



**W**e associate doors with choices. Remember the short story called "The Lady or the Tiger"? Or Monty Hall whipping the audience into a frenzy by asking, "What's behind door No. 3?" The most intriguing thing about a door might be what it conceals. If you're building a house or an addition, though, you've got to pay attention to the door itself. What do you want from a door? Your front door keeps out the cold and

other uninvited guests. Inside, doors perform a host of functions, from making a bathroom a more private place to isolating a noisy television to announcing the end of an argument. At a minimum, interior doors are large pieces of millwork and part of a room's overall design.

When buying a door, you'll want to know what the door is made of and how much it costs. Those of you on the lookout for a new door

have to weigh the virtues of hollow vs. solid vs. stile and rail, flat panel or raised panel, veneered or solid panel, veneered and engineered composite panel or molded, and then a whole raft of wood species, among other things. To learn more about doors, I talked to manufacturers, visited their factories, talked to carpenters who install doors and finally checked prices at door retailers here in southern New England. I'll give





# Shopping for Interior Doors

There are lots of choices between expensive wooden stile-and-rail and cheap hollow-core doors

by Charles Bickford

visual depth and crisp symmetry. At 1 $\frac{1}{8}$ in. thickness and about 60 lb., a typical interior door has the right amount of mass to swing easily on its hinges and to stop sound from traveling room to room. But according to studies commissioned by the National Wood Window and Door Association, I'm living in the past. Wooden stile-and-rail doors now account for less than 10% of the interior doors sold annually in the United States.

Still, the stile-and-rail door has been the door of choice for hundreds of years because its frame was more stable than its predecessor, the board-and-batten door. By loosely capturing the panel (the widest and most unstable part of the door) in a rigid frame, the stile-and-rail door lets panels expand and contract seasonally without causing the door to stick or warp.

The advantages of a rigid frame still don't overcome the wood's natural tendency to move. The stiles and rails themselves must be made from flat, straight-grained stock that will resist meteorological temptations, and even then, doors still occasionally warp. Although you can still buy doors made of solid wood, most wood doors are made of finger-jointed and veneered stock. This construction has two distinct advantages: One, the laminated frame won't warp as easily; and two, smaller pieces of lesser-quality wood are substituted for increasingly rare and expensive old-growth lumber.

I witnessed the process at a large door factory owned by Jeld-Wen Inc. (P. O. Box 1329, Klamath Falls, OR 97601-0268; 800-535-3936), a facility that makes approximately 20,000 doors a week. Logs of Ponderosa pine are sawn into usable lengths and widths; large knots and defects are discarded. Each piece is then sorted by size; smaller pieces are finger-jointed and glued into long runs of stile-and-rail stock, which are then veneered and shaped for assembly. The amount of waste at the end of the process is negligible; anything that can't be used for finger-jointing is shredded to make hardboard.

In addition to veneering frames, manufacturers apply the same thinking to panels. A stile-and-rail door can have two, three, four, five or six panels that can be raised or flat. In a door that's meant to be stained or clear finished, raised panels are traditionally made of solid wood; flat panels are cut from veneered plywood or composite. With a paint-grade door, doormakers usually won't use solid wood for the panels; when the wood moves (and it will move), an unpainted, unsightly line shows at the panel's perimeter. Medium-density fiberboard (MDF) panels are better: They can be shaped to any profile, they take paint beautifully, and best of all, they don't shrink or swell. Manufacturers are also now veneering MDF panels for stain-grade doors. If you are ordering custom paint-grade doors and think you must have solid-wood panels, have the shop prime and paint the panels before the door is assembled. When the panel shrinks, no unpainted line will show.

You can buy the most popular style, a six-panel door of standard size made of veneered Ponderosa pine, for just under \$100. The same door veneered in fir goes for about \$200, while a door made of oak might cost over \$300. Some custom builders I've talked to spend the extra \$10 to



\$15 for 1½-in. thick exterior doors and use them as bedroom doors; the additional ¾ in. helps to dampen sound and gives the door a more substantial feel.

### French doors are increasingly popular

—Single doors with lites are called sash doors; matched pairs are usually called French doors. The stile-and-rail construction, identical to that of paneled doors, gives the door frame its strength. To secure the glass, small pieces of trim called sticking are nailed or stapled to the muntins and bars. Morgan Door (Morgan Industries, 500 Park Plaza, Oshkosh, WI 54903-2246; 920-235-7170) has a newer method of installing glass called "compression glazing." Glass is captured in da-does during the door's assembly, eliminating the applied sticking that typically holds the glass. What about a broken pane? Doug Tyriv-er of Morgan says that the percentage of breaks is negligible, but if a pane does get broken, the sticking can be routed out and replaced in the traditional manner.

More recently, manufacturers have begun to offer large single panels of glass that are divided with a V-groove etched into the glass (photos p. 90), which certainly makes finishing the door and cleaning the glass much easier. Like the other doors, sash doors are available in a dizzying assortment of divided lites, sash-and-panel arrangements, beveled glass, etched oval panels and leaded glass. Whatever the configuration, the doors must always have tempered glass. A pair of prehung French doors in pine can set you back about \$500; add \$100 to \$150 if you want beveled glass; and double the price if you like the look of brass coming (trim) around the glass. Other species such as oak and fir are common options for stain-grade doors.

### Louvered doors aren't just for decoration

—Before the advent of air conditioning, louvered doors were a necessity in hot, semitropical climates. They allowed air to circulate while keeping direct sunlight and prying eyes at bay. These ventilated doors are also used in colder regions to vent hot water-heater closets, furnace rooms and damp basement closets.

You'll find most of these doors with louvers that are fixed in the open position. Better-quality doors feature louvers that are mortised into the stiles. Usually a custom item, movable louvers are handy for controlling the flow of air or sun-



**Hollow-core doors assemble in a snap.** After gluing the stile, rails and lock block to one hardboard skin, workers unfold corrugated cardboard onto the center of the door and lay the second skin down; the entire process takes less than ten seconds.

light into a space; cleaning the inevitable dust that collects between the slats is easier, too. Some door stiles even have nylon inserts that ease wood-on-wood friction.

A standard-size prehung louvered door costs about \$140, either full louvered or a louver and lower solid-panel arrangement. As with exterior shutters, the best way to finish a louvered door is either to spray it or pay someone else to do the job.

Bifold doors also come in louvered styles, as well as flush, solid six panel or mirrored. Retailers are stocking more molded-skin bifolds as well (more about molded skin later). Bifold doors are somewhat limited in their individual sizes, from 9 in. to 24 in., but can be hung in groups of two or four to cover up to 8 ft. of doorway. A common problem with bifolds is that some doors warp more easily because they're made from thinner stock, a problem that can be compounded when the door is louvered. A 4-ft. wide flush unit may cost under \$100, while a mirrored set can fetch upward of \$300. Cafe doors, those sawed-off louvered doors elbowed aside by movie cowboys, can be had with panels or with louvers, and each pair costs between \$150 and \$200 for a 30-in. opening.

**Flush doors are sometimes hollow but never empty**—The most inexpensive door on the market is the flush door, a simple flat rectangle

that consists of a thin wooden frame covered on both sides by a ½-in. layer of plywood or hardboard called a skin (photo top left, facing page). (The term "flush" refers to a detail of the manufacturing process. Oversize sheets of plywood or hardboard are glued onto frames; after the glue is dry, any excess is trimmed flush to the frame.) During the housing boom that followed the Second World War, these doors became popular because their materials were cheaper, and they were easy to manufacture, hence a lower retail cost. These days, flush doors and their molded-skin cousins account for approximately 90% of the residential interior-door market.

All flush doors have frames that consist of finger-jointed or solid-wood stiles and rails. Some manufacturers also substitute MDF for wood in the rails (and sometimes stiles) of their less expensive doors. A block of wood or MDF, known as the lock block, is glued on the strike side of the door and gives the installer a place to drill holes for

the doorknob. (Flush doors commonly have a lock block on either side to make the door reversible.) The void in the middle of the door is filled according to the type of door. Hollow cores are filled with a corrugated cardboard web (photo above). "Hollow core," sometimes used to describe any flush door, is a slight misnomer. They seem hollow because they weigh about 30 lb., half the weight of a solid stile-and-rail door, and don't have the mass to close as easily as a solid door. A favorite among eavesdroppers, hollow doors don't do much to stop kicking feet, either.

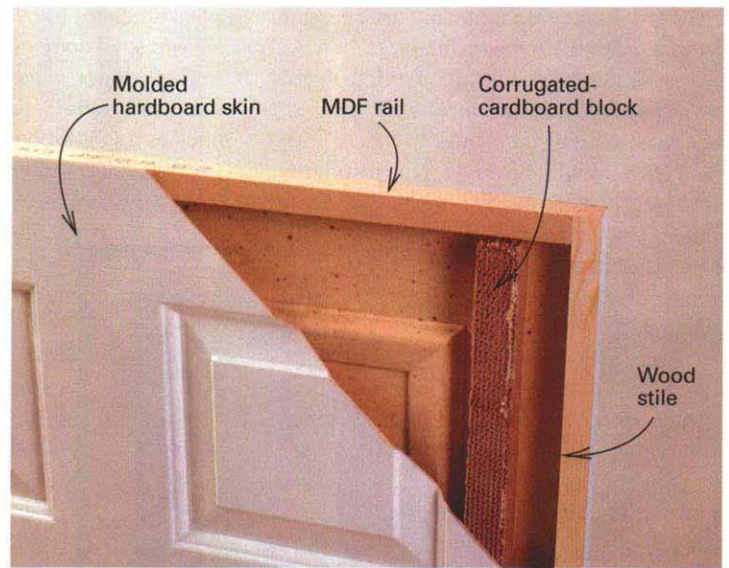
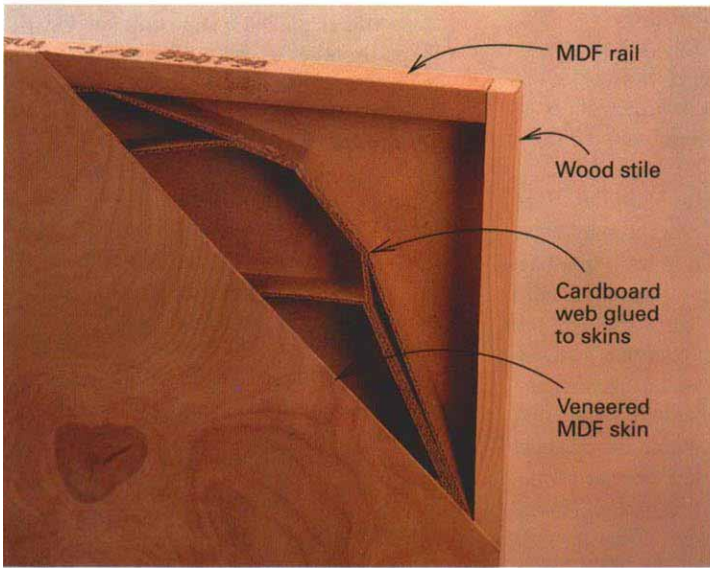
Paint-grade doors are usually clad in hardboard skins that have smooth textures or embossed grains and can be ordered prestained in a variety of faux species. Birch, oak and lauan are commonly used for plywood or MDF veneers; their cost and appearance depends on the type of veneer cut (rotary, plain sliced, book-matched) and species. A plain lauan slab (a term used to describe doors before they receive hardware) may cost \$20; a birch door with bookmatched veneers may go for up to \$100.

### Particleboard gives solid-core doors their heft

—Solid-core flush doors are the Mack trucks of the door world. Filled with particleboard or MDF, these doors weigh about 80 lb. without their hinges. This extra weight gives the door a solid feel when it swings shut, a trait that rates



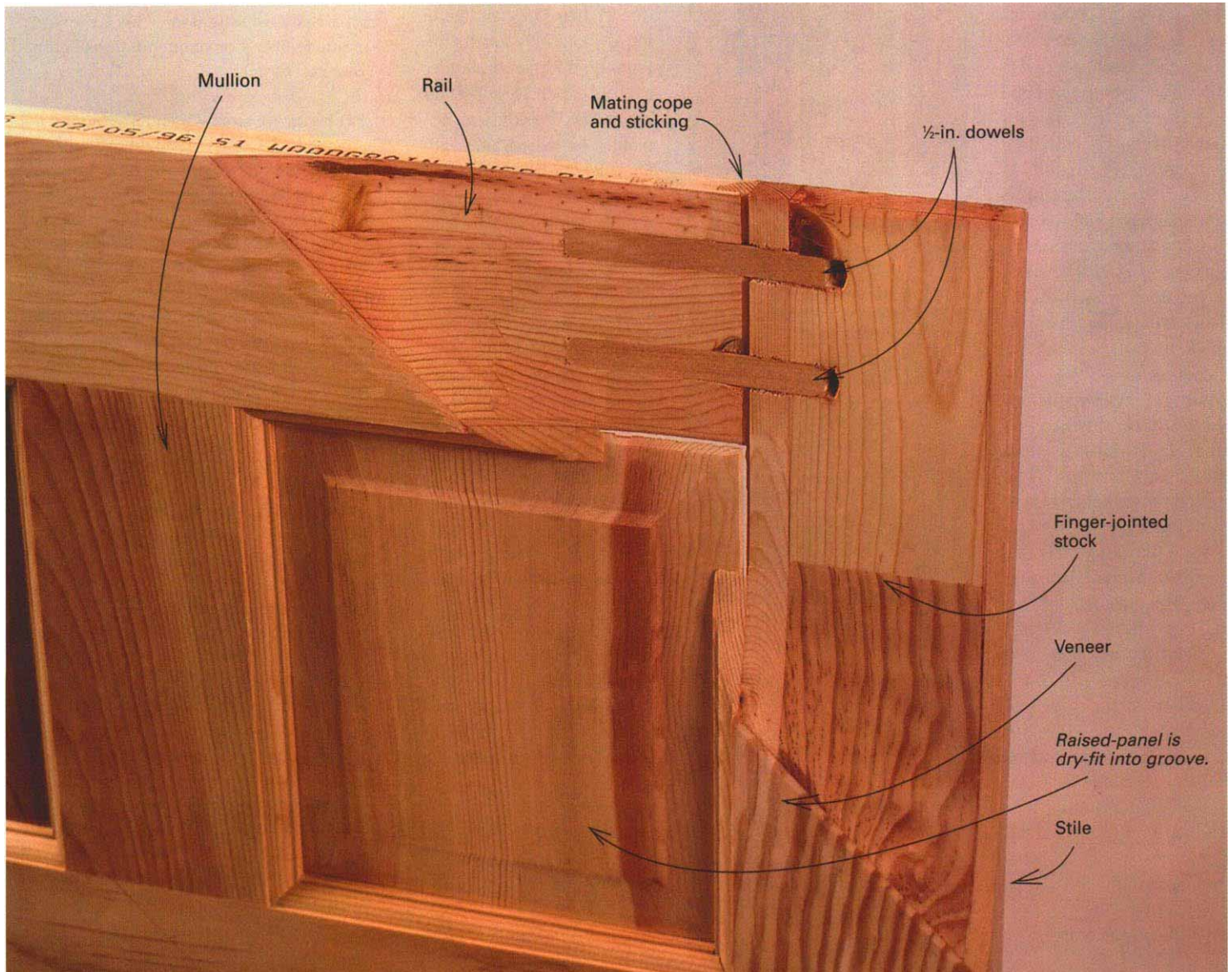
## What's inside a door?



**Flush-door construction.** Flush doors are strong, light and stable because the skins and frames reinforce each other. The door's interior is supported with a web of corrugated cardboard.

**Molded hardboard's beauty is skin deep.** Made from compressed wood fibers, these hardboard skins can be stamped into a variety of designs. Only 1/4 in. thick, the skins have a density similar to maple.

**Stile-and-rail door construction.** Modern stile-and-rail doors are built from finger-jointed and veneered lumber, which minimizes wood movement and maximizes lumber use. Doweled joints are strong and assemble quickly.





high with your average consumer. Doors filled with gypsum, normally used commercially for fire doors, weigh even more and are occasionally used in homes for extra fire protection. Another advantage of solid-core doors is their ability to dampen sound transmissions and to resist the antics of drunken frat boys.

The extra weight, however, puts a strain on hinges and jambs, especially on MDF jambs; replacing the middle hinge screw with a 3-in. screw can keep the smaller screws from pulling out of the jamb. You will also feel the strain if you have to hang these heavyweights all day. Solid-core doors are available in the standard array of hardboard plywood veneers and molded skins, and they cost about \$30 more than their lightweight brethren.

### Molded doors are flush doors with a new suit of clothes

—Developed in the early 1970s by companies such as Weyerhaeuser, Masonite and Caradco, molded-skin doors (photo top right, p. 89) now account for roughly half of the flush-door market, or about 15 million doors a year. The doors share the same internal construction as their flat cousins but are covered with hardboard skins molded in the shape of traditional stile-and-rail doors.

Manufacturers such as Masonite and Jeld-Wen process wood scraps, sawdust and other wood detritus into a soft, fuzzy mass of clean wood fibers that is mixed with binders and loosely pressed into long mats that resemble sheets of damp oatmeal. The mats are then fed into enormous stamping presses that heat and compress the sheets into 1/8-in. door skins. These skins are stamped with a wide variety of designs that include smooth or wood-grained surfaces, arched or straight rails, and different panel configurations.

As with other types of hollow doors, the molded door frames are lightweight (stile-and-rail members are 1 1/2 in. sq.); the strength of the door lies in the lamination of frame and skin. Molded

doors are also available with solid cores. Masonite (Masonite Corp., 1 Wacker Drive, Suite 3600, Chicago, IL 60606; 800-405-2233) also makes a solid door it calls Craft-Core; Masonite claims the door, filled with a composite lighter than the standard particleboard, weighs as much as a solid-wood door but has the dimensional stability of MDF.

Molded doors tend to be as stable as other flush doors. The skins resist abuse fairly well, too, having a density similar to hard maple. The weakest of the bunch, according to several tradesmen I talked to, are doors with MDF stiles. Larry Hart, a veteran door hanger from Southern California, told me that he won't install MDF-edged doors in bathrooms because the composite tends to wick moisture and warp the doors.

Molded-skin doors have been growing in popularity in the past ten years, mainly due to their low cost (starting at about \$40), low maintenance and resemblance to more expensive stile-and-rail doors. The skins can be painted or stained, although the latter finish can be tricky to execute properly. For an additional \$15 to \$25, you can order prefinished molded doors as well.

### Look for newer door materials in the future

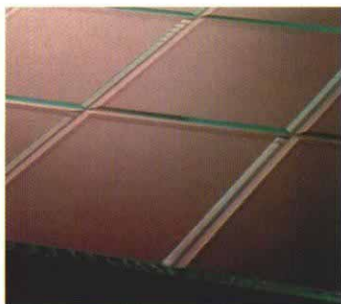
—As in other areas of the building trade, there is a strong trend in the door industry toward manufactured materials such as hardboard and other composites that are both dependable and inexpensive. Other materials that are sure to appear on the market include fiberglass, rigid-foam cores and carbon-fiber laminates. As

long as the door looks good, closes evenly, withstands years of abuse and slams good and loud when you want it to, it shouldn't matter what materials are used in the door—we can always use the wood somewhere else. □

*Charles Bickford is an assistant editor at Fine Homebuilding. Photos by Scott Phillips, except where noted.*



**Etched grooves replace wood muntins and bars in sash doors.** Some door manufacturers are now offering sash doors with large single lites divided by etched V-grooves, making the door easier to finish and to clean.



## Ordering doors

Once you've picked a style that you like, there are other questions to consider before purchasing a door.

### Door size is measured in feet and inches

—Doors come in a variety of standard sizes. The dimensions of a door are always referred to in feet and inches and are marked on the top rail of the door (photo top left, facing page); an interior door that's 30 in. wide and 80 in. tall is marked as a 2-6, 6-8 door (spoken "two-six, six-eight"). You can order door heights from 6-0 to 7-0, but 6-8 is the industry standard for interior doors, although 8-0 (96 in.) doors are becoming a stock item in the West and Southwest. Doors are usually available in widths from 12 in. (for closets and bifolds) to 36 in., graduated in 2-in. increments. If you are replacing a door in an odd-size frame, be aware of how much door you can safely cut away. One of the problems with hollow flush doors is that there is a limited amount of door to trim before you hit air and ruin the door. Check the manufacturer's recommendations before you start to cut.

**Prehung or not?**—If you are buying a houseful of doors, you might consider having the doors prehung. A prehung door has its hinges mortised into a solid jamb assembly and arrives at the job site ready to be shimmed and nailed into the opening (photo right, facing page). The casing is then nailed to the jamb.

An experienced door hanger can install a prehung unit in about 20 minutes, which more than makes up for the additional charge of prehunging, usually between \$30 and \$40 for pine jambs. For a little more money, you can customize the units by specifying types of jamb stock, binges and casing.

The split-jamb prehung door is a variation found in the Eastern United States and costs about the same as a solid jamb. This split jamb consists of two halves that join at the door stop, one side nesting into the other (photo bottom left, facing page). This arrangement allows the jamb's width to expand as much as 1/2 in. to cover any deviations in the plane of the wall. Both jamb sides have the casing already attached. Once half of the jamb is centered and plumbed in the opening, the casing is nailed to the wall, and the remaining half can be slid into place and nailed. Although you might see split jambs outfitted with inexpensive clam-



shell or colonial casing, you can often get other stock moldings for a few more dollars.

The Western cousin to the split jamb is called a prefit jamb. The head and legs of the jamb arrive at the job site unassembled, but each piece has casing nailed to both sides. The casing on each piece cups over the drywall, the head and legs interlock, and the casing is nailed off. Some prefits also feature a screw at the top of each leg that bears on the trimmer stud and can be

tightened or loosened to center the door in the opening.

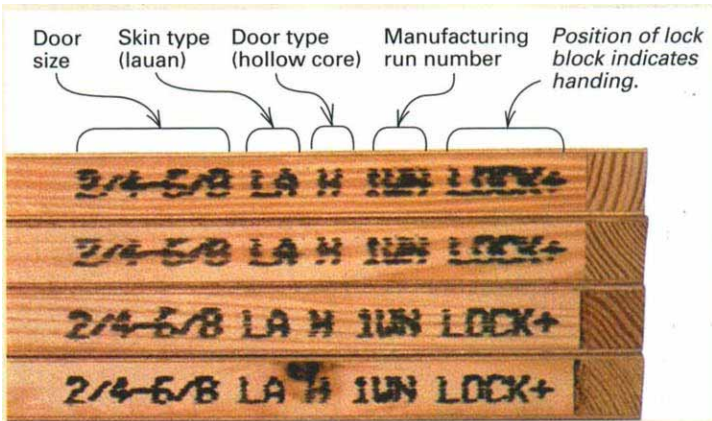
Keep in mind that although a prehung door comes with hinges and is bored for a passage set, it won't come with the passage set unless you specify it. Sometimes a millwork distributor will offer free passage sets, but usually these sets are cheap and not worth your attention.

**Handing a door**—One of the more confusing aspects of doors is the issue of "handing": What

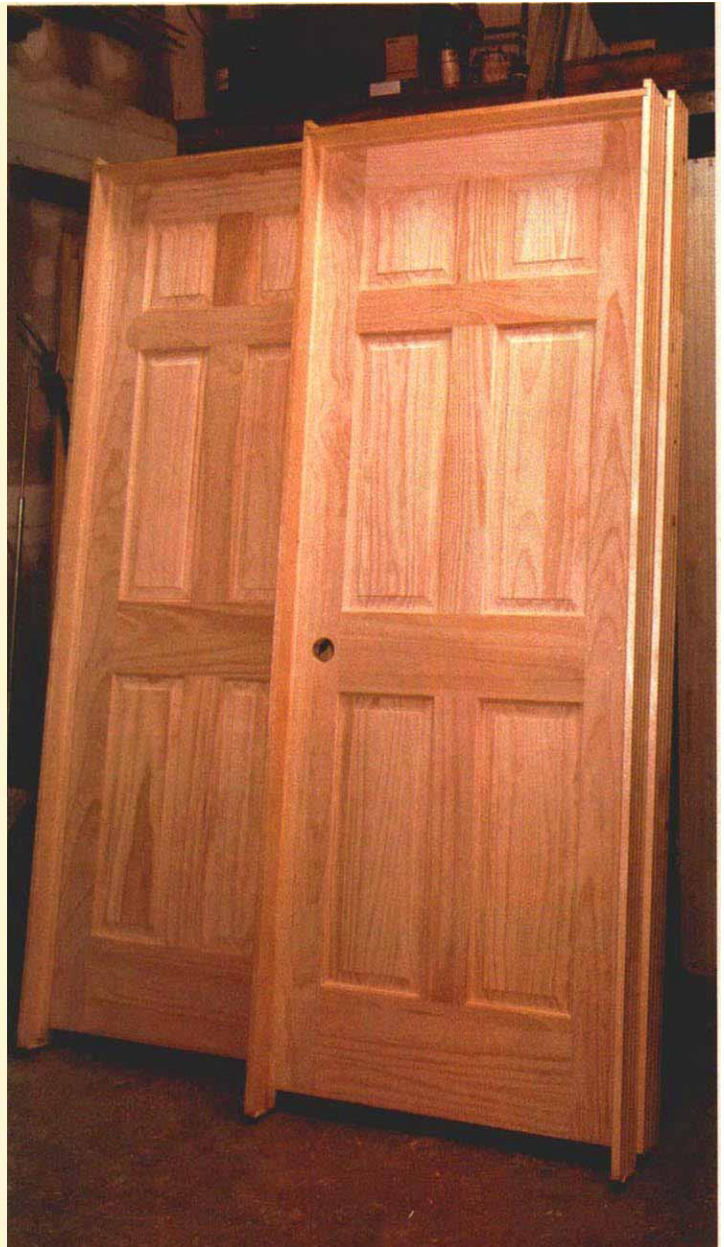
makes a left-hand door left and a right-hand door right? Ask five carpenters, and you'll get at least five different answers. Scott Whitten, a veteran door salesman at House of Doors in Cheshire, Connecticut, tells his customers to face the door. If the door opens toward you with the knob on the left, it's a left-hand door; if the knob is on the right, it's a right-hand door. This method works for French doors as well; the active door determines the handing of the set. The handing is normally

marked at the top of the door's rail and/or on the back of a prehung jamb.

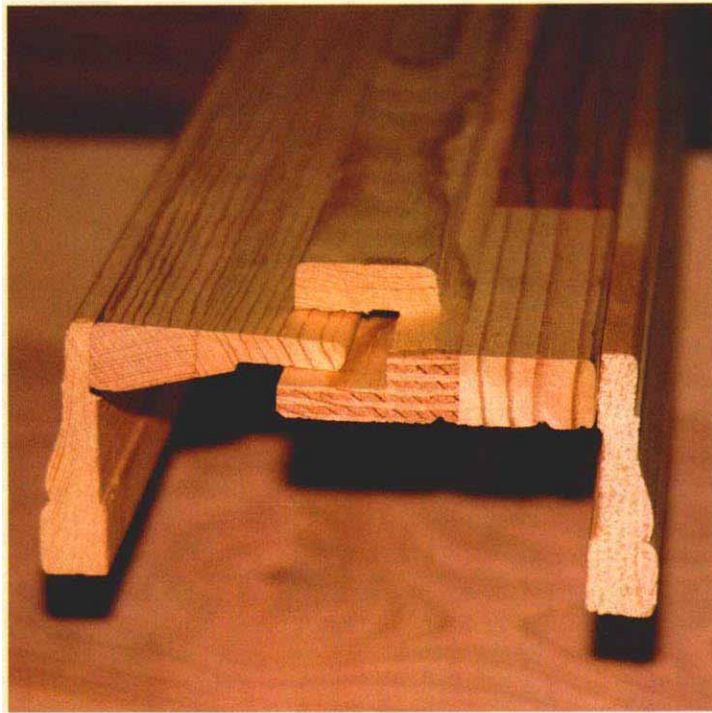
**Warranties**—All large door manufacturers offer a warranty with their product. Nearly all say the owner must seal all six sides of the door for the warranty to be in effect. The warranty also covers warping or twisting in excess of 1/4 in. deflection over the total length of the door but may not cover warpage on doors over 36 in. wide and 84 in. long.—C. B.



**To find out about the door, read the top rail.** Manufacturers stamp pertinent information such as the door's size, the type of skin and core, handing and the run number on the top rail.



**Prehung doors ready for a carpenter.** Doors hinged into pre-assembled frames await shipping to the job site. An experienced door hanger can install and trim a prehung unit in about 20 minutes.



**Split-jamb doors are prehung and precased.** The nesting arrangement of the two jamb halves, shown here from the bottom of the jamb leg, allows the jamb to span irregular wall thicknesses. Jamb are nailed through the door stop and casings.