters.

Contract documents shall:

• Specify neutral pressure or positive pressure compliance.

• If positive pressure, specify the category of door: A or B assembly.

• Specify whether the smoke and draft label (S label) is validated or not.

FACE MATERIAL SELECTION

The panel face veneer standards of the Hardwood Plywood & Veneer Association HP-1, latest edition, is adopted as the minimum standard for face veneers. Specifiers need to determine and specify the following:

VENEERS FOR TRANSPARENT FINISHES

Species: There are numerous foreign and domestic species available. Involve your manufacturer early in the design and selection process.

Matching: Many different visual effects can be obtained by face veneer matching.

• Appearance and layout of individual pieces of veneer.

• Matching between pieces (leaves) of veneer.

• Orientation of spliced veneer on a door face.

• Appearance of doors in pairs or sets.

• Appearance of doors with transoms.

MATERIALS FOR OPAQUE FINISHES

Medium Density Overlay, MDF or Hardboard. These provide the optimum paintable surface for architectural doors.

Close Grain Hardwood. Extra preparation will be required by the finisher as there will be grain show through, open appearing veneer joints, and other wood characteristics when using this product for a painted finish.

Manufacturers’ option. Face materials are determined by the manufacturer.

HIGH PRESSURE DECORATIVE LAMINATES (HPDL)

Virtually any high pressure decorative laminate color and texture can be used in the manufacture of architectural doors with the following cautions:

• High gloss and Vertical Grades of decorative laminate will highlight minor core and surface imperfections, often unacceptably.

• Decorative laminate doors are not recommended for use in non climate controlled interior or exterior environment due to the potential differences in lineal expansion between the faces and wood components when exposed to the elements.
Section 9
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Door Symbols and Abbreviations

Your door manufacturer is the best source of specific guidance when writing door specifications. The following short list of abbreviations applies to some door companies:

- **ME** = Matching edges; i.e., vertical edges same as decorative faces.
- **CE** = Compatible edges; i.e., vertical edges selected for compatibility with decorative faces.
- **PC** = Particleboard, MDF, or agrifiber core, solid core door with stiles and rails bonded to the core and abrasive planed flat prior to the application of the faces, including:
  - **PC-5** = Core with 2 layers on each side.
  - **PC-7** = Core with 3 layers on each side.
  - **PC-HPDL-3** = Core with laminate to each side.
  - **PC-HPDL-5** = Core with crossband and laminate each side.
- **SCLC** = Structural composite lumber core, solid core door with stiles and rails bonded to the core and abrasive planed flat prior to the application of the faces, including:
  - **SCLC-5** = Core with 2 layers on each side.
  - **SCLC-7** = Core with 3 layers on each side.
  - **SCLC-HPDL-5** = Core with crossband and laminate each side.
- **SLC** = Staved lumber core, solid core door with stiles and rails bonded to the core and abrasive planed flat prior to the application of the faces, including:
  - **SLC-5** = Core with 2 layers on each side.
  - **SLC-7** = Core with 3 layers on each side.
  - **SLC-HPDL-5** = Core with crossband and laminate each side.
- **FPC** = Floating particleboard core, solid core placed within a stile and rail frame, bonded together by the faces, including:
  - **FPC-5** = Core with 2 layers on each side.
  - **FPC-7** = Core with 3 layers on each side.
- **FSLC** = Floating staved lumber core, solid core placed within a stile and rail frame, bonded together by the faces, including:
  - **FSLC-7** = Core with 3 layers on each side.
- **FD** = Fire resistant core, fire resistant materials assembled to stiles and rails according to methods prescribed by the testing agency based on rigorous smoke, flame, and pressure tests. Labeled fire doors are specified by their resistance ratings:
  - **FD-5** = Core with 2 layers on each side.
  - **FD-7** = Core with 3 layers on each side.
  - **FD-HPDL-3** = Core with laminate to each side.
  - **FD-HPDL-5** = Core with crossband and laminate each side.
- **IHC-7** = Institutional hollow core, honey comb, ladder, or grid type cores inside stiles and rails, bonded together by the faces.
- **SHC-7** = Standard hollow core, honey comb, ladder, or grid type cores inside stiles and rails, bonded together by the faces.
- **SR** = Sound retardant doors, specified by their performance characteristics.
- **LL** = Lead lined doors, designed to resist penetration by radiation of various types, and specified by their performance.
- **ES** = Electrostatic shielded doors.
- **BR** = Ballistic resistant doors.

Basic Core Types

The design professional or specification writer has the opportunity to select the door core type. In the absence of specification, PC shall be furnished, complying with particleboard standard ANSI A208.1 Particleboard, Grade LD-1 or LD-2.

The five most common core types are PC, SLC, SCLC, HC, and fire resistant door core, conforming to the minimum requirements of WDMA - I.S. 1-A (latest edition).

Specify one, or a combination of, solid core, hollow core, or fire resistant core, and acoustical, ballistic resistant, or lead lining where and when required. The requirements for each core type are illustrated in Section 9. In the absence of clear specifications, the core shall be of the manufacturer’s choice. SCLC may be specified in any Grade.

- When solid core is selected, specify one of the following: PC, SLC, or SCLC. When the weight of the door is a design factor, consult the door manufacturer to determine the differences between PC, SLC, and SCLC core types.
- When HC, specify the honey comb, with the minimum cell size required, grid core, or ladder construction.
- When fire resistant core is required beyond the 20 minute label level, consult your door manufacturer for code compliant core types, blocking options, metal edges, cut outs, and astragals.

The use of SCLC for top and/or bottom rails, and blocking is acceptable. SCLC is proving to have excellent performance characteristics as a replacement for stave core, as it often minimizes or eliminates telegraphing of the lumber blocks through the face veneers or overlays. When the edge of an SCL core door will be visible after installation, design professionals may wish to specify a fill and paint treatment, or the application of a veneer edgeband to conceal the coarse texture of the edge of the SCL material. It is the responsibility of the design professional to make a selection in the best interests of the client.
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SPECIALITY CORES

Such as fire rated, sound resistant, x-ray, bullet resistant, or electrostatic shielded doors shall be properly specified, including the fire rating, sound class, lead thickness, and/or protection rating.

• At FIRE RATED doors, the type of construction, core type, thickness, edgebands, moldings, blocking, and use of intumescent coatings shall be the standard of the door manufacturer, conforming to the labeling authority granted to them by their labeling agency.

• At SOUND RESISTANT doors, the type of construction, thickness, edgebanding, applied moldings, special stops, stop adjusters, gaskets, and automatic threshold closing devices shall be the standard of the door manufacturer conforming to the STC (Sound Transmission Class) specified when tested as an opening unit (rather than sealed in place).

• At X-RAY DOORS, construction, thickness, edgebands, and moldings shall be of the manufacturer’s standard.

• At BULLET RESISTANT doors, the type of construction, thickness, edgebands, and moldings shall be of the manufacturer’s standard.

• At ELECTROSTATIC SHIELDED doors, the type of construction, thickness, edgebands, and moldings shall be of the manufacturer’s standard.

Cores other than those enumerated herein are manufactured to individual specifications and are not dealt with in these standards for that reason.

CORE TO EDGE ASSEMBLY

These standards provide for multiple types of assembly between the core and the vertical and horizontal edges in doors:

• Stiles and rails securely bonded to core, prior to application of faces.

• Stiles and rails NOT bonded to core prior to application of faces.

• Stiles and rails placed (not bonded) around hollow core inserts.

FIRE RATINGS

The Model Codes have established a fire door rating and operating classification system for use in protecting door openings in fire rated wall constructions. Fire doors must meet certain requirements and bear certifying labels of an independent testing agency approved by the building official.

CODE AND RULE REQUIREMENTS

The design professional shall be responsible for contract documents which clearly detail products which will comply with applicable codes and rules including, but not limited to, NFPA 80 requirements; ADA national and federal guidelines; local, state/provincial and federal building codes; positive pressure requirements and labeling; glass or glazing; prefitting and/or machining for hardware; prehanging and/or machining for weatherstripping; priming, sealing and/or transparent finishing; and flashing and/or metal edge guards. The door manufacturer is often a valuable assistant in these matters.

Fire doors shall be installed per NFPA 80.

Critical note and warning: The status of fire resistant doors and openings continue to change. The design professional shall verify that the total opening complies with both international and local code requirements before finalizing the specification for fire rated doors, hardware, and openings.

SPECIAL FUNCTION DOORS

Sound retardant (acoustical), lead lined (X-ray), ballistic resistant, and electrostatic shield doors are manufactured by some companies to meet these special needs. Refer to manufacturer’s literature for details.

Transom panels and special function doors are available and should be specified carefully, with particular attention to the meeting edge details, operational functions and accessories, and veneer match options. In the absence of clear and complete specifications, fabrication details will be of the manufacturer’s choice.

VEENER FACES

At stand alone doors with face species of Anigre, Ash, Beech, Birch, Cherry, Hickory, African Mahogany, American Mahogany, Makore, Maple, Red Oak, White Oak, Pecan, Poplar, or Walnut shall conform to the HPVA Door Skin Face tables included within the Materials portion of this section. Doors of a species not listed above shall conform to the HPVA Door Skin Faces as agreed on between buyer and seller.

• Doors adjacent to or that become a component of other architectural woodwork shall conform to the applicable requirements of Section 4.

• Stand alone, Center Balanced Matched doors, shall not have the width of outer leaves after trimming exceed 1” (25.4 mm) less than its adjoining leaf for Custom Grade, or 1/2” (12.7 mm) less than its adjoining leaf for Premium Grade.

• Before specifying, check with the door manufacturer for availability.

Special matching shall be so specified, such as: All doors on the same project are to be manufactured using the same or similar flitches.

Sequence matched face veneers required at pairs or sets of doors and adjacent panels.

VEENER FACE GRADE SUMMARY

Read Section 4 for the complete description of veneer face grades.

When veneers are specified as “natural,” they may contain any amount or combination of sapwood and heartwood, with the resultant contrast in color in many species.

The industry recognizes that cost is an important factor, and having lower veneer standards can result in some savings. Specifying Architectural Woodwork Standards Custom Grade meets that need. However, when doors are a part of an overall design scheme and/or are adjacent to other architectural woodwork specified under these standards, the level of quality of those doors must be consistent with other millwork components.


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DOORS IN PAIRS OR SETS

• **Pair Match** - Two doors hung adjacent may be (and in some Grades, must be) specified as a Pair Match. Note to specifying authority: Specifying Pair Matched only means the two doors are to be considered Pair Matched as per the AWS Grade specified, it does not mean the veneer is sequenced, nor does it designate the veneer cut or layup. The Grade specified will determine the type of Match required. Sequencing, veneer cut and layup if different from the Grade Rules must be specified. The illustration in Figure 9-001 shows flat or plain cut, book matched, center matched faces.

• **Set Match** - Three or more doors or two or more Pair Matched doors hung adjacent may be (and in some Grades, must be) specified as a Set Match. Note to specifying authority: Specifying Set Matched only means the three or more doors are to be considered Set Matched as per the AWS Grade specified, it does not mean the veneer is sequenced, nor does it designate the veneer cut or layup. The Grade specified will determine the type of Match required. Sequencing, veneer cut and layup if different from the Grade Rules must be specified. The illustration in Figure 9-002 shows flat or plain cut, book matched, center matched faces.

• **Doors with Transoms**

  The use of the transom increases the apparent height of the door and often enhances the appearance of the opening. The type of match should be specified, and a slight misalignment of veneer grain may occur between the transom and the door. Industry practice allows a variation in grain alignment from side to side of 3/8" (9.5 mm) on a single door, and 1/2" (12.7 mm) on pairs of doors with a single transom. If tighter tolerances are desired, they must be specified.

  Grain pattern alignment between the door and transom, even when cut from the same panel, will vary to some extent. This is due to the natural progression of the annual rings which create the figure in the wood. Misalignment will be more apparent in doors veneered with open grain species than with close grain. Misalignment of up to 3/8" (9 mm) is permitted in every Grade.

• **Continuous Match** - Provides optimum veneer utilization as each single piece of veneer extends from the top of the transom to the bottom of the door. Available veneer length in the species may limit this option.

• **End Match** - A single piece of veneer extends from the bottom to the top of the door with a mirror image at the transom.

• **No Match**

DOOR EDGE CONSTRUCTION AND TYPES

Edge construction is the manufacturer’s choice unless specified otherwise.

• **Type - A** - Solid Wood edgeband, face, and cross band edges show.

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- **Type - B** - Wood Veneer edgeband, face, and cross band edges covered.

- **Type - C** - HPDL or PVC edgeband, face, and cross band edges covered.

- **Type - D** - Solid Wood edgeband, veneer face edge shows.

- **Type - E** - Solid Wood edgeband, veneer face edge shows.

- **Type - F** - Solid Wood edgeband, face, and cross band edges covered.

**CONSTRUCTION DEFINITIONS**

- **Wood Face:**
  - 5-Ply consists of a center core on which is applied to each side a wood veneer or composite cross band with a face veneer applied over the cross band.
  - 7-Ply consists of a center core on which is applied to each side 3-ply face skins.

- **HPDL-Face:**
  - 3-Ply consists of a core with a plastic laminate face applied over both sides of the core.
  - 5-Ply consists of a wood veneer or composite cross band applied over the core before application of the face laminate.

**DOOR CONSTRUCTION CUTAWAY EXAMPLES**

Illustrations of grain direction is only applicable to wood veneer.

- **WOOD VENEER FACE** with particleboard, MDF, or agrifiber core (PC-5 / PC-7).

- **HPDL FACE** with particleboard, MDF, or agrifiber core (PC-HPDL-3 / PC-HPDL-5).

- **WOOD VENEER FACE** with staved lumber core (SLC-5 / SLC-7).

- **WOOD VENEER FACE** with structural composite lumber (SCL) core (SCLC-5 / SCLC-7).

- **WOOD VENEER FACE** with fire resistant composite core (FD-5 / FD-7).

To **PREVENT TELEGRAPHING**, inset solid wood edging when used must have similar moisture content as panel core, be glued securely and calibrated with panel core thickness prior to being laminated with a wood veneer on both faces.
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**DOOR CONSTRUCTION CUTAWAY EXAMPLES**

(continued)

- **HPDL with fire resistant composite core** (FD-HPDL).

- **WOOD VENEER/HPDL FACE with hollow core** (HC-7).

**CONSTRUCTION DETAILS**

- **General Molding Requirements**
  - Species shall match or be compatible with face veneer or laminate.
  - Specify transparent or opaque finish.
  - Molding shall be free of open defects, shake, splits, or doze.
  - Molding must be smooth and free of visible knife, saw, or sanding marks. Specify from following options:

- **Meeting Edge Options**
  - No bevel
  - Bevel
  - Flat astragal
  - Tee astragal
  - Rabbeted
  - Parallel bevel
  - Double egress

- **Horizontal or Transom Meeting Edge Options**
  - Non-rabbeted
  - Rabbeted

- **Glazing Options**
  - Transom Bar
  - Flat Trim

**Figure: 9-017**

**Figure: 9-018**

**Figure: 9-019**

**Figure: 9-020**

**Figure: 9-021**

**Figure: 9-022**

**Figure: 9-023**
**CONSTRUCTION DETAILS (continued)**

- **Glazing Options (continued)**

  ![Glazing Options](image1)

  - Flush Mouldings
  - Lip Moulding
  - Metal vision frame
  - Metal vision frame with glass
  - Metal vision frame with wood vision panels

  **Figure: 9-024**

All cutouts for metal or wood vision panels typically should be a minimum of 6" (152 mm) from the edge of the door and/or other cutouts for vision panels, locks, closers, or other hardware. This distance should be maintained or the fire label and warranty may be voided.

- **Louver Options**

  ![Louver Options](image2)

  - Variety of sizes
  - Wood slats
  - Wood chevrons
  - Metal chevrons
  - Fusible link

  **Figure: 9-025**

Generally, fusible link louvers installed in 45, 60, and 90 minute fire rated doors must comply with individual fire door authorities. Wood louvers are not allowed by NFPA 80 in fire rated doors. All doors must comply to accessibility requirements.

- **Fusible link Options**

  Fusible link (FL) louvers must be minimum 10" (254 mm) from the bottom of the door to the bottom of the louver cutout, and 6" (152 mm) from the edge of the louver cutout to the edge of the door and/or other cutouts for vision panels, locks, closers, or other hardware. These minimum dimensions should be maintained or the fire rating label and warranty may be voided. Sizes and details other than those illustrated are available.

- **Flashing Options**

  ![Flashing Options](image3)

  - Bottom of cutout
  - Door top
  - Exterior Surface

  **Figure: 9-026**

If the manufacturer is to flash the top of the door or the bottom edge of cutouts for exterior doors, it must be specified.

- **Dutch Door Options**

  ![Dutch Door Options](image4)

  - One sideshelf
  - Two sideshelf
  - 20-Min. door w/ shelf
  - No shelf
  - Rabbeted
  - Rabbeted w/ shelf

  **Figure: 9-027**

Hardware Blocking, if desired, shall be specified from the following typical options:

- **Blocking Options**

  ![Blocking Options](image5)

  - Top Block
  - Lock Blocks
  - Center Block
  - Bottom Block

  **Figure: 9-028**

Top Blocking may be full or partial width as required by its application.


Architectural Woodwork Standards 245
HAND and BEVEL OF DOORS

The “hand” of a door is always determined from the outside. The outside of an exterior door is the street or entrance (key) side. The outside of an interior room or auditorium door is the corridor or hall (key or imaginary key) side. The outside of a closet door is the side opposite the closet; the room, corridor or hall side. The outside of a single communicating door is the side from which the butts are invisible when the door is closed. The outside of twin communicating doors is the space between the two doors.

Standard handed doors push away from the person standing on the outside/key side. Reverse handed doors pull toward the person standing on the outside/key side.

FACTORY FINISHING (when specified)

Firms differ in the variety of factory finishes offered. Some finishes may not be available from all manufacturers. Finishes protect wood from moisture, handling, or harsh chemicals. The sooner moisture is restricted from entering or leaving, the longer wood lasts and the finer it looks. Transparent finishes without stain provide a protective coating for the wood, maintaining its natural look. Transparent finishes with stain provide the architect or designer an opportunity to create a striking visual effect by modifying color, texture, and sheen.

Finishing Options
Section 5 of the AWS defines the finishing systems and performance characteristics.

Carefully studying Section 5 with your manufacturer early in the design phase can result in both high quality and cost savings.

Factory finishing is generally specified when a project requires high quality performance and superior appearance.

Factory finishing offers many benefits, including:

- State of the art equipment in a well lighted, dust free environment (conditions normally not available in the field), which provides uniform color, texture, and sheen.
- Proper sanding prior to the application of stains and finishes. Field conditions often hinder surface preparation resulting in a lack of clarity and uniformity in finish and color.
- Protection from unfavorable relative humidity conditions at the earliest possible time.
- Cost savings (in most cases) over the total cost of field applied finishes by a separate contractor.
- Shorter installation time on the job site, resulting in faster project completion.

STILE and RAIL DOOR COMPONENTS

- **Stiles** - are the vertical outside members. They may be solid wood or veneered. Stiles usually have solid sticking (solid stuck, solid molded). Sticking is usually of three profiles: “ovolo”, “ogee” or “quarter round”. Other profiles may be used. The stiles are ploughed or grooved along the edge to receive the panels, rails, and/or glass. If the door is to be assembled by dowelled construction, the stiles are bored to receive the dowels. If the door is to be assembled by lag screw construction, the stiles shall be solid hardwood lumber. The stiles will contain much of the hardware for the door, and must be sized and fabricated to fit the intended hardware, locks, and latches.

- **Rails** - are the cross or horizontal members of the door. They may be solid wood or veneered. Rails are coped on both ends to fit the sticking of the stile. Tenons or dowels are machined into the rails to fit mortises or dowel boring in the stiles.

- The top and bottom rails are required, with the addition of intermediate cross rails or lock rails as appropriate. The bottom rail is usually the widest of the members, made of edge glued lumber or veneered, depending on the door construction. The top rail is often the same face dimension as the stiles.

- The lock rail, if there is one, is usually a wide member located at lock height. In the case of narrow stiles or large hardware, this rail serves to house the lock and latch mechanisms.

- **Mullions** - an upright or vertical member between panels. It is similar to a cross rail in the way it is fit and machined.

- **Panels** - are either solid lumber or panel products that fill the frame formed by the stiles, rails, and mullions. When the figure of the wood is visible in the finished product, the grain direction of the panels usually runs vertically.
Doors

introductory information

STILE and RAIL DOOR COMPONENTS

Muntins and Bars - Stile and rail door with glass panels often utilize muntins and bars, which are smaller in section than mullions. A bar is a rabbeted molding, which extends the total height or width of the glass opening. A muntin is a short bar, either horizontal or vertical, extending from a full bar to a stile, rail, or another bar. Muntins and bars are traditionally coped and mortised joinery.

STILE and RAIL DOOR DESIGN

Custom stile and rail door design offer many opportunities for creativity and choice. Some of the variables include:

- Panel layout.
- Grain patterns and relationships.
- Stile and rail construction.
- Molding details.
- Panel construction.
- Joinery techniques.

Selection among these variables requires some knowledge of their relative performance characteristics. The following drawings illustrate some of the options. Many manufacturers feel veneered and laminated constructions offer the lowest risk of warp for most species of wood. Consult your manufacturer early in the design process for assistance in making selections.

The strength of a stile and rail door is primarily dependent on the shoulders and joints between the stiles and rails. A wide bottom rail will increase significantly the strength and stability of a door far beyond that of a narrow rail.

Care should be taken to ensure that the design of a door’s stiles and rails is large enough to structurally accommodate the intended hardware, provide a strong and stable door, and accommodate the usage and size of the opening.

Because of warpage and twist characteristics of heavy, one piece, solid hardwood members, that method of construction is not recommended for stile and rail door construction.

Door panels of either flush/flat or raised design are typically of the same species as the stiles and rails.

STILE and RAIL DOOR JOINERY EXAMPLES

- Haunched Mortise and Tenon
- Slot Mortise and Tenon
- Loose Tenon
- Dowel

STICKING PROFILES:

- Cove & Bead
- Ogee

THICKNESS

Stile and rail doors are usually 1-3/4" (44 mm) thick. For doors over 3'-6" (1067 mm) in width or 8'-0" (2440 mm) in height, it is recommended they be 2 1/4" (57 mm) minimum thickness.

GRAIN DIRECTION and LAYOUT

Traditionally, the grain direction flows with the longest dimension of the stile or rail. Panel grain typically runs vertical; however, it can be altered for design purposes. If raised panels are to be rim raised veneered construction, the grain of the rims will flow around the panel with the long dimension of the rim material.

There are a variety of methods of stile and rail fabrication. It is possible to fabricate stile and rail doors that will perform within the tests established in this Standard using any of the illustrated techniques and others. The illustrations are intended as guidelines for the design professional and should not limit the potential for creative solutions. Glass cannot always be centered on stiles and rails, depending on the thickness. Moldings and stop are usually applied with small brads or finish nails.
STILE AND RAIL DOOR PANEL LAYOUT and GRAIN PATTERNS

STILE and RAIL DOOR CONSTRUCTION

Figure: 9-038

Figure: 9-039
STILE and RAIL PANEL CONSTRUCTION

Panel product, flat panel
2-ply lumber raised panel
Solid raised panel
Rim raised veneer panel alternate
3-ply lumber raised panel
Rim raised veneer panel alternate

Other configurations may be available

PANEL and GLASS RETENTION

Flat bead stop
Moulded stop (One side applied)
Lipped moulding
Inset moulding

Other configurations may be available

DESIGN IDEAS

Includes examples of Stile and Rail door configurations. These design ideas are not comprehensive and are for the reader to use as a starting guide.
**SECTION 9**

Doors

**SPECIFY REQUIREMENTS FOR**

- **FIRE RATINGS.**
- **CODE or REGULATION** compliance, and
  - If they require certain design accommodations, and it is the responsibility of the design professional to employ such within their door designs and schedule.
- **HARDWARE** such as kick plates, door closers, hinges, panic hardware, locks, etc.
- Prohibition of **FINGER JOINTS**, which are otherwise allowed at edges.
- At **STILE and RAIL DOORS**:
  - Stile or rail widths and/or construction.
  - Ornamental detail or joinery.
  - Panel layout and grain direction.

**RECOMMENDATIONS**

- If **FIELD FINISHED**, include in Division 09 of the specifications:
  - **BEFORE FINISHING**, exposed portions of woodwork shall have handling marks or effects of exposure to moisture, removed with a thorough, final sanding over all surfaces of the exposed portions and shall be cleaned before applying sealer or finish.

- **THOROUGHLY REVIEW** Sections 3 and 4, especially Basic Considerations, Recommendations, Acknowledgements, and Industry Practices within GENERAL for an overview of the characteristics and minimum acceptable requirements of lumber and/or sheet products that might be used herein.

- **REVIEW** the GENERAL portion of Sections 3 and 4 for an overview of the characteristics and the minimum acceptable requirements of lumber and/or sheet products that might be used herein.

- **STRUCTURAL MEMBERS**, grounds, in wall blocking, backing, furring, brackets, or other anchorage which becomes an integral part of the building’s walls, floors, or ceilings, required for the installation of architectural woodwork are not to be furnished or installed by the architectural woodwork manufacturer or installer.

- For an excellent **PAINT GRADE SURFACE** Medium Density Overlay (MDO), Medium Density Fiberboard (MDF) or Hardboard should be specified.

- **WOOD DOORS** should be avoided in exterior applications.

- **At GLASS LIGHTS** - To create the proper seal against weather, wind, and rain, the finish coats on doors should be allowed to flow onto the glass area at least 1/16” (1.6 mm), and:
  - When cleaning, a razor should not be used to scrape the glass because it will destroy the seal; a broad blade putty knife should be used to protect the seal between the paint and the glass. See illustration below showing the finish lapped on the glass.

![Figure: 9-042](image_url)

![Figure: 9-043](image_url)
The **COMPLIANCE** portion of this Section has been intentionally excluded to protect our sale of Grade Rules, which allows us to provide these standards free of charge to Design Professionals.