Building Wooden Screen Doors

Durability and aesthetics hinge on sound joinery and steadfast materials

by Stephen Sewall

According to Steven J. Phillips' Old-House Dictionary, the purpose of a screen door is "to allow ventilation but exclude insects." Of course if it can accomplish that gracefully, all the better. During the late 1900s, when screen doors first became popular in this country, most were designed to enrich, or at least complement, the architecture. To that end, a wealth of styles emerged, many of which were featured in pattern books and copied by carpenters. Even many of the mass-produced screen doors in those days were both fetching and functional.

Nowadays, though, the ubiquitous aluminum screen door is the one most likely to appear on someone's doorstep. To be sure, aluminum doors have their place, but all too often they wind up in classical entryways or over finely wrought entry doors, spoiling the intended effect.

A wooden screen door, on the other hand, can be unobtrusive, allowing the main door to show through. Or it can mask the door behind it and serve as an architectural ornament in its own right (photos facing page). As a homebuilder and architectural woodworker, I've built screen doors both ways. And in either case, the basic construction principles are the same.

Screen-door anatomy—In its simplest form, a screen door consists of two stiles, a top rail and a bottom (or kick) rail (drawings, p. 74). Traditionally, most screen doors were built of pine, oak and other domestic woods. But pine is soft, and oak isn't especially stable or weather resistant. Cypress is a good choice, but here in Maine it's hard to find. Though I've used a variety of woods for my screen doors, I prefer Honduras mahogany. It's strong, stable and holds paint and varnish well.

I build my doors 1⅛ in. thick, a compromise between light weight and sturdy construction. Originally, I joined stiles and rails with dowels because it was quick and easy. But after *a* while, the joints loosened. Screen doors bear the brunt of the weather and they get slammed a lot, especially when they're spring-loaded. Pneumatic closers (the kind you see on most aluminum screen doors) are especially hard on wooden screen doors because they hesitate in mid-swing and cause excessive racking. Nowadays, I use mortise-and-tenon joinery exclusively for my screen doors.

Stiles and top rail are a minimum of 4-in. wide, which makes for a sturdy door and provides plenty of room for locksets and springs. The kick rail is at least 8-in. wide to keep the door from distorting. I cut two narrow tenons instead of one wide tenon in the kick rail so that the mortises don't weaken the stile.

Tenons are 3 in. long and ⅜ in. thick, or one third the thickness of the stock. A ½-in. wide by ⅜-in. deep rabbet along the inside edge of the frame accommodates the screen and screen stop. That's all there is to it.

Making the door—One approach for making this type of a door is to cut the mortises and tenons and glue up the door first, and then rabbet and groove its inside edge with a router to accept the screen and stop (this requires that the rabbets be chiseled square at the corners). But I prefer to rabbet the stiles and rails *before* assembly, extending the rabbets down the full lengths of the stiles. This requires that the ends of the rails be cut to engage the edges of the stiles (top right drawing, p. 74). The cuts are easily made with dado blades on a table saw, and the resulting lap joints strengthen the door.

I start by selecting clear, straight-grained stock with a moisture content of about 10%. After sizing and jointing the stock, I lay out the mortises on the stiles. I stop the bottom mortise about 1-in. short of the bottom end of the stile so that the door can be trimmed without cutting into the mortise and tenon. One inch of stock separates the two mortises for the bottom rail. On the top end, I hold the mortise back about ½ in. On the inboard sides, the mortises stop where the rabbets begin.

I cut the mortises with a horizontal boring machine. I prefer this over a hollow-chisel mortiser in a drill press because the boring machine is faster and more accurate. The only drawback is that it produces mortises with rounded corners. To avoid squaring the ends of the mortises or rounding over the edges of the tenons, I cut the tenons narrower than the mortises by the diameter of the mortising bit, or ⅜ in. That leaves small half-circle hollows on either side of the tenons, which fill up with glue during glueup. I also cut the short rabbet at the mouth of each mortise with the boring machine, squaring its inside corner with a chisel. Mortises can also be cut with a router or chopped out by hand with a mortising chisel.

I cut the tenons on a table saw fitted with a ¾-in. wide dado head set to depth of ⅜ in. I lay the stock flat on the table and push it through carefully with a miter gauge set to 90°. The rip fence on the table saw serves as a stop to determine the length of the tenon. Starting with the shoulder cut and pulling the stock away from the fence with successive cuts, I need to make only five or six passes to cut a 3-in. long tenon.

I readjust the fence to cut the other side of the tenon so that it's ½ in. longer than the first side to compensate for the screen rabbet. After the cheek cuts are completed, I adjust the height of the dado head, flip the rails on edge and trim the tenons to width using the same method. I cut out the space between the double tenons on the bottom rail with a bandsaw. Tenons can be cut a number of other ways, of course, such as with a single-end tenoner, a tenoning jig on a table saw (see *FHB* #36, pp. 39-41), a bandsaw or even by hand with a backsaw.

With the mortises and tenons completed, I cut all the rabbets using either the dado head on the table saw or a shaper, which gives a cleaner cut. The ½-in. width of the rabbet gives ample room to center a ⅛-in. wide by 3⁄16-in. deep (approximately) groove. The screen will be pressed into this groove and held fast with ⅛-in. dowel stock (more on that later).

I cut this groove with a combination blade on the table saw (the inside corners are connected after glueup with a small chisel). The width of the groove is crucial and must be determined by trial and error with a piece of screen and dowel. The dowel must fit snugly and tightly enough to hold well, but not so tightly that the dowel can't be pressed below the surface of the wood. When the dowel fits correctly, the door is ready for glueup.

Gluing up—Before gluing up a door, I assemble it dry to make sure everything fits. I use two-part epoxy for my screen doors. Though it's expensive and has a relatively short pot life, it's waterproof, has excellent gap-filling ability and is transparent when it cures. Unlike most other glues, it actually bonds better on sawn surfaces than on planed wood. Also, epoxy can be mixed to be a bit

Wooden screen doors can be unobtrusive or ornamental, depending on the desired effect. The screen doors in the photos below are simple, allowing the entry doors to show through. The screen door pictured above, built of solid oak, conceals the main door and serves as an important visual element in the entryway.

The door below, built of Honduras mahogany, is simple and sturdy. The lock rail adds strength and divides the upper and lower half of the door behind it. The door pictured above is a stone's throw away from the ocean and features bronze screening, which resists corrosion. The storm doors over it protect it from nasty weather.

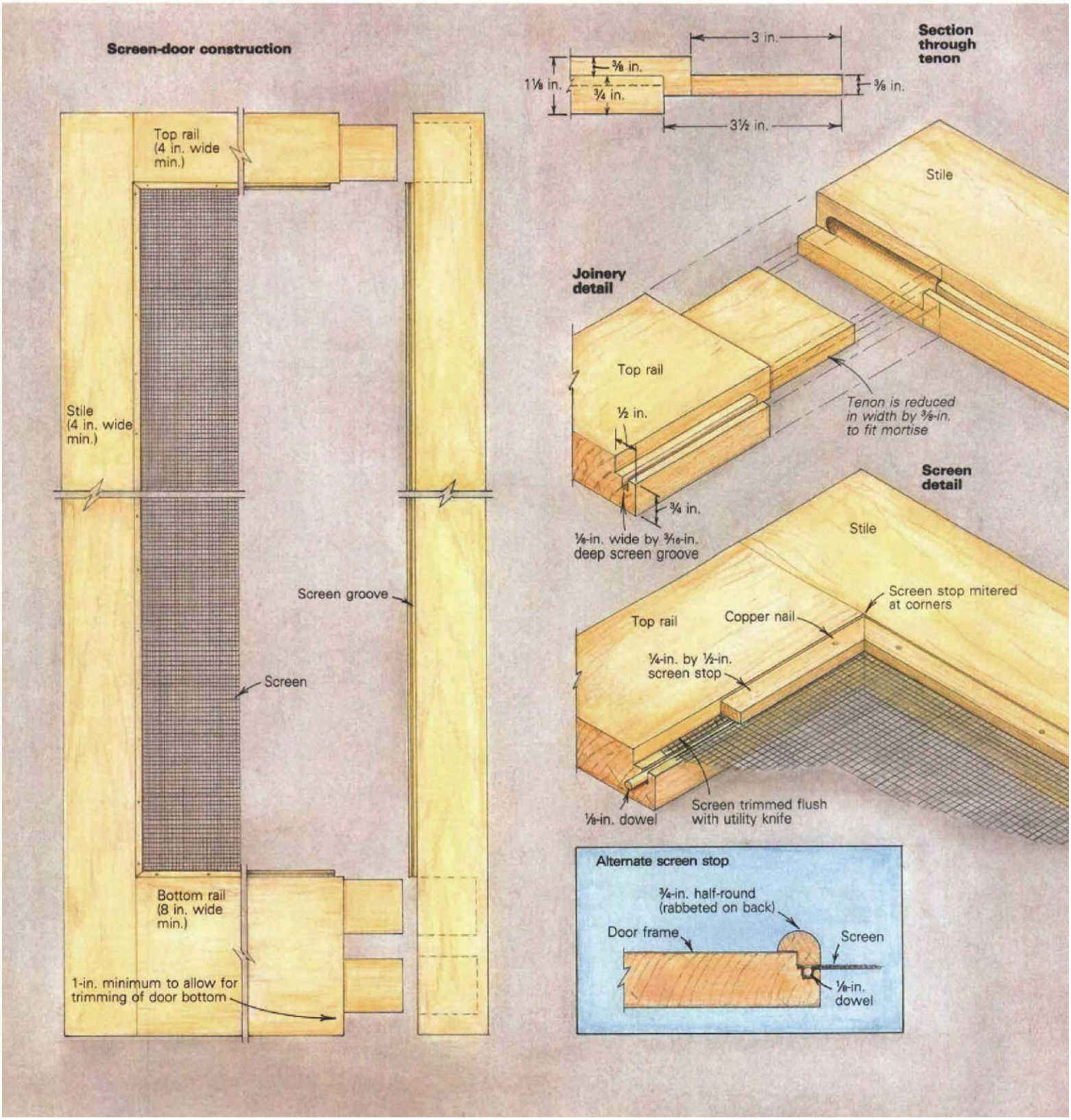
flexible so that it will move with the wood. Though epoxy usually requires a temperature of 65° F or above to cure, special formulas are available for use at colder temperatures. Epoxies have also been developed that cure quickly or adhere well to specific types of wood. The epoxy I use is made by Allied Resin Corporation (Weymouth Industrial Park, East Weymouth, Mass. 02189), but there are plenty of good brands available.

I use bar clamps and leave them on overnight. A long clamp tightened diagonally straightens the door if it's out of square.

If the door is to be finished, I finish it right after glueup, but before installing the screen. My doors are usually finished with an oil-base primer and paint, or with spar varnish with a UV filter.

Installing the screen—With the frame completed, the final step is installing the screen. There are several different types of screen on the market, though they aren't all easy to find. Most hardware stores carry aluminum and fiberglass screening, which are relatively inexpensive. Bright aluminum screening lets the most light through, but it dents, tears and corrodes easily. Charcoal-colored electro-alodized aluminum is tougher and resists corrosion. Fiberglass, the cheapest screen on the market, is easy to work with and won't dent. But it does stretch, and bluejays, grasshoppers and other critters like to chew on it.

I often use bronze screening. It's expensive and stiffer to work with than aluminum and



fiberglass, but it's strong and resistant to corrosion, an important consideration when installing screens in houses by the ocean (where I do most of my work). It also tarnishes to a greenish color, a look that some of my clients prefer. I buy mine at a local hardware store.

Screening is also made of galvanized steel (which turns chalky and disintegrates) and stainless steel (by far the most expensive and durable screen on the market). Some manufacturers even make a coated fiberglass screen called "solar shade" that blocks 70% of the sun's heat while providing ventilation. It's supposed to reduce air-conditioning bills and carpet fade. Hanover Wire Cloth, Inc. (E. Middle St., Hanover, Pa. 17331) calls their product Solar Guard or Solar View, depending on the mesh. The New York Wire Co. (152 N. Main St., Mt. Wolf, Pa. 17347) calls theirs Goldstrand Solar Screen.

Whatever the screening material, I use a splining tool to push it and the ⅛-in. dowel into the groove (photo below). A splining tool consists of a handle about 8-in. long with a narrow 1½-in. dia. metal wheel on either end. One wheel has a convex edge and is used to coax the screen into the groove. The other wheel has a concave edge and is used to press the dowel into the groove.

Because the tool is designed for installing screen in metal frames (where rubber gaskets are used instead of dowels to secure the screen), it doesn't fit the dowels quite right. But with practice and patience, it works fine. Some hardware stores sell splining tools, or they can be purchased from Elgar Products, Inc. (P. O. Box 22348, Cleveland, Ohio 44122).

I cut the screen 4 in. bigger than the opening, which leaves enough extra screen to grab onto and pull tight during installation. Starting at a stile, I press the screen into the groove with the convex wheel, making sure the weave of the screen is straight in relation to the frame. Then I turn the splining tool over and shove the dowel into the groove. This locks the screen into the groove.

Next, starting at the middle of the opposite side, I push the screen into the groove with the splining tool while pulling the screen tight with my other hand. The screen doesn't have to be perfectly tight because when I press the dowel into the groove, the screen is tightened further. After I install the second dowel, I repeat the process with the remaining two sides. When installed, the screen should be stretched nicely with no major depressions. If any objectionable dips remain, I pry out a dowel, tighten the screen and insert a new dowel.

The excess screen is bent into the corner of the rabbet with the splining tool and trimmed off at the corner with a razor knife. I cover the edge of the screen with a simple ¼-in. by ½-in. stop, mitered at the corners and fastened with copper nails (drawing facing page, lower right). For a more decorative effect, I sometimes use ¾-in. half-round instead, rabbeted on the back side so that.it holds the screen and covers the edge of the door (drawing facing page, below right).

The screen is installed with the use of a splining tool. The tool consists of a handle with a metal wheel on either end, one with a convex edge and the other with a concave edge. To install the screen, the author presses the screen into the screen groove with the convex wheel. That done, he flips the tool over and presses a ⅛-in. dowel into the groove with the concave wheel (photo above), locking the screen into the groove. Excess screen is trimmed off at the corner of the rabbet with a utility knife.

Hardware—I use solid-brass hardware for its durability. Stanley Hardware (a division of The Stanley Works, New Britain, Conn. 06050) makes a 3-in. by 3-in. stamped solid-brass hinge with a ball tip that is well-made, reasonably priced and looks good.

For the door latch, I use a surface-mounted lockset made by Merit Metal Products Corp. (242 Valley Rd., Warrington, Pa. 18976). The lockset has a knob on the exterior side, a latch on the interior side and is lockable. As a bonus, it's easy to install. I'm extra careful, though, to install the lockset where it won't bump into the lockset on the primary door (I learned that lesson the hard way).

Storm doors—There isn't much difference between a screen door and a storm door, except that storm doors are designed to inhibit, rather than encourage, air infiltration. That means substituting ¼-in. thick laminated safety glass or tempered glass for the screen. Some screen-door manufacturers build doors with interchangeable panels to fill both functions. But the doors require additional hardware to secure the panels. Also, it's difficult to stretch screen tightly over a narrow, removable frame without causing the frame to bow. Plus, large panels of glass are difficult to handle in removable frames. I prefer to make two separate doors that can be interchanged by removing the hinge pins.

The only difference between my screen doors and storm doors is that I adjust the size of the rabbets to accommodate the glazing, and of course, I eliminate the screen grooves. The glass is contained in the rabbet with either glazing points and glazing compound or with wood stops. When using glazing compound, I cut the rabbets ¼ in. wide by ⅝ in. deep, which allows the proper slope for the glazing compound. The same size rabbet also works well in conjunction with ¼-in. quarter-round molding. Otherwise I cut the rabbets ¼ in. wide by ⅜ in. deep and use ¾-in. dia. half-round molding. The molding is rabbeted on the backside so that it laps over the edge of the door frame. □

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Drawings: Robert Goodfellow