

# Wood Against Weather

*The right product and good techniques will keep your outdoor projects from falling apart*

by Jim Tolpin

**W**ith the time and effort required to construct a piece of outdoor furniture, an obvious question is what finish will protect it from the sun, rain and cold. The answers range from doing nothing to spraying on a coat of catalyzed linear polyurethane, the same stuff used to paint 747 jumbo jets. The choice of whether to finish or not to finish is not just a question of protecting the wood. You must decide how you want your outdoor furniture to look over its lifespan and how much time you're willing to invest to maintain this appearance year after year.

## **No finish: carefully choose the wood**

Deciding not to finish means choosing a wood that is stable and rot resistant. It also means being willing to accept a coarse-textured piece of furniture that can vary in color from silver gray to dark gray or brown. The advantage of not finishing is the minimal maintenance required to keep the surface clean.

*Choose wood carefully for unfinished exterior furniture. Plantation teak, used in this bench, is a good choice because it's naturally rot-resistant and turns a beautiful silver gray. Some oth-*

Some good woods for outdoor use are redwood, cypress and cedars. I especially like Port Orford cedar for its workability and light color. These species contain natural pesticides in their chemical makeup, and all are incredibly resistant to rot. However, these relatively soft woods offer little impact resistance, and they have been extensively over-harvested. But in recent years, several companies have formed to recycle old timbers.

For a harder wood that will stand up to bumps, choose white oak or black locust. These woods build up *tyloses*, a bubble-like formation that blocks the penetration of water into the cell structure, making them particularly well-suited for outdoor use. Two other woods usually associated with indoor furniture, black cherry and walnut, surprisingly rate with the cedars in decay resistance because of their closed-cell structure. Also, Pacific yew is a beautiful wood that outperforms even redwood in rot resistance. But these species move quite a bit with changes in moisture content,

*er durable woods are white oak, cypress and cedar. These woods are easily maintained by occasionally scrubbing away dirt and mildew. Bronze caps protect the bench's feet from standing water.*



# Building to last

The type and quality of the finish and the material from which outdoor furniture is made contribute immensely to its beauty and to its durability. But the best of coatings and materials can be destroyed by construction techniques that trap water within the furniture. Trapped water nourishes voracious parasites that can reduce wood to a sponge cake of half-digested cellulose.

With this happy thought in mind, I'm inspired to find ways to build outdoor furniture with a second line of defense. I've learned that a structure exposed to the elements needs to be built with waterproof glues, joints that shed water without sacrificing strength and with fasteners that won't rust away.

## Fasteners and adhesives

When you must attach components to one another, use a fastener made from (or coated with) a non-ferrous metal. Not only does iron rust, eventually crumbling to dust, but also it causes corrosive damage to the wood, especially to acidic woods like oak. If I don't care about appearance, I'll use a hot-dipped galvanized fastener. If appearance is important, I'll choose either stainless steel or bronze. In some applications, such as attaching thin slats to a framework, I'll use the boatbuilding technique of riveting with copper tacks and roves, a dish washer over which the end of the tack is peened (see the sources of supply box on p. 90).

Woodworkers can choose from three types of outdoor adhesives: a water-mixed plastic-resin glue, a two-part epoxy resin and Titebond II, a new one-part adhesive that the manufacturer claims will stand up to most outdoor applications except submersion. Although I've yet to try it, the convenience of an adhesive that you don't have to mix is mighty appealing. I've used Weldwood's plastic-resin glue for years. Unlike epoxy, the plastic-resin glue is not strong across gaps. But I'm allergic to epoxy, and I don't like its sensitivity to temperature during setup. For oily woods such as teak, however, epoxy remains the best choice.

## Water-shedding construction

Whenever possible, I design joints so water can drain out. The canted base of the half-lap joint, as shown in the drawing at right, prevents water from accumulating under the overlapping tongue. A slot mortise-and-tenon joint, as shown in the drawing, is easy to cut, and its angled shoulders drain water from the joint. This joint exposes the tenon's end grain on a horizontal surface and should be capped, or the tenon should be stopped short, as shown in the drawing. Note that the cap has a convex top surface to shed water and a groove along its bottom edge. The groove acts as a water dam, encouraging the water to drip at this point, rather than continuing to the joint area.

## Other defenses

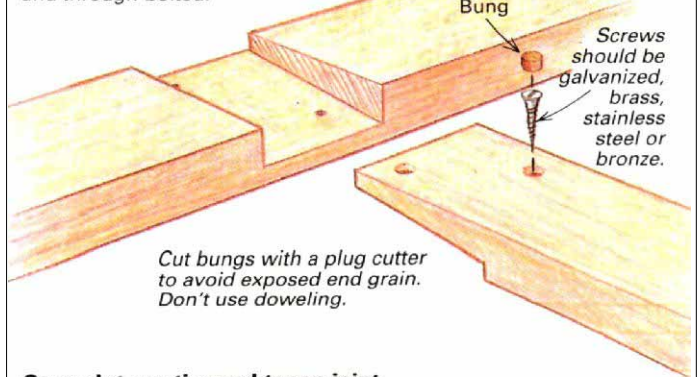
As added insurance against water finding a home between two non-glued wood surfaces, I coat the joint's mating surfaces with a luting compound before fastening them together. Traditionally, pine tar was used for this purpose, though modern adhesive caulking compounds and specialized marine bedding compounds, such as Dolfinite by Woolsey/Z-Spar, have largely replaced pine tar (see the sources of supply box).

My last defense is common sense. Leaving unprotected legs of outdoor furniture sitting in moist soil is asking for trouble. I seal the end grain of legs with paint and set them on bricks or gravel for good drainage. I also avoid leaving my furniture sitting unprotected under blistering summer sun or under a winter's worth of snow. A tarp can protect your furniture year round when not in use, but in the winter, it's best to bring it indoors. This is why I've designed many of my chairs and tables to fold for storage. Finally, if I do decide to put a finish on the structure, I am then committed to keeping that finish intact. —J. T.

## Joinery to cope with water

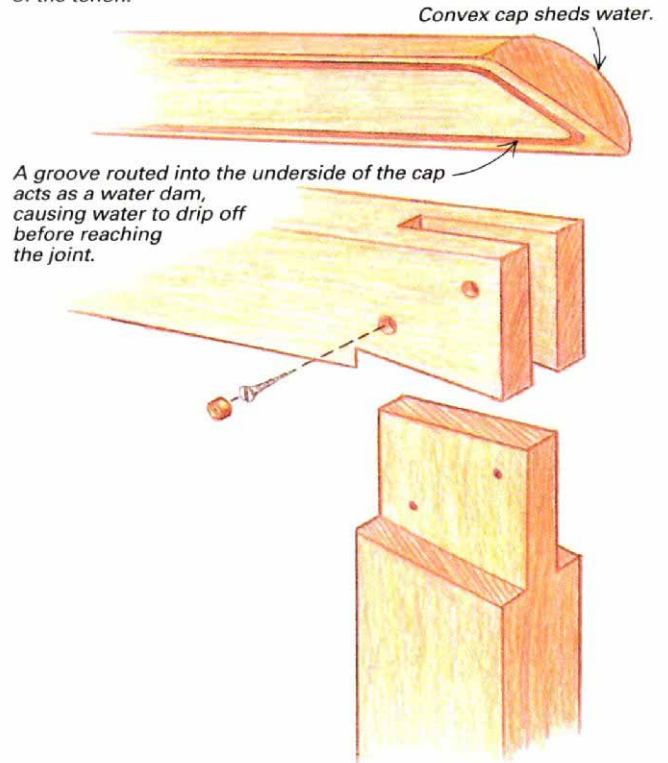
### Half-lap joint with canted base

A sloped base allows water to drain freely from this joint. This type of joint would usually be glued and screwed or luted and through-bolted.



### Open-slot mortise-and-tenon joint

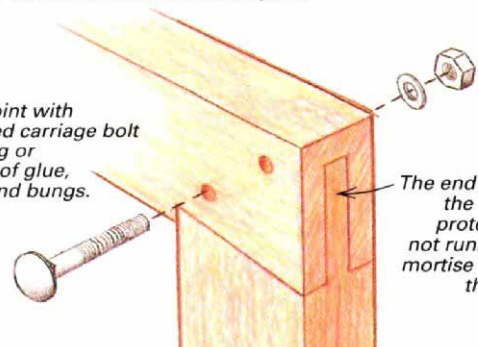
Sloping shoulders prevent water from being trapped in this easy-to-cut joint. A concave cap protects the end grain of the tenon.



### Modified-slot mortise-and-tenon joint

Secure joint with galvanized carriage bolt and luting or waterproof glue, screws and bungs.

The end grain of the tenon is protected by not running the mortise through the stock.



making them prone to surface checking and warping if left unfinished.

For outstanding beauty with exceptional stability and rot resistance, nothing can beat Honduras mahogany or teak. These woods age to a gorgeous silver gray after only six months of exposure. But quotas and over-harvesting have driven prices up and availability down. The good news is that plantation teak and other lesser-known species are now being harvested, often from sustainable-yield forestry operations in tropical countries.

Inherent rot resistance is not the only criterion to consider when choosing wood to be used outside. The wood should be air-dried to a maximum 20% moisture content to provide stability and enduring, tight-fitting joints. In addition, select the stock from the heart of the tree, avoiding the sapwood. The sapwood contains—you guessed it—sap. And sap is full of sugar, a wood bug's breakfast of champions.

### Selecting the right finish

To get a color other than gray and to minimize the inevitable surface checking of exposed wood, you can coat the wood with penetrating oils, varnishes, paints or epoxies. Clear penetrating oils and water sealers designed for exterior use contain ultraviolet (UV) filters and bring out the natural color of the wood. The UV filters help shield the wood from solar radiation, which destroys the lignin in the wood and reduces the wood's ability to hang on to the finish. Transparent stains and washes enhance the natural color or impart their own tint.

Finally, you can seal the wood entirely under a pigmented gloss topcoat—I call this *paint* around my shop. Paint is the right finish if you want to shield the wood from sunlight completely.

To test the longevity of the commonly available oils, stains and water seals, outdoor furniture maker Mark Singer of Santa Barbara, Calif., subjected dozens of coated wood samples to grueling tests in an accelerated environmental chamber. After the equivalent of one year in a harsh environment, not a single sample was free from significant deterioration. Singer's suspicions were confirmed.



**Paint can't overcome poor design.** *This unlined, wood planter box is destined to fail because the moist soil holds water against the wood, allowing it to seep into the joints, and these joints aren't designed to drain water. The unprotected end grain of the feet also wicks up water from the puddles in which the planter stands.*

Unless these types of finishes are constantly renewed, they lose both their protective functions and their decorative effects, and the surface of the wood eventually turns blotchy.

Gloss topcoats deliver the maximum durability in a clear finish, especially in harsh sun-drenched environments. The additives that turn a gloss finish to semi-gloss or satin soften the finish coat, reduce UV reflection and decrease longevity. Traditional spar varnish has no peer in bringing out the beauty of wood. It's durable, long lasting in a harsh marine environment and is easily renewable. As long as a varnished surface is regularly maintained (at least once a year), the color of the wood will last indefinitely. Regular maintenance includes touching up nicks and worn spots, and sanding and reapplying

two new topcoats before signs of graying show up.

Modern urethane varnishes can last at least twice as long as spar varnishes, though their intrinsic hardness makes them significantly more difficult to repair. The new water-based urethane exterior varnishes are as hard and durable as their petroleum-based brethren. In addition, water-based products are less toxic during application, they recoat within hours and they are non-yellowing. None of the urethanes, however, can equal the distinctive rich glow of spar varnish.

The ultimate in long-lasting protection and gloss retention are the aerospace industry's catalyzed, two-part, linear polyurethane finishes (see the sources box). This amazing sniff, when properly applied over an epoxy undercoating, dries 50% harder than spar varnish and reportedly lasts up to five years in marine conditions. But the price is high. To coat 100 sq. ft. costs about \$150.

Paint is, by far, the most protective and longest-lasting coating you can put on a piece of wood destined to live outside. The higher the gloss and the lighter the color, the better the protection. The gloss reflects the sun's harmful rays, and the light colors absorb less of the heat that can break down the paint film. □

*Jim Tolpin is a woodworker in Port Townsend, Wash.*

## Sources of supply

The following companies manufacture or supply products that can be used for building and finishing outdoor furniture:

### Exterior finishes and supplies:

Detco Marine (also carries linear polyurethanes), PO Box 1246, Newport Beach, CA 92663; 800-845-0023 or 714-631-8480

Hydrocote Co. Inc., PO Box 160, Tennent, NJ; 908-257-4344

Interlux Co., 2270 Morris Ave., Union, NJ 07083; 908-686-1300

Woolsey/Z-Spar Marine Paints, 36 Pine St., Rockaway, NJ 07866; 800-221-4466

X-I-M Products, Inc., Westlake, OH 44145; 800-262-8469

### Brushes and painting tools:

The Wooden Boat Store, PO Box 78, Brooklin, ME 04616; 800-225-5205

The Wooden Boat Shop, 1007 N.E. Boat St., Seattle, WA 98105; 800-933-3600

### Exterior fasteners:

Doc Freeman's, 999 N. Northlake Way, Seattle, WA 98103; 800-423-8641

Jamestown Distributors, PO Box 348, Jamestown, RI 02835; 800-423-0030

### Copper nails and roves:

Ray Speck Boatbuilding, 228 37th. St., Port

Townsend, WA 98368; 206-385-4519

### Waterproof adhesives:

DAP Inc., PO Box 277, Dayton, OH 45401; 800-543-3840

Franklin International, 2020 Bruck St., Columbus, OH 43207; 614-443-0241

Gougeon Brothers Inc., PO Box 908, Bay City, MI 48707; 517-684-7286

### Information on tropical woods:

Woodworkers Alliance for Rainforest Protection (WARP), PO Box 133, Coos Bay, OR 97420; 503-269-6907

Rainforest Alliance, 65 Bleecker St., 6th Floor, New York, NY 10012; 212-941-1900

# Applying exterior finishes

Pros use certain tricks to get outstanding results every time. While these tricks may not make you a pro overnight, they are sure to improve your results. But first, you might as well get used to hearing this timeless platitude: A finish is only as good as its preparation. This is as true for simple wipe-on stains as for the most expensive catalyzed urethane paint.

## Preparing the surface

Preparation means well-sanded surfaces, including sanding after raising the grain with a damp rag. Hardwoods need only be sanded to 120-grit, as long as all sanding scratches from the previous grit have been removed. Softwoods should be sanded to 220-grit. Never use steel wool to smooth wood destined for the outdoors. The remnants of steel in the pores of the wood will rust and ruin the finish.

Preparation also means well-cleaned surfaces. Wash off oily handprints with a rag dampened with thinner and follow with a light sanding. Before applying the first coat of a primer or a sealer, thoroughly vacuum the wood, and then use a tack rag to wipe away any remaining particles.

Most finishes can be put on directly from the can by brushing, wiping or spraying. The only trick is to not recoat too quickly. Follow the manufacturer's directions. Some finishes, especially the penetrating oils, should never be applied in direct sunlight. Bill Kennedy of Specialty Furniture Co., a manufacturer of outdoor furniture in Mt. Pleasant, Mich., says that sun-heated wood can bleed out the finish, which then glazes on the surface. Because oil finishes are not designed to stand on the surface like a varnish, they quickly crack and craze, and eventually peel off, requiring stripping and sanding to a clean, solid surface before refinishing.

## Applying varnish

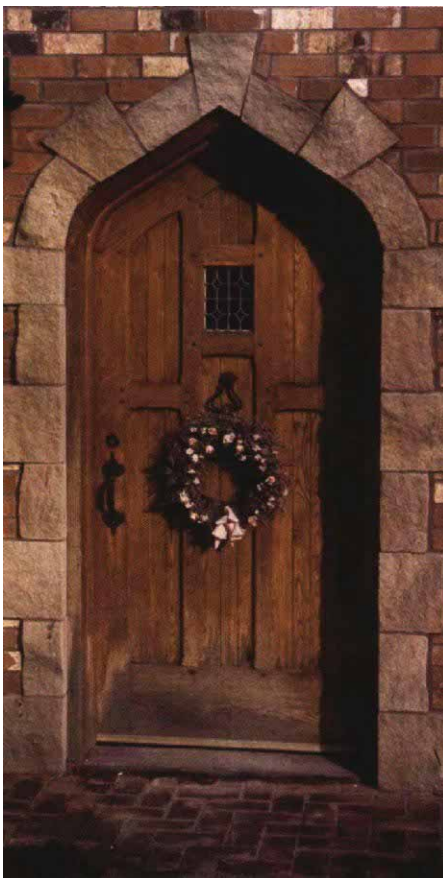
For a clear, smooth and uniform coating of varnish, follow these basic practices:

- Mix varnish by gently stirring with a paddle, never by shaking it. The resultant bubbles end up as holes and bumps in the surface film.
- Never use the finish straight from the can. Instead, strain it through a paper cone filter into a clean bucket.
- Use professional varnish brushes made from fine China bristle or badger hair grouped into an oval cross section. These brushes cost a small fortune, but they contribute immensely to the illusion that your varnish job had a pro behind the brush. Never use your varnish brushes for paint.
- Avoid varnishing in cool, damp conditions, or in direct sunlight. Cold prevents the film

from hardening properly, and the sun's heat hardens the outer surface of the film too quickly, resulting in wrinkles and sags. Also, gases in the warmed wood bubble up through the finish, leaving pock marks.

I'm pretty good at applying varnish, but Julia Maynard, a full-time, freelance painter and varnisher in Port Townsend, Wash., is the best I've seen. Here are her recommendations for a durable professional-looking varnish finish:

- Use a marine-grade spar varnish with ultraviolet (UV) filters. Beginners would do well with a less dense, less expensive variety such as Interlux's Schooner Varnish (see the sources of supply box). It flows easily and sets up quickly to reduce wrinkling and sagging problems, and it holds up nearly as well as the most expensive varieties.
- To extend the life of the varnish coating, especially when applied to oily woods such as teak, use a volatile and highly penetrative undercoat. The best is Flashbond 300, made by X-I-M Products (see the sources box).
- To build up enough UV filtration to really protect the wood, especially in sunny climates, apply at least five coats of varnish.



*No finish lasts forever. This white oak door, built for a client seven years ago by the author and finished with six coats of spar varnish, shows the effects of exposure and neglect. The finish at the top of the door, protected by the overhanging wall, is still in good shape, but at the fully exposed bottom, the finish is completely gone.*

Apply each coat carefully—think of each layer as the final coat. To avoid lap marks, apply the varnish from the dry area back to the wet area.

- Use a hand block, never a power sander, to sand to 280-grit between coats, removing all brush marks and other imperfections.
- Never use thinner to clean off the dust between coats (it reduces adhesion). Instead, vacuum and wipe with a tack rag.
- For a super final finish, go to a sixth coat. But first, sand the gloss off the last coat with 320-grit wet-or-dry paper, being careful not to cut through the topcoat. Clean away the dust, and apply the last coat with all the skill you've acquired over the first five coatings.

## Applying paint

As with varnish, there are similar precautions to take for a durable, first-class paint job. Don't shake—stir the paint. Don't use it straight from the can; filter it into a clean bucket. Apply paint at room temperature and out of the direct sun. And finally, use a good China bristle brush to apply paint.

Follow these steps to achieve a top-notch paint finish:

- Fill countersunk screw holes with wood plugs (bungs), fixing them in place with shellac or varnish. Don't glue the bungs if you might want to get to the screws again.
- Sand the surfaces to 120-grit for hardwoods, or 220-grit for softwoods. Raise the grain with a damp rag at the 100-grit stage, and then sand off the protruding fibers.
- Fill small defects with a glazing compound (be sure it is compatible with your paint) or a specialized surfacing compound such as Interlux's #257 (see the sources box).
- Vacuum and tack the surfaces thoroughly. Julia Maynard then wipes the surfaces with a rag dampened with isopropyl alcohol to pick up fine dust and draw any surface moisture out of the wood.
- Apply the primer coats. Yes, that's plural. Build up the paint thickness with three coats of primer. Maynard, and many other professional exterior painters, do not, however, recommend using standard primers. They think the surface left by primers is too chalky for the best topcoat adhesion. They prefer a thinned-down semigloss topcoat paint. White is okay for most colors, but gray is best for low-hide colors like red and yellow. Sand between primer coats with 150-grit paper to remove all brush streaks, runs and drips.
- Sand the last coat of primer to 400-grit, clean up, and apply the gloss topcoat, always brushing from the dry area back to the wet area to avoid lap marks.

To make all this worthwhile, buy the most expensive enamel. It will only be a few bucks more per gallon. Oil or latex-based enamels are about equal in durability. But don't bust the bank on marine oil-based enamels unless you know the furniture will be exposed to salt air, intense sunshine and an occasional splash of gasoline. —J.T.