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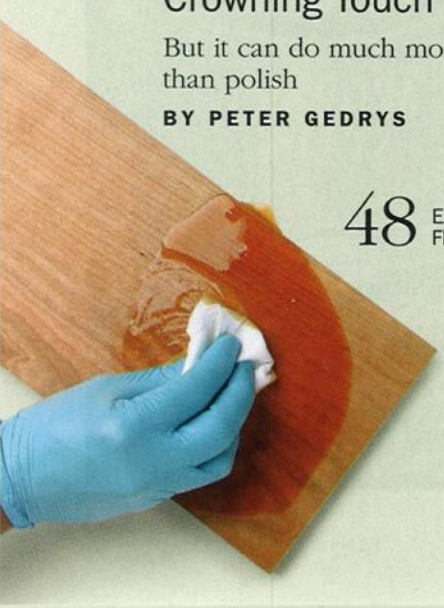

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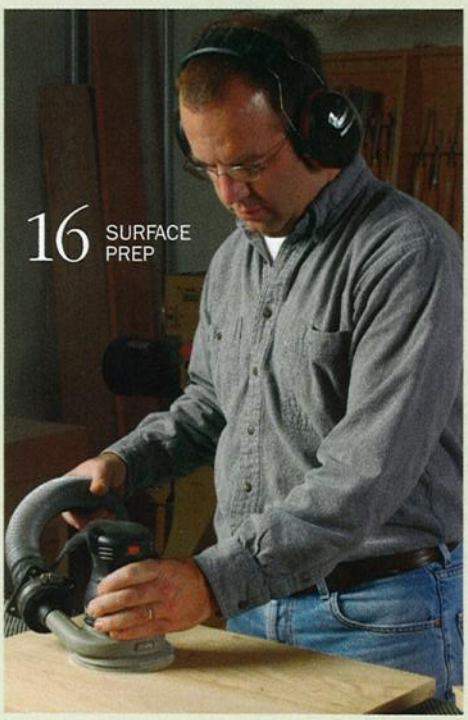

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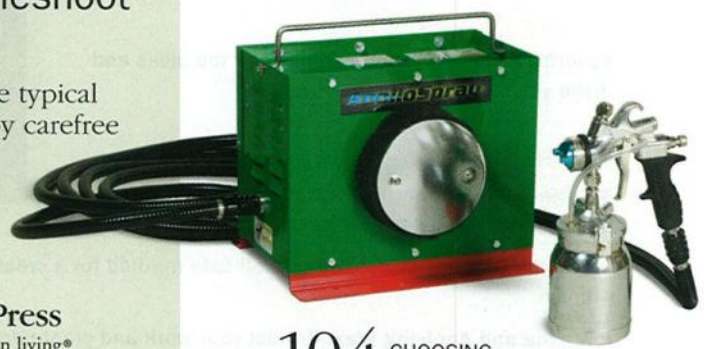

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editor's letter

ENJOY THE REWARDS OF FINISHING, WITHOUT THE RISK

In any woodworking or home improvement project, there's a great sense of accomplishment as you conquer the challenges along the way. By the time most of us start thinking about brushing on a stain or varnish, we've already invested a lot of time and energy in the work. We've got a real achievement on our hands, and the last thing we want is to mess it up with a bad finish.

That's where *Finishing Wood* comes in. In this volume, we've chosen the best articles from *Fine Woodworking* and *Fine Homebuilding* magazines, covering the most versatile and trustworthy finishes for furniture, cabinetry, interior trim, and much more.

Our authors, all expert finishers, take the guesswork and stress out of finishing, tackling the process in simple steps. Follow them and you'll get great results every time, whether you are painting a cabinet door, staining crown molding, or highlighting the grain on a maple chest of drawers.

I guarantee you'll find *Finishing Wood* to be a reliable reference, one you will keep for many years.

—Steve Scott
Finishing Wood editor

FineWoodworking.com/finishing-wood

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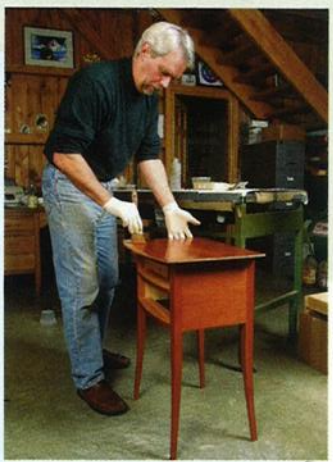

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- **Pop the Curl in Cherry:** Learn a fail-safe method for a creating a high-impact finish.
- **Mixing and Applying Wax:** Protect your work and create decorative effects.

The Best of Fine Woodworking

finishing wood

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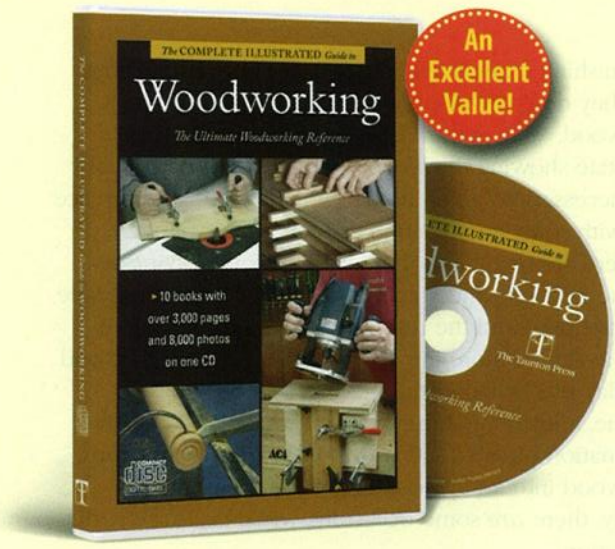

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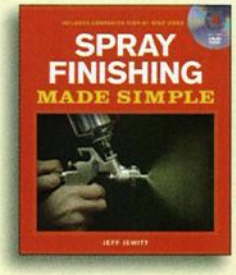

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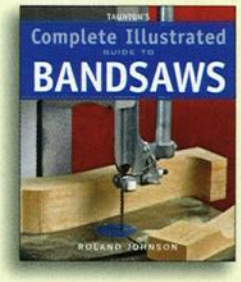

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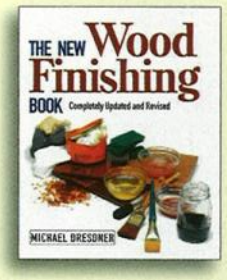

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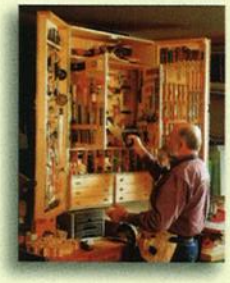

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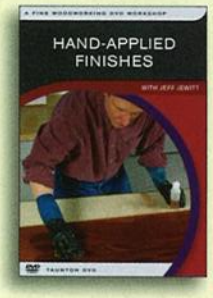

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Why finish wood?

IT MAY BE A CHORE, BUT THERE ARE GOOD REASONS TO APPLY A FINISH

BY MARK SCHOFIELD

Finishing experts tell you how to apply a finish but they don't always explain *why* you should finish wood. Why not leave a piece in its just-planed state showing the wood's natural beauty? Is it really necessary to go to all that trouble coating your piece with some combination of oil, resin, or plastic?

In fact, there are many important reasons for applying a finish—some aesthetic and some practical. A finish can reduce seasonal movement and the resulting stresses on joinery. It also makes a surface more impact-resistant and protects wood from everyday use, whether the piece is a rarely handled picture frame, a kitchen table, or an outside chair. Also, the right combination of dyes, stains, and clear finishes can turn humdrum wood into an eye-catching piece.

And finally, there *are* some occasions when no finish really is a valid option.

Slow down wood movement

When it comes to protecting a piece of furniture from the damage that can be caused by wood movement, applying a finish is no substitute for careful construction.

Still, certain finishes will reduce wood's tendency to absorb and release moisture. This in turn will slow seasonal expansion and contraction, reducing stresses that can eventually damage joinery and helping to minimize problems like door panels that rattle in winter or drawers that stick in summer.

Some finishes are better at this than others. No clear finish can match paint at controlling moisture, even over a few weeks. Pure oil finishes in particular

Photo, this page: Kelly J. Dunton

Fine Woodworking

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Protect the surface

An oil finish is easily renewed. *Penetrating finishes like linseed oil or tung oil don't protect as well as film finishes like polyurethane, but they can be sanded away to repair damage, and then renewed.*

are ineffective. Spar varnish gives some protection, but the standouts among clear finishes are shellac and polyurethane.

If you do apply a moisture-excluding finish, be sure to treat all surfaces equally. Otherwise, each surface will absorb and release moisture at a different rate, causing the boards to cup.

Finished wood stays cleaner

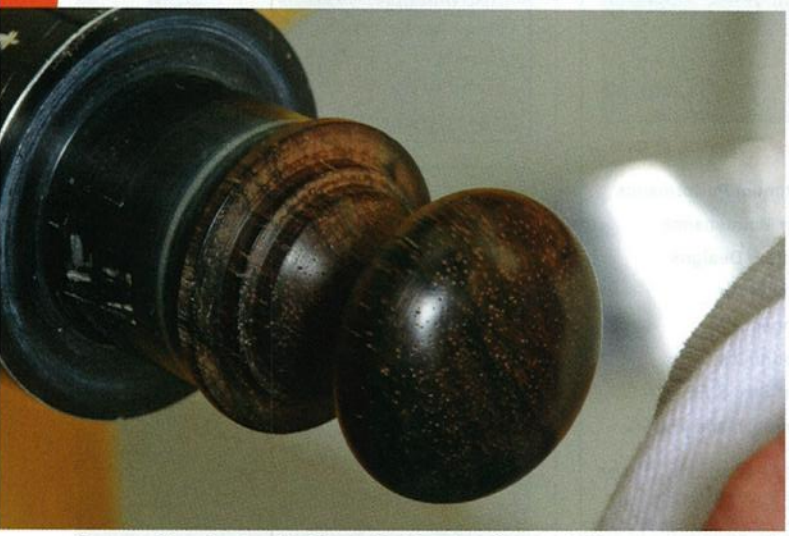
No piece stays looking like the day it was made. The surface gets a slightly rough feeling, sunlight oxidizes the surface cells, and hands leave oil and dirt. A clear finish can give wood varying degrees of protection against environmental damage as well as everyday wear and tear.

The need for protection varies by the intended location and use of the piece. If you want the look of natural wood, a rarely handled piece such as a picture frame or an ornamental turning probably only needs one coat of finish followed by a coat of wax.

Tabletops likely to come into contact with food and drink need a finish that can protect the wood. Unfinished, scrubbed-pine tables were fine for the nobles who employed scullery maids, but if you're cleaning up after yourself, you'll find that traces of red wine and ketchup are removed far more easily from a durable film finish such as varnish or polyurethane.

Penetrating finishes offer less protection, but minor damage can be repaired more easily by sanding and then wiping on another coat of finish. This easily repairable finish is suitable for surfaces that won't be subject to frequent damage by liquids. The "easily" is relative when compared to repairing a film finish: It is still quite a lot of work to sand out the damage and apply new finish to the damaged area and possibly the whole immediate surface, so you don't want to do this once a month to a kitchen table. Almost any other piece, including the tops of occasional tables (especially in an adults-only house), will be fine with a penetrating finish.

Some woods finish themselves



Easy option for tropical woods. *Dense, oily woods like cocobolo absorb less moisture and can be sanded and buffed to a high polish without applying any finish at all.*

Enhance wood's beauty

Yes, beauty is in the eye of the beholder, but even those who hate finishing must have had that moment of pleasure when the first coat of finish lights up the wood. The impact is greatest with highly figured wood—burls, crotches, blister, and ribbon stripe. Finish increases the light/dark contrast and exaggerates the shimmer, or chatoyance.

Applying a finish also increases the contrast between light and dark woods, whether it is walnut drawer pulls, wenge trim, or the mahogany background to holly stringing.

Don't confine yourself to clear coats: Dyes can really put the tiger in tiger maple, while bright dyes help blister and quilt-figured maple to jump out.

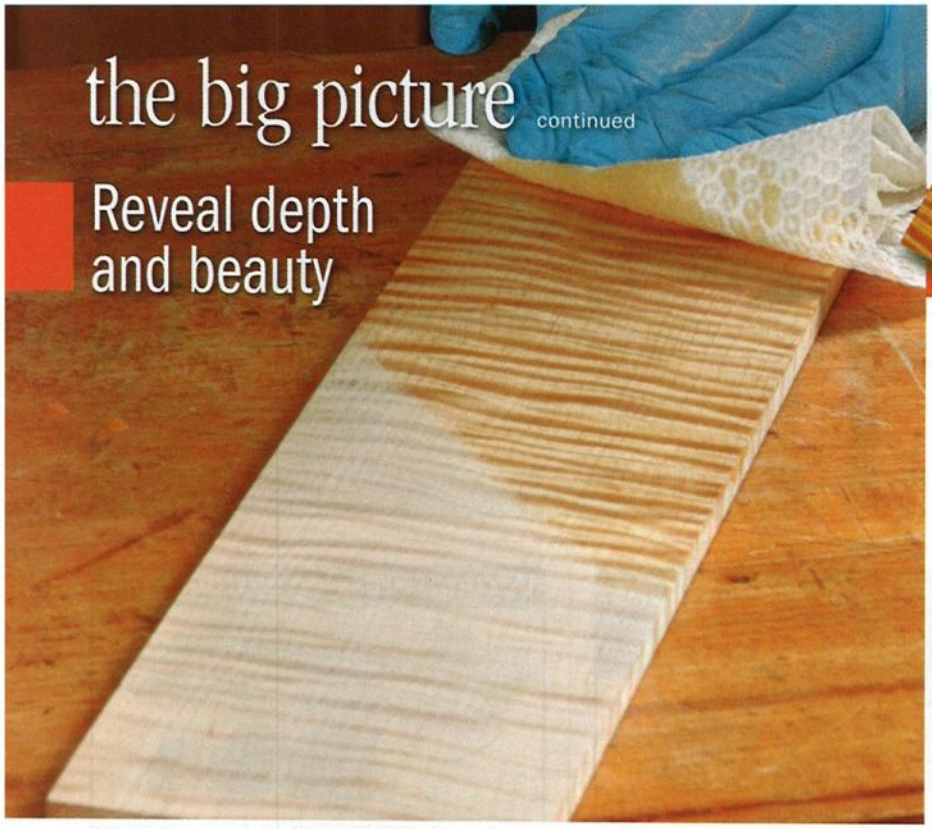
Finishing outdoor furniture

Whether to finish an outside piece is rather like deciding whether to dye your hair. You can either accept going gray, or you can

Photos, except where noted: Steve Scott

the big picture continued

Reveal depth and beauty



Tiger maple, in living color. *Dyes can give your work a full color palette while also enhancing figure.*

What they mean by "the finishing touch." *A clear finish transforms the wood by enhancing contrast in the figure and emphasizing the surface luster.*

apply dye/finish on a regular basis. In both cases, make the choice and then stick with it; neither gray roots nor an outdoor piece with peeling finish are attractive.

A finished outdoor piece is much easier to keep clean and dry. After a day of rain, you can wipe it with a cloth or a towel and you have a surface ready for those white trousers or dresses. An unfinished piece will stay damp for hours or even days after a good soaking and will grow lichen, moss, etc.

Outdoor finishes not only need to withstand the elements but also must allow for far more wood movement than interior finishes. The answer is to use a durable yet flexible finish. Apply many layers of a marine varnish, particularly on end grain. Immediately repair any damage before water can get under the finish, and when the surface loses its shine, apply another coat. If you wait until the finish has begun to crack and peel, the only solution is to go back to bare wood and begin again.

For those determined not to apply a finish, a durable outdoor wood such as teak, white oak, or cedar will give you years of good service before weathering starts to weaken it. You can also avoid finishing some dense, oily tropical hardwoods such as cocobolo or rosewood. Sand them to a high grit and then buff them (on a buffing wheel for small objects) and they'll retain a medium luster. □

Mark Schofield is Fine Woodworking's *managing editor.*

Outdoors: To finish or not?

Two ways to survive the great outdoors. *To finish his outdoor furniture (right), Sean Clarke applies multiple layers of epoxy sealer and marine varnish. Or you could take Hank Gilpin's approach (far right) and apply no finish at all.*

Photos, this page (top and bottom left): Mark Schofield

The Crucial First Step is Surface Prep

Two great ways to prepare a smooth, flat surface

One of the happiest moments in any woodworking project comes when you begin applying a finish. It's then that you see the wood's final appearance deepening in color and character before your eyes. But whether you're finishing a piece from your own shop or one from the unfinished furniture store, the results won't be satisfying if you haven't prepared the wood's surfaces for the finish. Instead, your eye will be drawn to every hollow, every scratch, every patch of tearout.

The only way to keep these flaws from showing up is to make them disappear before the finish goes on. The surfaces must be smooth, flat, and free of milling marks, scratches, tearout, and other imperfections that can detract from the beauty of your work.

Preparing the surfaces usually means using one of two time-honored technologies: sandpaper or handplanes. Which is best? To explore the question, we went into the *Fine Woodworking* shop and tried both techniques using two sets of furniture parts milled from the same cherry stock. The project was a Shaker table with tapered legs. Milled to final dimension and with the joinery already fitted, each set of parts was ready to be sanded or planed in preparation for a finish.

Art director Michael Pekovich demonstrated handplanes and scrapers. Editor Asa Christiana used a random-orbit sander and hand-sanding. Afterward, each applied a coat of Waterlox, a wiping varnish, as a way to check the results. We were interested in knowing whose finish looked best at the end.

As it happened, Mike and his handplanes were able to complete the work a little more quickly and achieve a slightly superior finish. Bottom line: If you follow either method carefully and thoroughly, you'll get great results.

Online Extra

To see the demonstration as it happened, go to **FineWoodworking.com/finishing-wood**.

Photos: (this page) Kelly J. Dunton

'No sharpening required: Sanding is a sure and simple way to get flawless surfaces'

BY ASA CHRISTIANA

When I started out as a woodworker, I didn't know much about sharpening and couldn't get my hand tools to work well. So I used sandpaper to prepare surfaces for finishing. Sandpaper has a short learning curve; I learned a lot of what I needed from a great Taunton Press video on finishing by Frank Klausz.

Truth be told, I've since switched to handplanes for a lot of my surface prep. A few passes with my sharp No. 4, and I usually have a dead-flat surface ready for finish. But the handplane doesn't work with every type of wood and figure, so I still break out my random-orbit sander and trusty sanding blocks quite often.

Sandpaper is a great equalizer: It works on every wood and in nearly every situation. It eliminates the risk of tearout that comes from planing surfaces with changing grain direction or lots of figure. And, let's face it, if you're applying more than one coat of finish, there's a good chance you'll be sanding anyway to prepare the surface between coats—a task you absolutely can't tackle with a handplane. In any case, handplanes must be perfectly tuned and razor sharp to work at all. With sandpaper and a few tips, anyone can create flawless surfaces.

'Handplanes flatten and smooth quickly, with no dust'

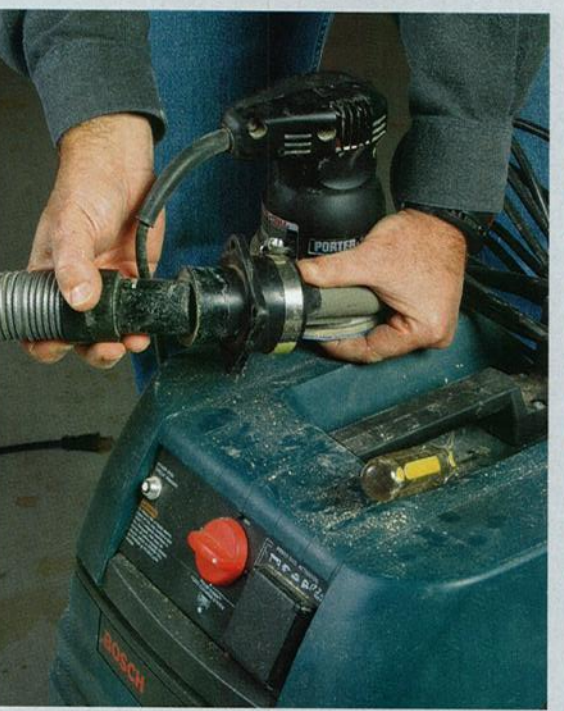
BY MICHAEL PEKOVICH

I did a lot of sanding in the 15 years between my first run-in with a dull, rusty handplane and my eye-opening test drive with a truly sharp one. Unfortunately, that's not an uncommon experience. A sharp handplane can work wonders, going from machine marks to a glass-smooth surface in minutes. A dull plane can do a lot of damage, both to your lumber and your psyche.

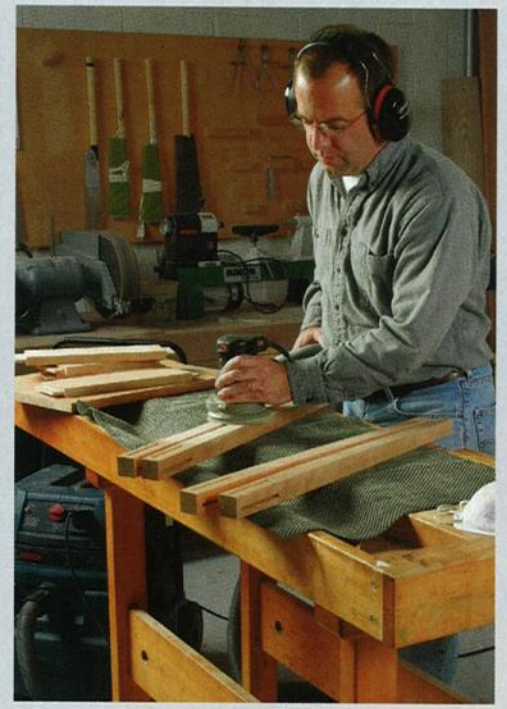
The good news is that it's easier than ever to start working with your first handplane. Years ago, your choices were to buy an inferior new plane that needed a lot of tune-up work or an old high-quality plane that also needed a lot of tune-up work. Today the market offers many excellent new planes that require little more than a five-minute sharpening before the shavings start to fly.

I still keep a scraper and fine sandpaper on hand to fix the occasional tearout, but my smoothing plane has eliminated the dusty hours of sanding that used to accompany every project. In addition to saving time and leaving a smooth surface, the handplane excels at creating dead-flat surfaces and crisp chamfers, hallmarks of fine woodworking that are impossible to achieve with sandpaper alone.

POWER SANDING: DEAL WITH DUST AND DON'T SKIP A GRIT



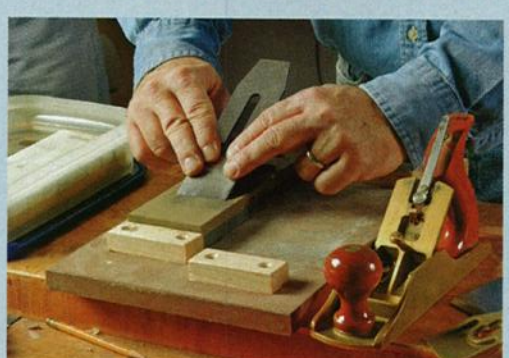
Better than a dust mask. *Connect a shop vacuum to the sander's dust port to keep dust out of the air and avoid clogged sanding pads. Better vacuums switch on with the sander when the tool is plugged into an onboard power outlet.*



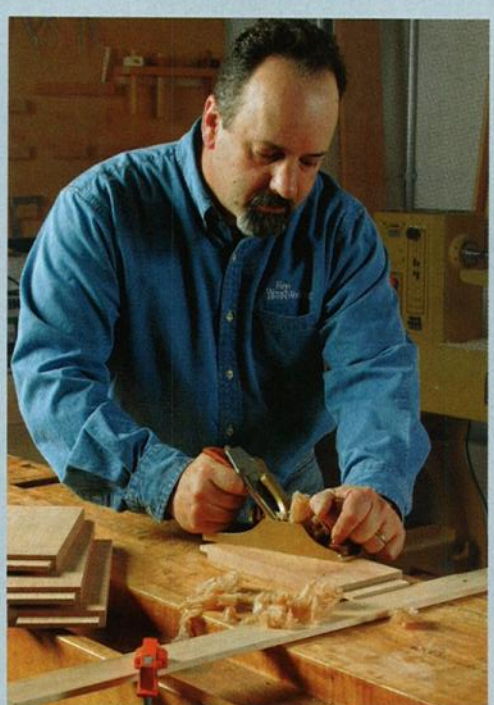
Gang up parts. *Start with a coarse grit, P80 or P100, to remove burns and mill marks. Avoid rounded edges on narrow stock by ganging two narrow pieces together. Note, this only works if the surfaces are level.*

Change disks frequently. *Don't hesitate to use more than one disk of the same grit before moving to a finer abrasive. A worn or clogged disk will slow down the work.*

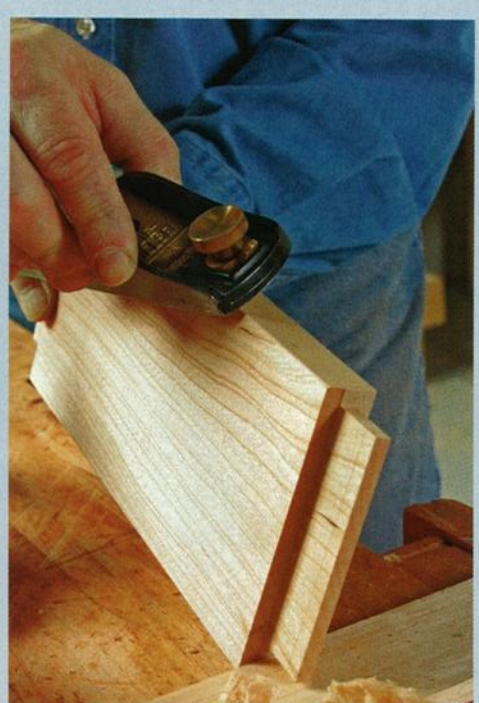
HANDPLANING: START SHARP AND USE SIMPLE STOPS



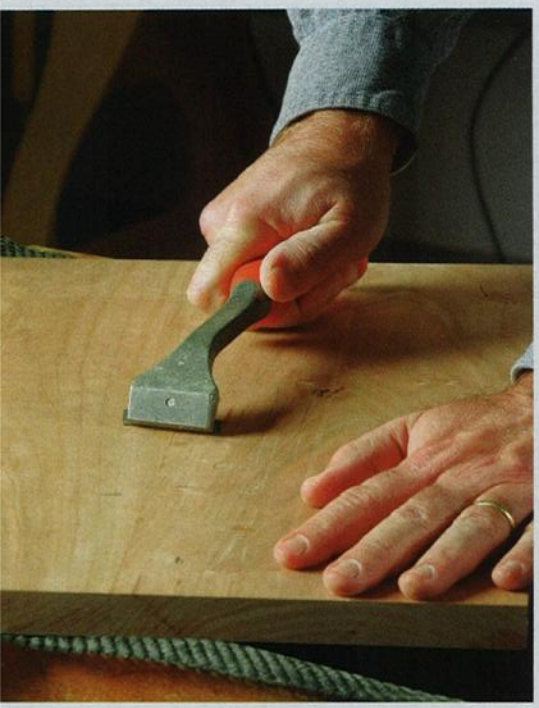
Get sharp first. *Using waterstones and a honing guide, Pekovich polishes a narrow band at the blade's beveled tip (top). He removes the burr with his finest stone (bottom).*



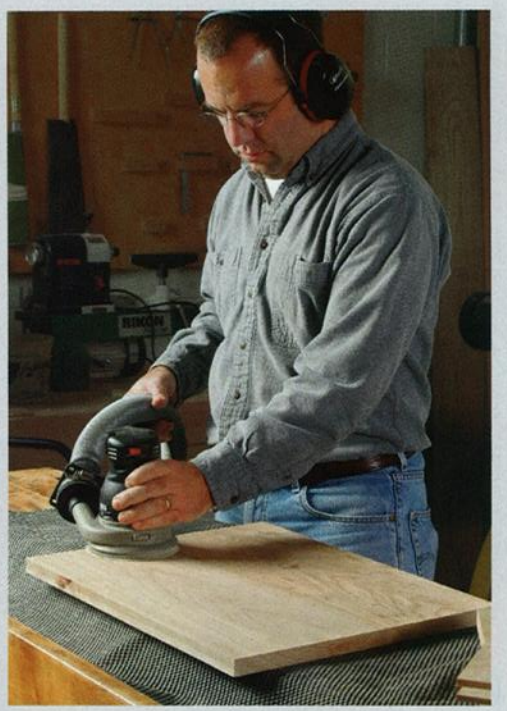
Easier than benchdogs. *A simple planing stop clamped across the benchtop is all you need to secure the work, and it lets you quickly flip the piece or change to another.*



Don't bother with hidden surfaces. *To save time and wear on the blade, plane only the outside face and bottom edge of each apron. Afterward, chamfer the bottom edges with a block plane.*



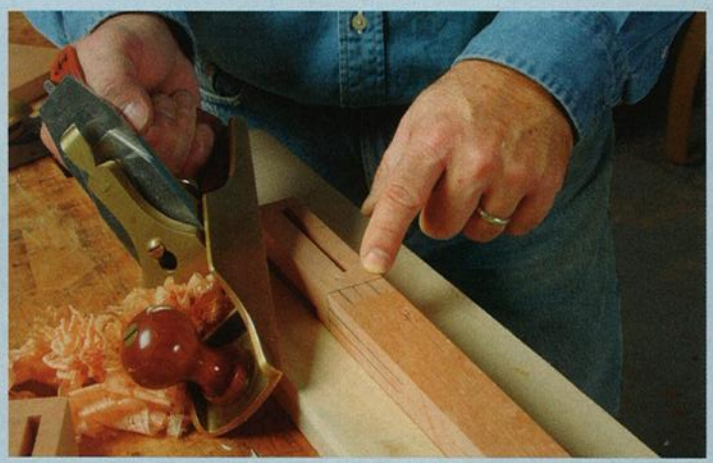
Scrape away the glue first. *Christiana starts work on the tabletop by using a sharp paint scraper to remove the glueline in the middle of the panel.*



Sand evenly. *It is critical to work the surface evenly and systematically to guarantee it will end up flat. It's easy to linger in one area and create a hollow, which you may not notice until finish is applied.*

Work in stages. *Use each successive grit to remove the scratches left by the last one, until the abrasive is so fine (P220 or more) that the human eye can't see the scratches under a finish.*

Holding narrow work. *A simple L-shaped jig mounts in the vise and holds the leg securely during planing.*

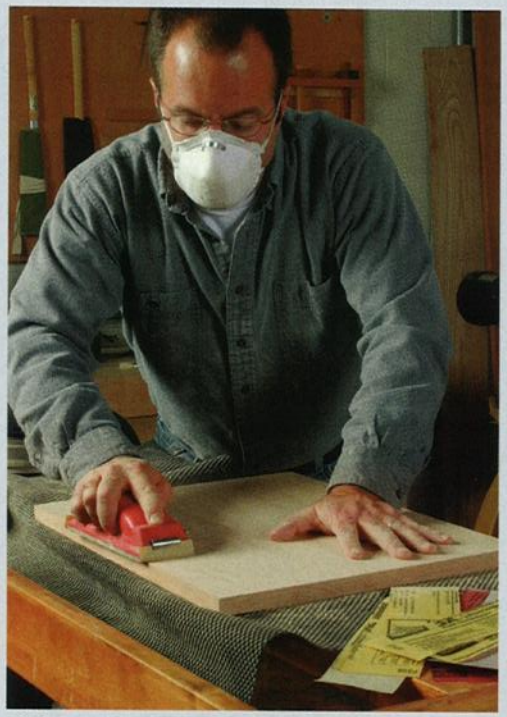


Mark the top end of the taper. *Planing too much on the tapered area can cause the intersection with the flat area to move. To avoid this, draw a few pencil lines just below the intersection as a guide.*

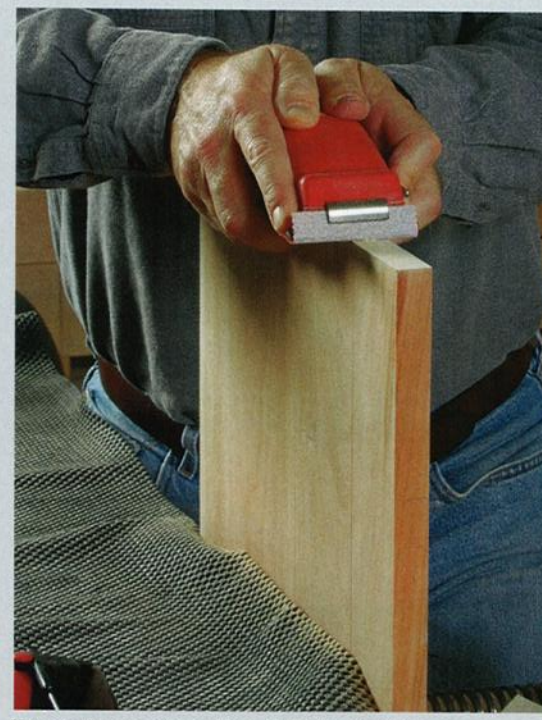
A piece of scrap keeps the workpiece level. *To plane the outside faces, insert the taper's matching cutoff underneath to support the leg along its length.*

FINISH BY HAND-SANDING

Shopmade paper cutter. *Christiana's cutting jig uses an old hacksaw blade to trim sandpaper sheets squarely to fit on padded sanding blocks. The blocks hold the paper flat, ensuring that it will leave a flat surface.*

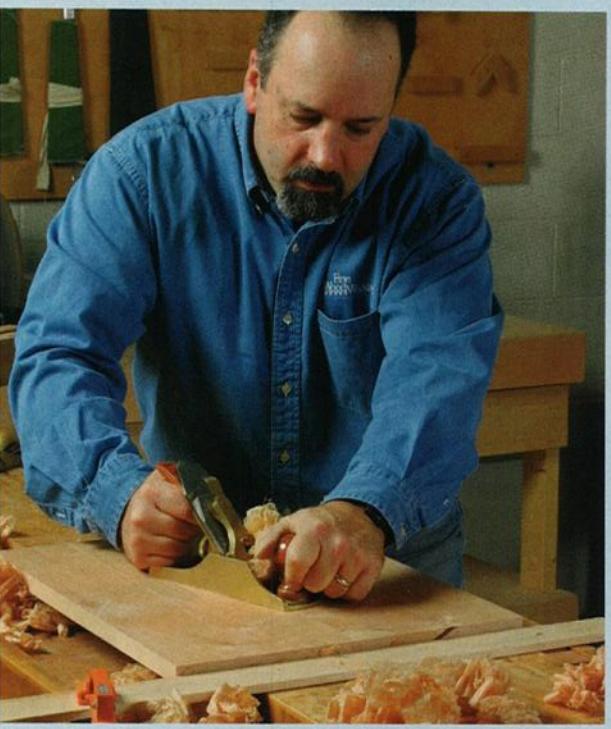


Finish by hand. *Begin hand-sanding with the last grit you used on the random-orbit sander, usually P220. Work the sanding block in the direction of the grain to remove the last swirl marks from the sander.*



How to keep edges flat. *Hold the workpiece in a vise, with the narrow edge horizontal. Use the sanding pad like a block plane, running your fingertips along the workpiece to keep the block flat and the edge square.*

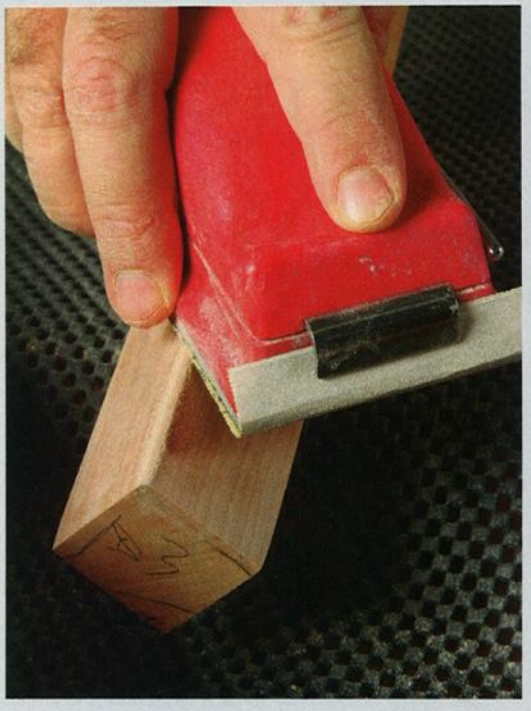
THE TOP GETS EXTRA CARE



Plane in two stages. *First, level any high spots until the top is flat on both sides. After resharpening the iron, set the plane for a light cut and take a series of smoothing passes over the entire surface of the show side only.*

Treatment for tearout. *Pekovich typically uses a card scraper to remove any tearout.*

Sandpaper? *Because the scraped areas have a different scratch pattern than the planed areas, it's good to blend them by following any scraping with P320- through P600-grit sandpaper over the entire top.*



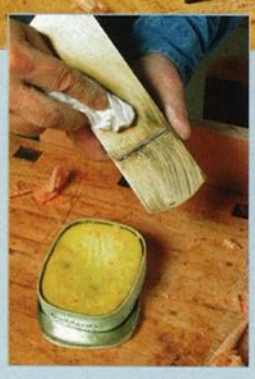
Sanding block breaks edges, too. *Easing the sharp edges makes them friendlier to fingers and more resistant to damage. Turn the block 45° for a few passes with P150-grit paper to create a light bevel.*

When to stop. *The final grit depends on the type of finish: P220 for shellac or polyurethane, or as high as P600 for an oil finish, especially on blotch-prone woods like cherry.*

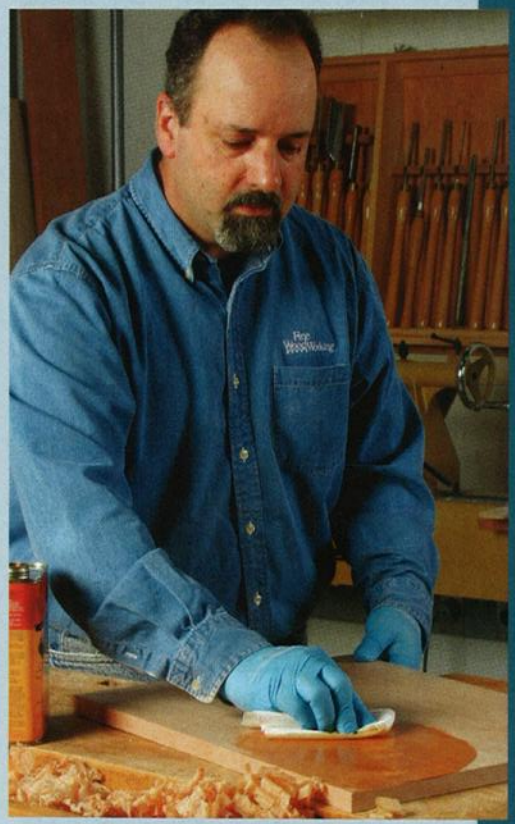
Comparing results

ASA: LOW-RISK SANDING IS IDEAL FOR BEGINNERS

This demonstration reinforced for me the fact that sandpaper handles the toughest grain without a hitch. Mike ran into some tearout, especially on the legs and aprons, and that took some real fussing for him to overcome. I had no such problem. And, under a coat of finish, my surfaces matched up well with Mike's. My tabletop had a tiny bit more blotching, but that may have been due to differences between individual boards. On the downside, the demo left no doubt that sanding takes longer. Even with time devoted to sharpening, Mike was done a half hour before me. Some folks suggest using a belt sander for speed, but I don't. The random-orbit sander is much easier to control. Bottom line, I recommend sanding to beginners because they will find it so much easier. Just work the surface evenly, move patiently through the grits, and use a block for hand-sanding.



How to tackle end grain. *Start by lightly lubricating the plane's sole with paste wax. To avoid chipout at the far edge, take a few short passes from that end first. Then rotate the piece and work normally, stopping short of the far edge.*



Dead flat and smooth. *Careful surface preparation pays off, especially on your project's broadest, most visible surfaces.*

MIKE: YES, PLANES ARE FASTER, BUT DON'T RUSH

I've always contended that handplaning was faster than sanding, so it's nice to know that I haven't been laboring under a false assumption. That said, I planned on half an hour to prepare these parts and it took twice as long. As always, the devil was in the details. With perfectly straight-grained lumber, planing is a breeze, but in the real world, that's rarely the case. The quartersawn grain on the legs was especially tricky and prone to tearout. I spent extra time scraping those parts, and should have done even more for the best results.

During the demonstration, I used just one bench plane and a block plane to show that you don't need to buy a lot of handplanes to get started. But I wound up doing a lot of adjusting for heavy and light cuts. Normally, I'd have set up a No. 5 jack plane for flattening parts quickly and a No. 4 for final smoothing. That would have saved some time and effort.

THE **BASICS**

Finish as You Build

Coats go on easier, cleaner before assembly

BY CHARLES NEIL

For most woodworkers, finishing is a chore to be put off as long as possible. So they wait until after a piece is assembled to figure it out. Instead, finishing should be one of the first things on your agenda; if it isn't, you will work yourself into a corner—literally.

At age 13, I ran across a guy who painted cars. I really enjoyed watching him work, and later learned to do painting and finishing myself. I worked for years in that industry, and along the way I learned a lesson that has become invaluable in my woodworking: Look at each piece as a collection of parts. Just as a vehicle breaks down into the hood, the trunk lid, the doors, etc., a piece of furniture or the trim in a room can be broken down into components.

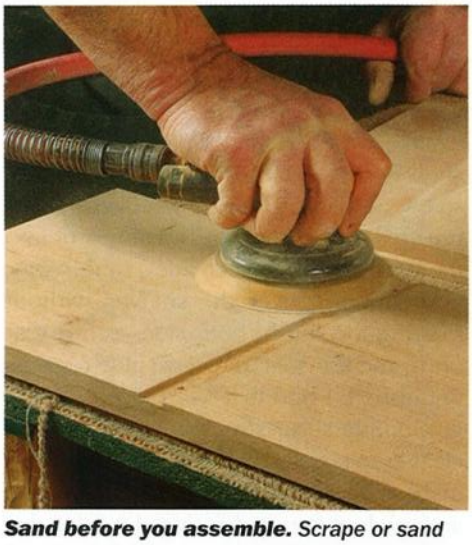
This step-back cupboard, for example, consists of the doors, the face frame, the shelves, the crown molding, and other distinct parts. Not only is it much easier to sand and pre-finish these parts before they are assembled, but I also have a number of ways to modify the design of the components slightly to simplify finishing.

On this cupboard, the upper cabinet interior is spray-painted and the rest of the piece is finished with Waterlox wiping varnish, but you can use my techniques with any type of finish.

Photos: Mark Schofield

Pre-finish interiors

You dado the sides of the case before assembly, so why not finish them too? A few minutes spent prepping the components for finish saves hours trying to finish the assembled interior.



Sand before you assemble. *Scrape or sand boards while they can be laid flat. Once a piece is glued together, it is much harder to reach into corners either by hand or with a machine.*

Mask off glue surfaces. *Clear finish or paint will interfere with glue's ability to bond wood, so use masking tape to seal off surfaces that will be glued.*

Temporary handles. *Screw blocks of scrapwood to each end of the shelves. You'll be able to handle the shelves cleanly while finishing them, the glue surfaces are protected, and both sides can dry at once.*

Think finish before you cut and glue

Few woodworkers are handy enough with dyes to be able to harmonize boards of different colors. Therefore, spend some time at the lumberyard sorting through the boards for matching color and grain.

Once you get the wood home and begin to lay out the parts on the boards, it often pays to alter the dimensions of your piece slightly. Unless you're building an exact replica, the design usually has a little flexibility. Say you have two beautifully matched boards that are ideal for the tabletop but are ¼ in. narrower than your planned width. It is much better to compromise on the design and use the best matching boards for the premier surface. No amount of skilled wood coloring will make up for an ill-matched top.

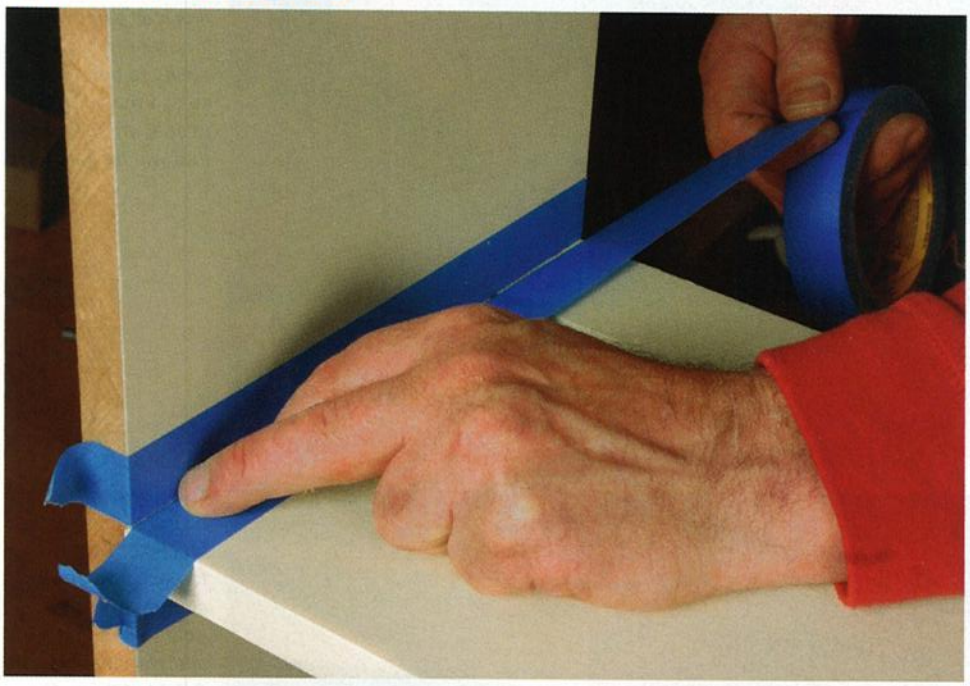
Pre-finish the interiors and anticipate squeeze-out—After finding the best match between the boards and the individual parts of the project but before you do any assembly, think about the finish. For example, on this step-back cupboard, if you assemble the top case and glue in the shelves, sanding or scraping and finishing will be very difficult where the parts meet at 90°. Instead, finish the entire interior of both upper and lower cases now. You may have some touch-up to do later, but finishing these panels while you can lay them flat is much easier than

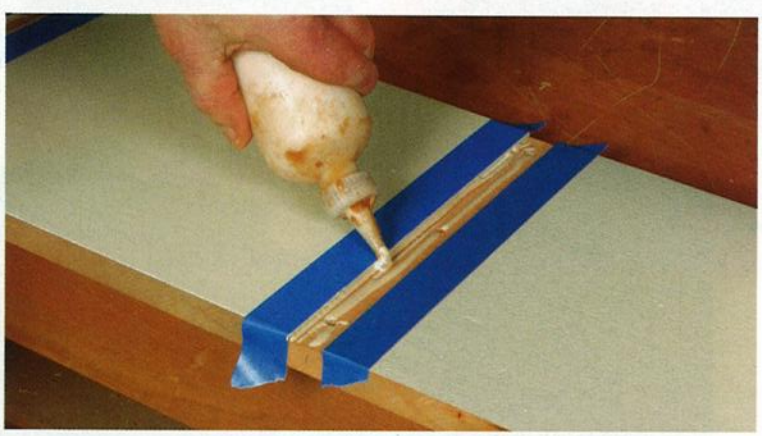
Finish the inside. *Whether you use a brush or spray gun, it is much easier to finish the interior of the upper cabinet before the cabinet is assembled.*

Protect against glue squeeze-out

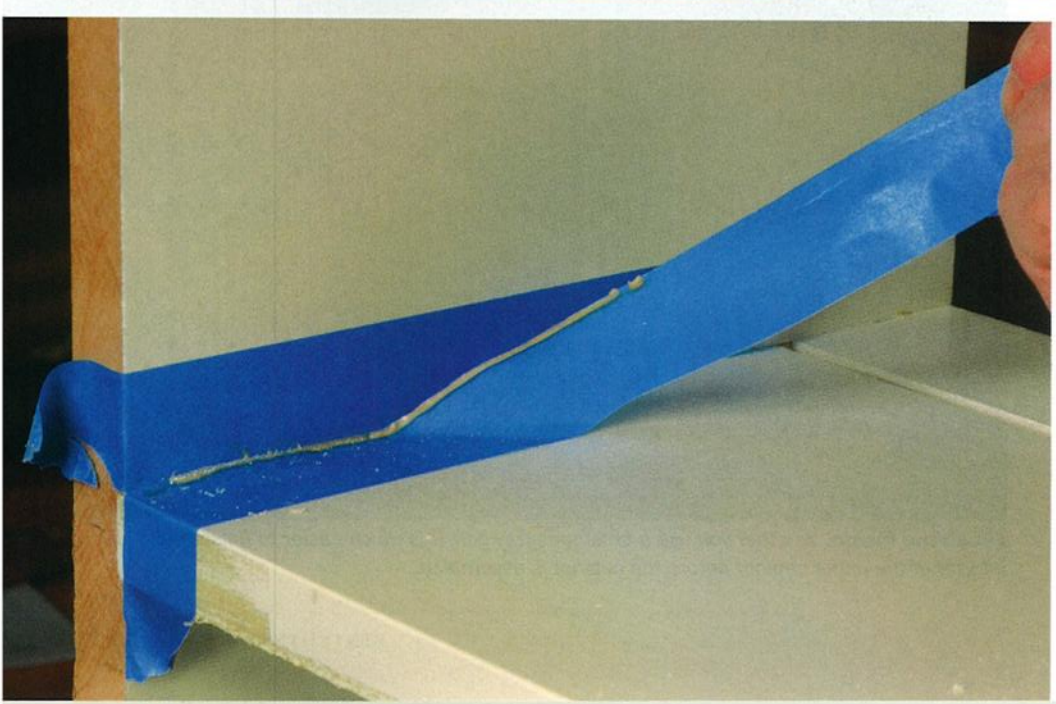
You don't want to scrape dried glue off the finished interior, so use some blue masking tape to catch any squeeze-out.

INTERIOR SHELVES





Tape and peel. *Dry-assemble the piece and place masking tape adjacent to glue surfaces (above). Now disassemble and apply the glue (right). When the parts are glued up, any squeeze-out goes onto the tape and is easily peeled away (below).*



wrestling with the whole case. You also will get much better results.

Mask off areas that will be glued. On shelves that are finished on both sides, screw on end caps sized to cover the entire area on the shelf ends that will fit into the dado in the cabinet sides. In this way, you can turn over the shelves without marring the finish, both sides can dry at once, and the area to receive glue remains unfinished. I find that ⅛-in.-deep dadoes give ample shear strength, are easier and cleaner to cut, and leave plenty of material in the shelf sides for adding the screws and antique-looking square plugs I used in this piece (see bottom photos, facing page).

After applying the finish, remove the masking tape from the glue surfaces and dry-fit everything. Now apply masking tape to the areas adjacent to glue surfaces. When you glue the cabinet together, any squeeze-out will collect on the tape and be easy to remove. The alternative is trying to remove squeeze-out in hard-to-reach areas that are already finished.

Make and install the face frames— Here again, some pre-finishing and masking tape can spare you a lot of agony. Apply finish to the inside edges of the face frame. Before gluing the face frame to the carcase, place tape on the adjacent surface of the carcase to protect it from squeeze-out. Don't worry about the exterior, because those surfaces will remain accessible and you'll be scraping or sanding them after the piece is assembled. No matter how particular you are, you may still get some glue on the wood. Don't try to wipe it off with a damp cloth; instead, let the glue set until it's semi-firm like chewing gum, then use a chisel or scraper to peel it off the surface. Now clean the wood with acetone; it removes the glue better than water and works with PVA, polyurethane, epoxy, and hide glues.

A neat trick for attaching moldings

With the two carcases glued up, it's time to focus on the smaller parts, starting with the base and crown moldings. Any time you have a cross-grain application, such as where these moldings contact the sides of the cabinet, two issues come into play. First, the expansion and contraction of the

FACE FRAMES

Pre-finish adjacent parts. *The face frame will be next to the already painted shelves, so finish the edge before attaching it.*

Tape the cabinet edges. *Apply tape to the cabinet interior adjacent to the face frame (above). This makes removing excess glue much easier once the frame is attached (left).*

wood means you can't glue the pieces all the way across—an inch or two at the front is as far as you dare go. Second, there is risk of cross-grain sanding scratches.

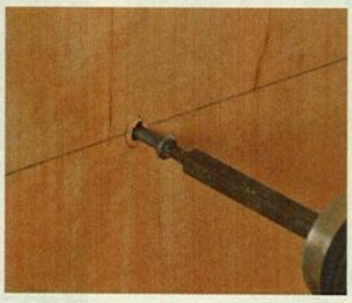
However, there's a nice, simple trick that solves both problems at once. For the base molding, rather than using a narrow strip of wood that must be nailed to the cabinet with the subsequent nail holes to fill, make the molding a couple of inches wider and then notch it to fit under the lower case. This allows the base to be screwed to the underside of the cabinet using slotted holes in the sides of the molding that allow for movement. The horizontal top section of crown molding is attached to the top in the

TIP

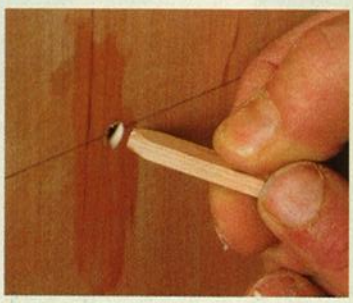
If you get surplus glue on the wood while the glue is curing, remove any residue with acetone.

A novel way to hide screw holes

Neil reinforces shelf-to-side panel joints with screws, but matching filler to the finished wood is problematic. Sink trim-head screws ¼ in. below the surface. Tap in a square peg with diagonals slightly greater than the hole's diameter. Once dry, saw and sand the peg flush, apply a finish, and it will resemble an antique square peg.



Drive the screws. *As well as the hole for the shaft, drill ¼-in.-dia. holes to receive the head.*

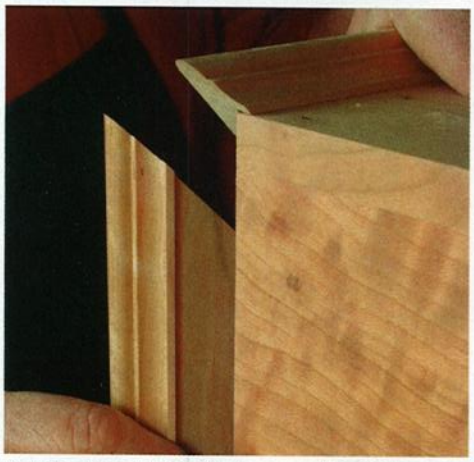


Square peg, round hole. *Taper the tip of a square peg and then glue and tap it into the screw hole.*

Meant to show. *When finish is applied, the square pegs stand out.*

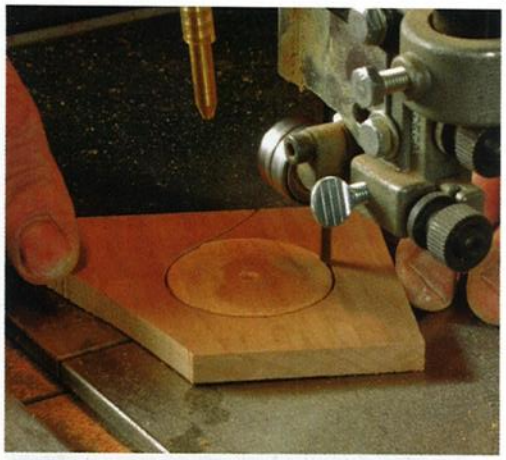
Pre-assemble moldings

Instead of nailing on pieces of molding at the last minute, make them into a robust separate unit, pre-finish them, and attach them to the cabinet with hidden screws.



Notched molding. *The base molding fits under the cabinet instead of being nailed to the front and sides. This means it can be pre-assembled and screwed on.*

Drill a hole. *Use a Forstner bit just smaller than the corner area to drill a little more than halfway through the wood. Keep the point just to one side of the joint to avoid splitting it.*



Shopmade circle. *On a piece of wood slightly thinner than the depth of the hole in the miter joint, just start to drill a hole with the same bit and then cut out the circle on the bandsaw.*

same way using slotted screw holes. The base and the crown can now be prepped and finished independently of the rest of the cabinet. The sides of the cabinet can be worked unobstructed, removing the risk of cross-grain scratches.

I have a novel way to reinforce the relatively weak miter joint at the front corners of the molding. After the miter is glued and dried, take as large a Forstner bit as will fit into the notched section of the molding and drill halfway through. Now bandsaw a piece of wood slightly smaller than the diameter and depth of the hole. Glue the circle into the hole with the grain running perpendicular to the miter joint.

Prep and finish a frame and panel before assembly

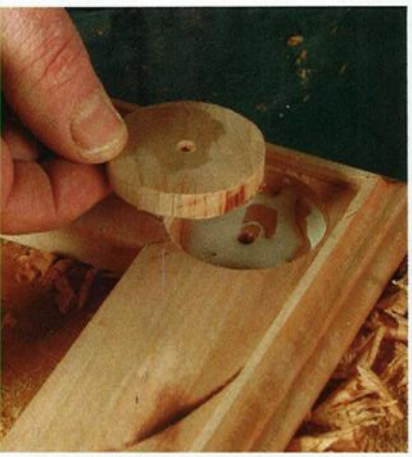
Solid-wood panels are designed to move within the frame. While this is a neat solution to the problem of wood movement from a woodworker's perspective, it presents a number of problems to a finisher. When the frame and panel are finished after glue-up, an unfinished area that sits in the grooves becomes exposed if the panel contracts later. On the other hand, if finish

Frame-and-panel tips

It is almost impossible to finish an assembled frame-and-panel neatly. Plan ahead!

Finer grits for end grain. *To prevent the end grain on a raised panel from absorbing too much finish and turning dark, sand it successively with P320-, P400-, and P600-grit paper.*

Don't forget the frame. *Sand the inside edges of the frame parts before the panel is inserted and the frame is glued together.*



A stiffer joint. *Glue the circle into the hole with its grain perpendicular to the line of the joint.*

Divide and conquer. *It is much easier to prep and finish the molding and the case sides before joining them.*

"glues" the panel into the frame, either the panel will split as it tries to contract, or it will break the frame as it tries to expand.

Second, it is nearly impossible to scrape or sand the sides or back of a raised panel and the inner edges of the frame after the frame has been glued together. It is much easier to prep these areas while they are still individual parts.

On a raised panel, the end-grain beveled area will absorb more finish and appear darker than the rest of the panel. To avoid this, it is necessary to sand this area with much finer sandpaper or use some other form of absorption control. You can either finish just the profiled part of the panel or, if you prefer, the entire surface. With the components done, check to see if any finish needs touching up before assembling the cabinet. Screw on the moldings and feet, nail or screw on the pre-finished backs, and attach the doors. By taking the time and making the effort to plan ahead, you'll be rewarded with a finish worthy of your masterpiece and a lot less hassle. □

Charles Neil is a woodworker and finisher in New Market, Va.

Finish the parts. *Apply finish to the panel (above) and the inside edges of the frame (left) before glue-up.*

Protect the finish. *After the frame has been glued together, you probably will need to flush-sand the joints. To avoid damage from the sander, tape off the nearby sections of panel.*

Home stretch. *By finishing individual parts separately and controlling glue squeeze-out, Neil ensures a flawless finish.*

THE **BASICS**

Sand Between Coats for a Flawless Finish

New products simplify this critical step

BY JEFF JEWITT

Whether you spray, brush, or wipe, one of the keys to a great finish is learning to sand between coats. When I began finishing in the 1970s, there weren't many choices when it came to sanding a finish: Steel wool shed tiny hairs that got embedded in the finish; regular sandpaper (if you could find it above 240 grit) clogged quickly when sanding shellac or lacquer; and if you wanted to flatten defects between coats of finish, you used wet-or-dry paper, which was messy and made it hard to gauge your progress.

Today, not only are there much better choices among consumer-oriented abrasives, but the Internet also has given everyone access to industrial abrasives. I'll narrow down what to use with film-forming finishes like lacquer, varnish, and shellac (in-the-wood 100% oil finishes and thin applications of oil/varnish mixes typically don't require sanding). I'll describe new products to use for dry-sanding between coats, and I'll cover the better use of wet-or-dry paper for sanding the final coat in preparation for the rubbing-out process.

Fine grits and a light touch

Going from sanding bare wood to sanding a finish involves a change of gears. Instead of power-sanding using grits mostly P220

Photos, except where noted: Mark Schofield; product shots: John Tetreault

or coarser, you typically hand-sand using grits P320 and finer.

The first coat of finish, whether a purpose-made sealer or just a thinned coat of the final finish, generally leaves a rough surface with raised grain embedded in the finish. At this stage you aren't flattening the surface, just smoothing it, so there is no need to use a sanding block. Using P320-grit stearated paper, you can make a pad by folding a quarter sheet into thirds. This pad works best if you have to get into corners and other tight areas. Otherwise, you can just grip a quarter-sheet of paper by wrapping one corner around your pinkie and pinching the other corner between your thumb and index finger. An alternative is pressure-sensitive adhesive (PSA) paper in the same grit (P320) that comes in 2¾-in.-wide rolls. You can tear off only what you need and temporarily stick it to your fingers.

Another option, which costs a bit more, is hook-and-loop pads that allow you to hand-sand using disks designed for random-orbit sanders. If the sandpaper starts to load up with debris or corns, I swipe the grit side of the paper against a piece of thick carpet (Berber is best). You also can swipe it on a gray abrasive pad.

It's important to remove the residue after each sanding, or it will cause problems with the next coat of finish. If your finish is oil-based, solvent lacquer, or shellac, dampen a clean cotton or microfiber cloth with naphtha or mineral spirits and wipe away the debris. I prefer naphtha because it evaporates faster and leaves a little less oily residue. For waterborne finishes, I make a mixture of 5% denatured alcohol in tap water (roughly 1 oz. denatured alcohol to 16 oz. water). It's OK to follow the solvent

Stearated sandpaper: No more clogging

The biggest advance in sanding between coats of finish has been the increasing availability and improving quality of stearated sandpaper. A waxy-feeling powder, zinc or calcium stearate (or a mixture), is incorporated into either aluminum-oxide or silicon-carbide sandpaper. The stearate prevents the dry finish residue from sticking and forming clumps, or corns, or clogging the spaces between the abrasive particles.

Dry-sanding between finish coats is better than wet-sanding because it allows you to see what you're doing much more clearly. If a surface is wet with lubricant, you could be sanding right through the sealer or finish because the lubricant creates an illusion of finish on the wood.

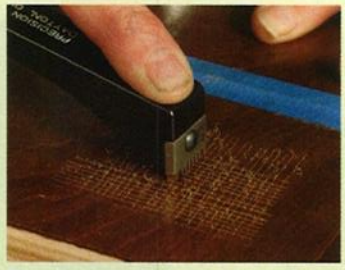
Myth-buster: New paper works with water-based finishes, too

Tough test reveals the truth. *Jewitt applied eight waterborne finishes to a sample board and then sanded sections with different stearated sandpapers before adding a final coat of each finish.*

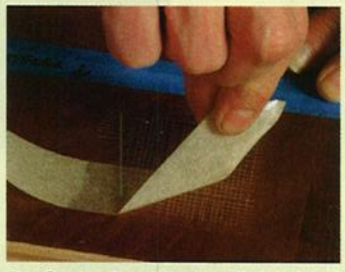
I've always assumed that stearated sandpaper caused adhesion problems with waterborne finishes. However, after finding little hard evidence, I decided to test several consumer and industrial sandpapers with a variety of waterborne finishes.

I applied one coat of each finish to a separate sample board. When it was dry, I divided the board into sections and sanded this coat smooth with a variety of P320-grit stearated sandpapers. After I removed the sanding residue, I applied another coat of finish and after 72 hours, evaluated the surface for flow-out and adhesion (right).

I found no compatibility issues with any of the sandpapers and waterborne finishes. If you use a premium stearated paper, you'll have no problems as long as you remove the residue after sanding.



Deep scratches. *Jewitt used a special tool to scratch a pattern in the cured finish.*



Perfect adhesion. *No finish from the scratched area stuck to the tape when he pulled it away.*

How to handle flat surfaces

2 WAYS TO HOLD PAPER

Fold into thirds for tight spots. *Fold a quarter sheet of sandpaper into thirds. All the paper can still be used but there is no grit-on-grit contact.*

Sand inside corners. *Folding the sheet into thirds allows you to work your way into tight spots.*

Hand sander. *For sanding flat surfaces, just wrap a corner of the sheet around your little finger and grip the opposite corner between your index finger and thumb.*

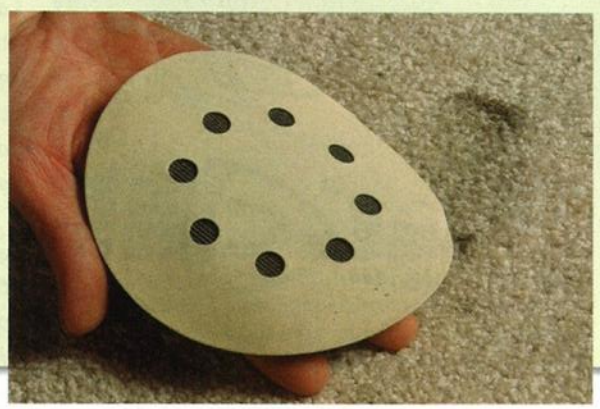
2 WAYS TO USE DISKS

Handy pad. *You can hand-sand using disks designed for random-orbit sanders by attaching them to a Velcro-backed pad.*

TIP

KEEP SANDPAPER CLEAN

Unlike power sanders with onboard dust extraction, hand-sanding can clog the paper quickly. A quick wipe on a carpet remnant gets it clean again.



wipe with a tack cloth, but most tack rags can leave a residue that will interfere with the adhesion of waterborne finishes. One waterborne-friendly tack cloth is 3M's item No. 03192.

Higher grits for subsequent coats—After you have smoothed the sealer coat and applied the first real coat of finish, you should generally use P400- or P600-grit paper to sand; otherwise, you might see tiny sanding scratches in finishes that don't melt into each other, such as oil-based products and most waterborne ones.

You can use a power sander on large, flat surfaces, once you have built up enough finish thickness (at least four to six coats). Use caution when sanding, staying away from the edges and using P400-grit paper or higher. For better visibility, I always do this with dust extraction. The better papers out there have holes punched to match the ports on the sanding pad, or are made up of a mesh like Mirka Abranet. An industrial product called Clean-Sand by 3M is disk paper with a spiral progression of small holes for dust extraction.

Special products for moldings, carvings, and turnings—Although you can use sheet sandpaper with shopmade or commercial profiled sanding blocks on gentle profiles, this won't work on sharp curves and other extreme profiles. For these areas, use ultra-flexible sanding sponges or a synthetic steel-wool substitute.

TIP

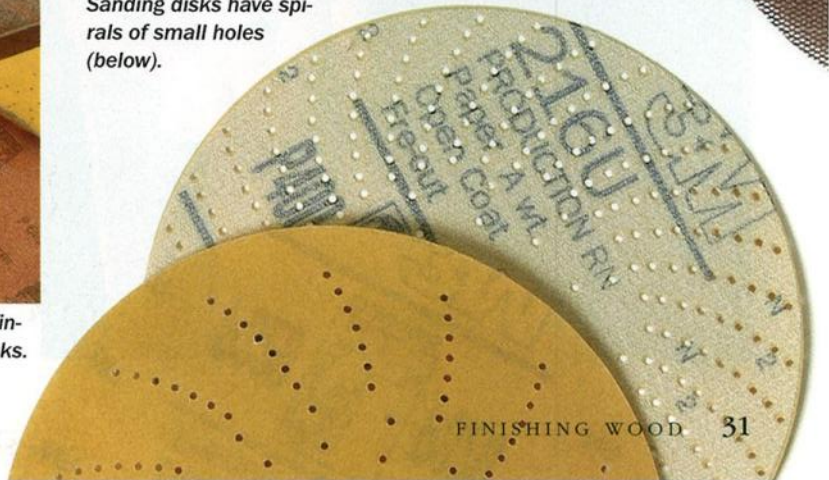
REMOVE THE DUST

It is very important to remove all the sanding residue before applying the next coat of finish. For solvent-based finishes, dampen a cloth with naphtha or mineral spirits. The former dries faster (but is harder to spell).

Neither of these products has stearates because the face is more open and clogging isn't an issue. After use, most of them can be cleaned with soapy water and re-used. I like ultrathin synthetic steel wool, which more easily conforms to profiles and turnings. Choices include Mirka's Mirlon Total and 3M's Multi-Flex, both of which are available in a convenient roll, but look for 3M's Sand-Blaster flexible pads,

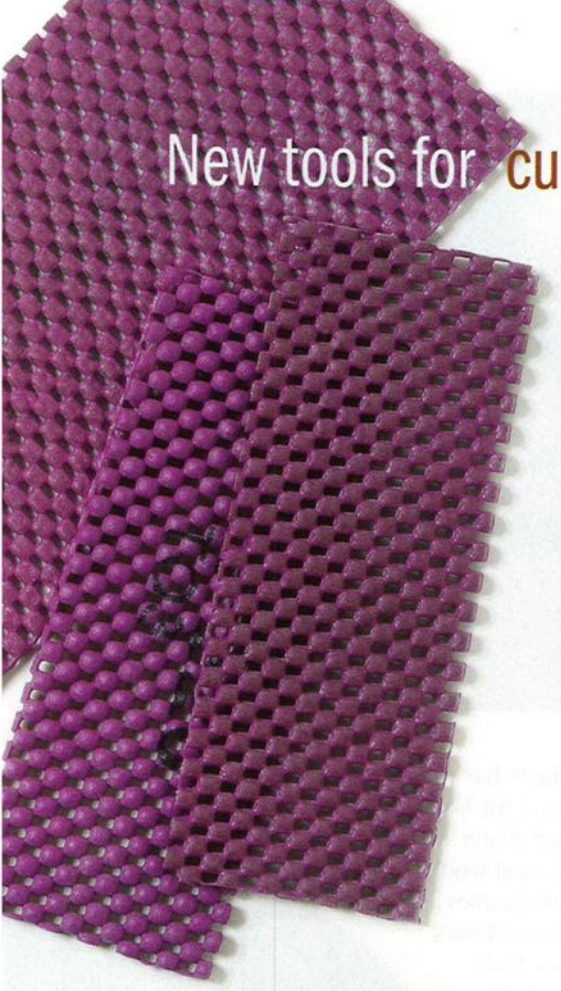
2

Power-sanding comes later. *Once you have applied five or six coats of finish, you can safely use a random-orbit sander equipped with P400-grit disks.*



New disks, better dust extraction. *Through-the-pad dust extraction has been one of the great innovations in wood finishing. The latest disks work even better and fit all sander models regardless of their hole configuration. Mirka's Abranet is an abrasive-coated mesh (top), while 3M's Clean Sanding disks have spirals of small holes (below).*

New tools for curves and carvings



Foam mesh. *3M's Sandblaster is a drawer-liner type of foam mesh coated with abrasive. It can be folded over to reach into tight corners or wrapped around curves.*

Abrasive pads. *These pads come in a variety of grits and are thin enough to get into carvings.*

Sticky paper. *Adhesive-backed sandpaper is useful for sanding narrow surfaces. Simply stick it to a finger.*

which last a bit longer and are easier to find at most home centers and hardware stores.

On thin, flat areas like the inside edge of a picture frame or door, hold the pad with your thumb on top and the rest of your fingers underneath. This keeps it level. Or just use a small piece of the adhesive-backed paper mentioned earlier.

Wet-or-dry paper still the best for final flattening

Unlike stearated sandpaper, wet-or-dry sandpaper can be either FEPA (P) or CAMI graded. Make sure you know what you're using, because a P600 is equivalent to just under a CAMI 400. All FEPA-graded sandpaper should have a P before the grit number; if there is no P, assume it's CAMI grade unless otherwise specified. One feature of wet-or-dry paper is that you can get it

Sanding sponges. *Less flexible than the other products, sanding sponges are good for gentle curves and can be washed out after use.*

Switch to wet sanding for the final coat

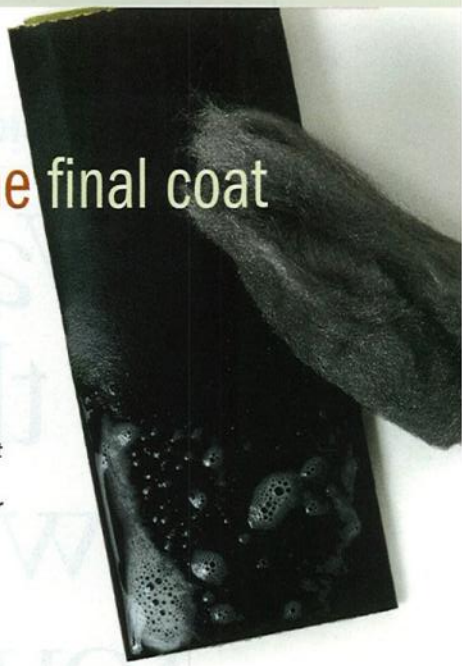
in grits up to 2,000 and sometimes higher. If you have any trouble finding it, try an automotive parts supplier.

Wet-or-dry sandpaper is a very sharp and fast-cutting abrasive and works best for removing final defects and flattening the finish prior to rubbing out (where you polish the flattened surface to the desired sheen). You can use mineral spirits, a light mineral oil called paraffin or rubbing oil, or soapy water as a lubricant. Of the three, soapy water is the least messy, though it seems not to cut as fast or as well as the other two. I add a capful of Dawn dishwashing liquid for every pint (16 oz.) of tap water, and then apply the mixture using a plant mister.

Start with a quarter-sheet of P600-grit paper wrapped around a cork, or a cork-faced, block. Spray some lubricant on the surface and begin sanding with the grain if possible. On a top, I typically rub the outside 3 in. first so I can focus on keeping the block flat and not tipping it off an edge (that happens naturally with my arm motion if I'm taking a long sweep from one end to the other). Once I've gone around a few times, I come back and do the center. Wipe away the slurry and examine the surface. You're done when the surface looks about 80% to 90% dull. Don't try to make the entire surface perfectly dull, because you'll probably sand through the finish.

After using the wet-or-dry sandpaper, you can follow up with paste wax applied with 0000 steel wool for a satin finish. An alternative to steel wool is a very fine abrasive foam pad such as Mirka's Abralon. The 1,000, 2,000 and 4,000 grits can be used for sheens ranging from dull to satin. You don't need compounds or polishes with these products. □

A frequent writer on finishing, Jeff Jewitt lives in Cleveland, Ohio. His latest book and DVD is Spray Finishing Made Simple *(The Taunton Press, 2010).*



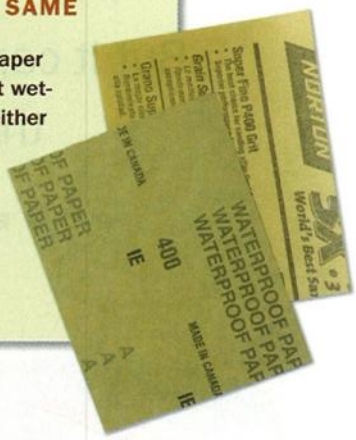
Flat surfaces. *Wet-or-dry sandpaper is the best way to smooth the surface prior to rubbing out the finish. Use soapy water as a lubricant and wipe away the slurry to check your progress.*

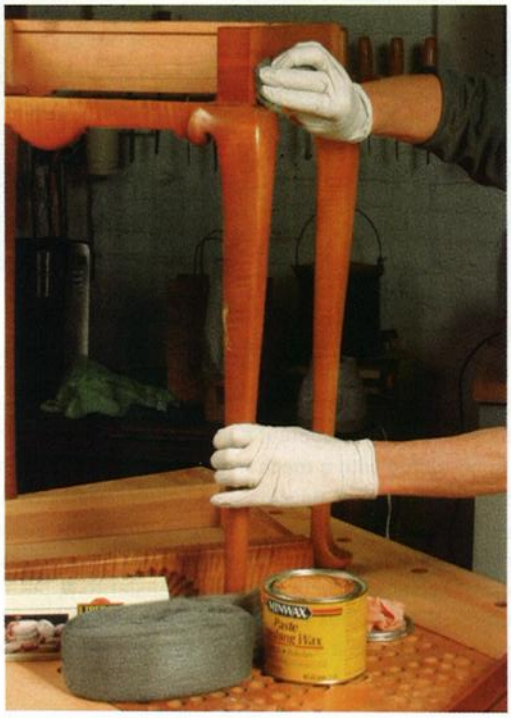
Tight curves. *Use 0000 steel wool lubricated with soapy water to remove the gloss on curved surfaces.*

TIP

ALL GRIT NUMBERS AREN'T THE SAME

Almost all stearated paper is FEPA (P) graded, but wet-or-dry papers can be either P or CAMI graded. The difference is significant in the higher grits, so make sure you know what you're using.



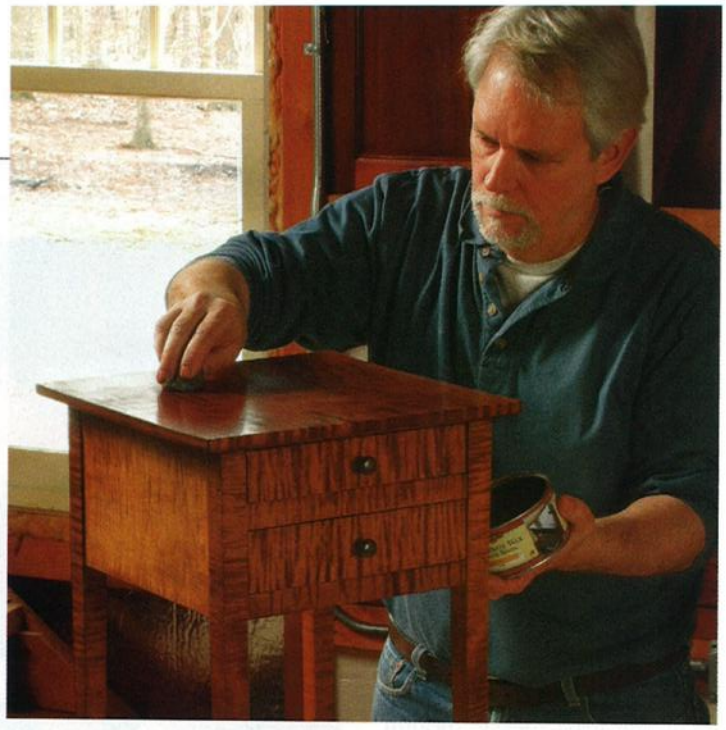


Finish up with wax. *Apply some paste wax with Liberon's 0000 steel wool and then buff the surface with a cotton cloth for a smooth, satin finish.*

Wax Is the Crowning Touch

But it can do much more than polish

BY PETER GEDRYS



There is a quality to a wax topcoat that can't be matched by more durable, modern finishes. The soft sheen and tactile quality of a waxed surface just begs to be touched. Not only does a waxed surface look good and feel good, but it also helps protect the finish underneath.

Besides being a final coat on finished wood, wax has a number of other uses. It can serve as a minimal finish to maintain a wood's natural beauty, or it can give a just-made piece an antique look. Colored waxes can create special effects. Best of all, the tools are simple and the techniques are easy. Whether you like to build your own pieces or refinish garage-sale finds, your projects will look and feel better after a proper waxing.

Wax polish finishes a finish

The most common use for wax is as the final layer of finish. It can go on top of any type of finish, from an in-the-wood couple of coats of

CHOOSE ONE MADE FOR FURNITURE

In general, if the first use mentioned on the can is polishing wood floors, don't use the wax on furniture. It is likely to contain a high percentage of carnauba wax and is designed to be buffed with a mechanical floor buffer. You'll have a hard time buffing it by hand. Butcher's Bowling Alley Wax and Minwax finishing wax fall into this category. Waxes designed for furniture tend to be easier to use. They usually are softer in consistency (what I call a semi-paste wax) due to their higher percentage of solvent, which makes them easier to apply. I've had good results with Antiquax; Fiddes dries fast and has a low odor; Liberon's Black Bison goes on very smoothly but has a strong odor; and Goddard's has a pleasant lemon verbena scent.

Photos, this spread: Michael Pekovich (this page, top); John Tetreault (product shots)

Step one is understanding the ingredients

CLEAR-WAX BASICS

Although brands of wax vary greatly in price, they all draw from the same limited number of raw waxes and solvents.

The best-known wax is beeswax. After the honeycomb has been melted and refined, it can be left dark or placed in the sun and bleached. Medium-soft, beeswax produces a medium-gloss finish.

The cheapest component is paraffin wax, derived from refining crude oil. Relatively soft and colorless, it serves as the base for many wax blends. Also obtained from petroleum is microcrystalline wax, a highly refined and expensive wax that has excellent resistance to water. It is favored by museums because of its neutral pH.

To offset paraffin wax's softness, manufacturers add harder waxes: Carnauba, obtained from scraping the leaves of a Brazilian palm tree, produces a very high shine but is also very hard to buff out when used alone; candelilla, obtained from the leaves of a Mexican plant, is much like carnauba, but somewhat softer.

Raw waxes. *Shown from left are beeswax, paraffin, and carnauba flakes.*

The speed at which a solvent evaporates will determine how long you have to wait before you can buff the wax. Traditionally, turpentine was used to dissolve beeswax, but its relative expense means this medium-paced solvent is rarely used in commercial waxes.

Mineral spirits is the most common solvent and can be formulated for slow or medium-paced evaporation. Faster-evaporating solvents include naphtha and toluene. I avoid toluene waxes such as Briwax (below) for a number of reasons. First, I dislike their strong odor; second, toluene is most likely to damage a finish that is not fully cured; third, I find they harden very fast, making them somewhat difficult to work with.

COLORED WAX

If you do one thing after reading this article, I hope you'll try using a dark wax. As this piece of walnut shows, a clear wax on a dark, open-pored wood can leave white residue in the pores. Even if the pores are filled, the clear wax can leave a slight haze on a dark surface.

Conversely, wax the same color or darker than the wood can enhance the appearance. See p. 39 for more detail and to learn how dark wax can be used to give an aged look.

You can buy wax in a range of wood tones, or you can take clear paste wax and color it yourself. You must first melt the wax, but because wax is flammable, never heat it over an open flame. Instead, place it in a container over heated water, a device known as a double boiler. Add artist's oils or universal colorants and mix them in thoroughly. Let the wax solidify before use.

Buy the right color. *Find one that matches the wood and it won't show in pores and recesses.*

Or color your own. *If you need only a small amount of colored wax or you want an unusual color, melt some clear paste wax in a container over hot water, and then mix in artist's oil colors.*

Finish a finish with wax

GLOSS LOOK

Create a wax applicator. *Place some wax in the center of a double thickness of cheesecloth, gather the edges of the cloth together, and twist them closed.*

oil to high-gloss, rubbed-out shellac. The wax helps to even out the sheen and adds a measure of protection that can be renewed easily. However, don't rush to apply it: Almost all waxes contain solvents, which can damage a film finish that isn't fully cured. For most finishes, this means waiting a week; but wait at least a month before applying a paste wax to solvent-based lacquer.

For best results, use an applicator—Using widely available but hard paste waxes, beginners tend to put on too much, then wonder why the surface smears when they try to buff it. The answer is to make a wax applicator.

Take some good, dense cheesecloth and fold it over. Place a small amount of wax on the middle of this pad. Gather up the edges and twist them to form a small knob that encloses the wax. As soon as you rub the surface, the wax will start coming through the cloth evenly and thinly. Although you can use softer semi-paste wax this way, you gain the most benefit when using harder paste waxes. For closed-pore, light-colored woods such as maple, I use a clear wax, but for open-pore woods such as oak or mahogany and darker closed-pore woods like cherry, I use a colored wax.

When you rub the surface, you will apply a very thin film of wax. The applicator prevents you from applying too much. I begin by applying the wax in circles, forcing it into any open pores, and then I give it a once-over with the grain to straighten everything out. If you run out of wax, don't apply more to the outside of the applicator; just unwrap it and replenish the inside. When

A thin coat is critical. *The cheesecloth applicator allows an even amount of wax to reach the wood. Apply the wax in a circular motion (1). Follow up by giving some light strokes with the grain (2). Before buffing, wipe the surface with a white nonabrasive pad; the open weave picks up any residue (3). Don't use a colored pad; many contain abrasives. To raise the shine (4), you can do the final buffing with a cotton cloth or a paper towel. Turn it frequently to keep removing surplus wax.*

Photos, except where noted: Mark Schofield

finished, you can store the applicator inside the can of wax.

To get the best results, you must wait for the solvent to evaporate before you remove the excess wax and buff the surface. If you do this too soon, you'll either remove the wax or just move it around. If you wait too long, it becomes progressively harder to remove the surplus. Although the wax won't get hazy like car polish, it will change from glossy to dull. The time this takes varies by brand and atmospheric conditions, but 20 minutes is average.

Although using the applicator should prevent excess wax, I still rub the dried wax with a white nylon nonabrasive pad (woodworker.com). The open weave picks up any thicker patches or small lumps of wax. The final step is to buff the surface with a soft cloth like terrycloth, an old T-shirt, or even a paper towel. Rub the surface vigorously and turn the cloth frequently so that you burnish the wax rather than just redistribute it.

At this stage, if you find you simply can't get the surface to shine, you probably put on too much wax or let it harden for too long. Rub the surface with a cloth dampened with mineral spirits to remove most of the wax. Wait an hour for the solvent to evaporate, and then reapply the wax more carefully.

Rub out the surface with wax—If you prefer a medium luster, an option when waxing a cured finish such as shellac, varnish, or lacquer is to apply the wax with 0000 steel wool or a gray abrasive pad. This will reduce the sheen and soften the look. To better lubricate the steel wool, I use a softer semi-paste wax. To avoid cross-grain scratches, apply the wax with the grain only. It is easy to apply too much wax with this method, so you'll probably need to go over the wax once it has dried with clean steel wool or a white nonabrasive pad. When the wax has cured, buff the surface in the same way as previously described.

Waxing intricate shapes and carvings—By highlighting areas that are proud and leaving recesses dull, wax can give carvings and moldings a more three-dimensional appearance. The softer the wax, the easier it is to work into the corners using either a cloth or a small stiff brush. When dry, a vigorous buffing with a dry and moderately stiff-bristle brush will yield good results.

Renewing a waxed surface—When a waxed surface begins to look dull, try buffing to renew the sheen. If this doesn't do the trick, simply apply and buff another layer of wax in the same way as described earlier. When done correctly, the layers of wax are so thin you need have no concern about wax buildup.

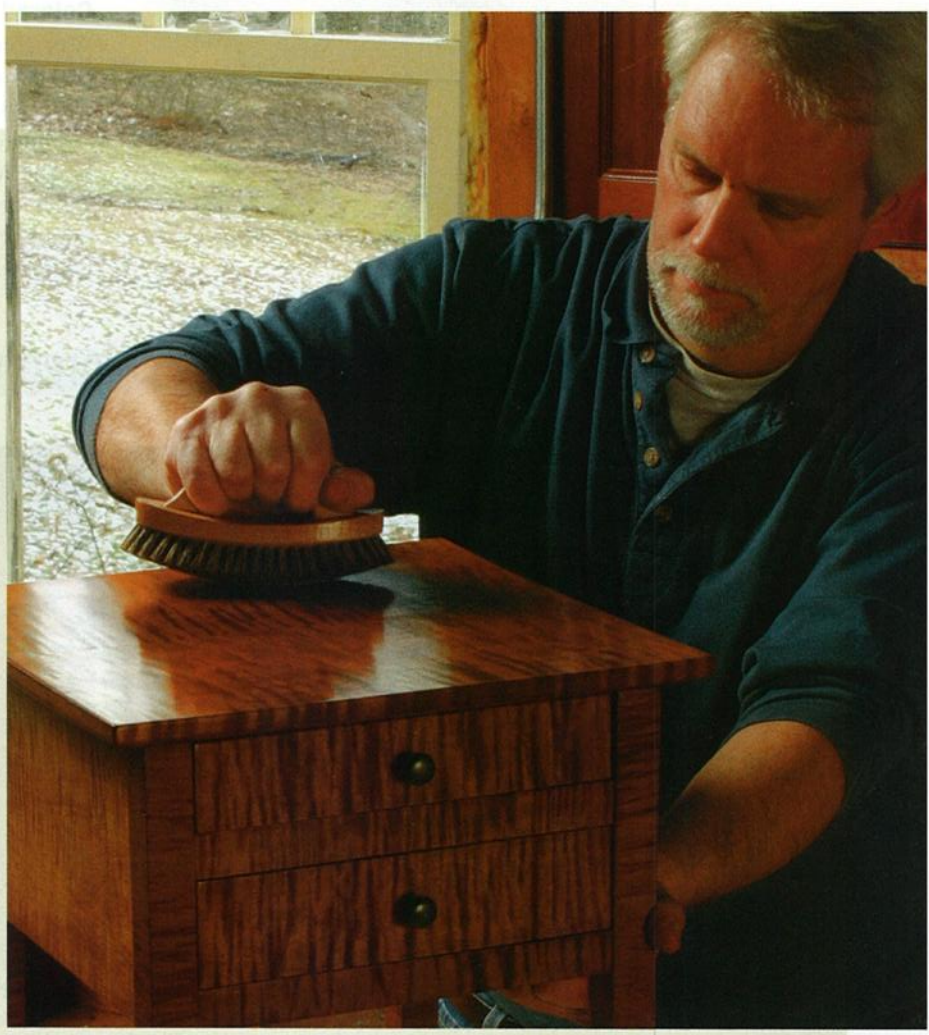
If the surface becomes worn or dirty, wax can be removed with mineral spirits or one of the proprietary wax washes. If it is very

Online Extra

Peter Gedrys mixes up a batch of wax and finishes a piece at **FineWoodworking.com/finishing-wood.**

SATIN SHEEN

Steel wool and wax. *You can combine rubbing out the finish and waxing it by using steel wool to apply the wax. Liberon's 0000 steel wool gives the most even scratch pattern (right). To avoid cross-grain scratches, rub the steel wool with the wax in the direction of the grain only (below).*



Not just for shoes. *You can buff wax with a brush. This works well in carved areas and produces a slightly lower shine than a cloth.*

Use it alone as a minimal finish

Simple steps. *For objects rarely touched that don't need a protective finish, wipe on a single coat of shellac, sand when dry, and then wax and buff.*

grimy, use either 0000 steel wool or a gray abrasive pad with solvent to loosen the wax. Wipe well with paper towels, and then rewax the surface.

Wax bare wood for a natural look

Wax also can be used on its own as a finish. It has the advantage of barely changing the natural color of the wood, just giving the surface a slightly higher sheen. The downside is that it gives minimal protection, but this is not a problem for objects such as picture frames that are subject to infrequent handling. As with waxing a finish, you need to match the wax color to the wood.

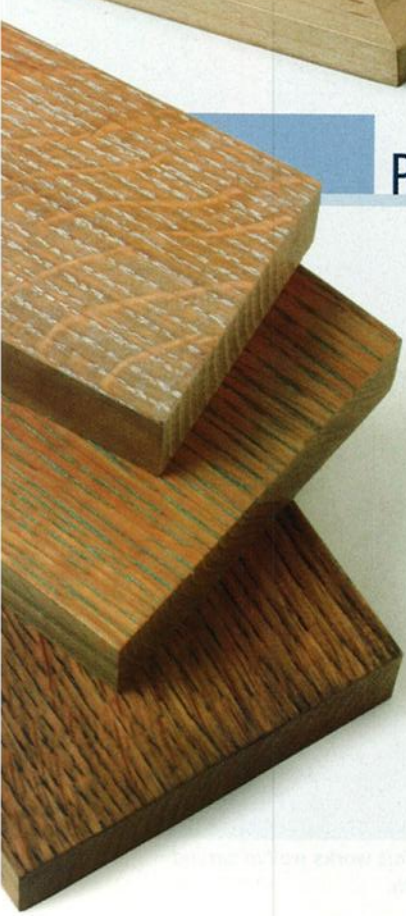
A variation on this is one of my favorite finishes. I seal the bare wood with a coat or two of a 1- to 2-lb. cut of shellac, lightly sand it when dry, and then apply the wax. I've used it with great success on lightly used furniture and on architectural components such as paneling. The thin barrier of shellac barely changes the wood's appearance yet makes it smoother and less porous, allowing a more even luster. It also allows me to easily remove the wax at a later date, if required.

Colored wax gives a range of looks

Wax comes in a range of colors, from wood tones to specialty colors such as black and white. These colored waxes can be used either for decorative finishing or for replicating antiques.

A limed finish on white oak is the most famous decorative wax finish. First, open up the pores with a brass brush or a slightly stiffer bronze brush, then vacuum and blow out the pores thoroughly. Seal the surface with a thin coat of shellac, and then rub white wax well into the pores. Wipe off the excess and apply

Pop the pores with colored wax



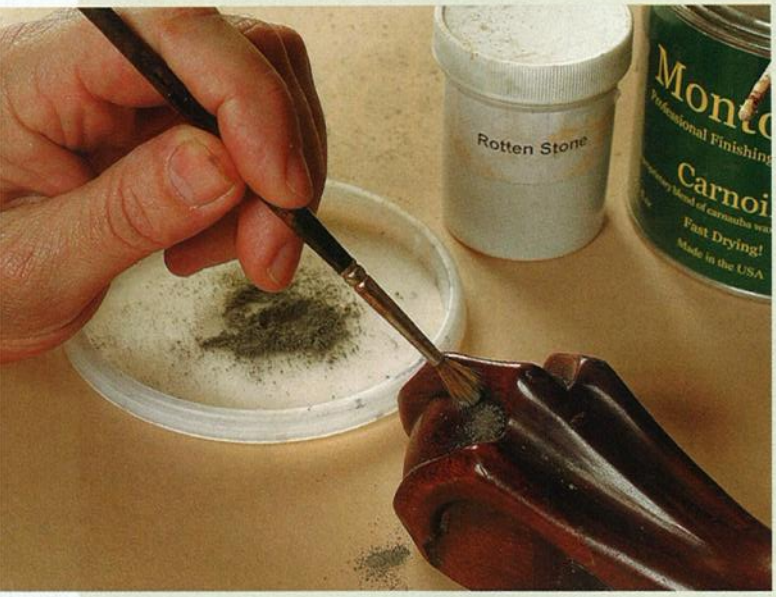
Prepare the wood. *Open the pores by brushing the wood with a bronze or brass brush. After removing the dust with a vacuum or compressed air, apply a single coat of shellac.*

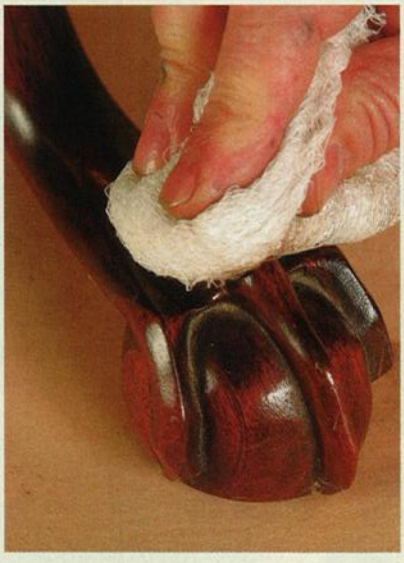
A limed finish. *Fill the pores with white liming wax, and then remove the surplus. Later add a coat of clear wax, or for a higher gloss, a coat of shellac.*

Color wax with powders. *You can color clear wax by adding dry pigments or mica powders. Afterward, topcoat with either clear wax or shellac.*

Wax can give an aged appearance

CREATE INSTANT DUST

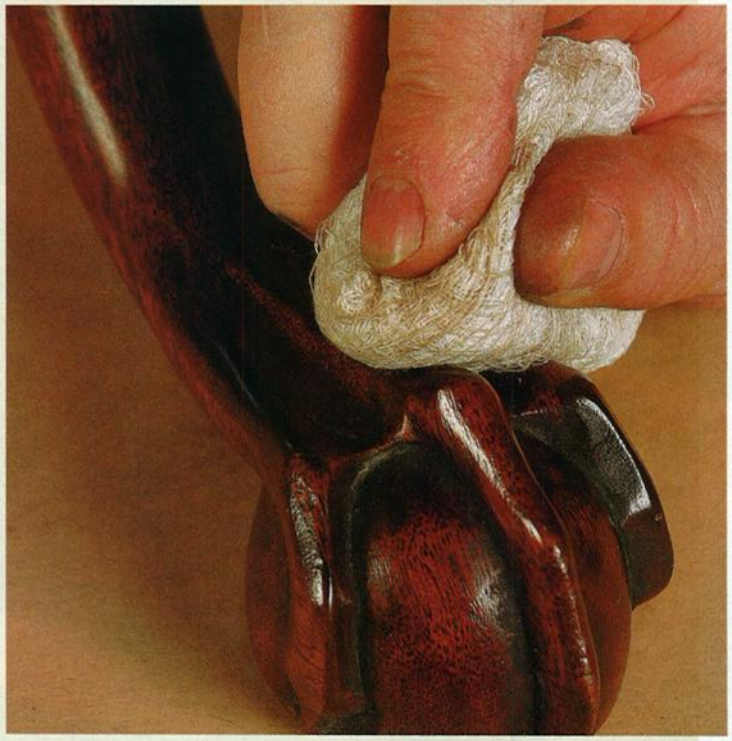




Dirt in the crevices. *Apply softened paste wax into the nooks and crannies of carvings. Then tap in some rottenstone with a stiff-bristled brush (top). When the wax has dried, rub the area with crumpled newspaper to remove the bulk of the rottenstone, and then burnish the high points with a cloth (right). This leaves a line of gray similar to that found on antiques.*

ADD YEARS OF POLISH

Simulate wax buildup. *To replicate the dark recesses found on antiques, use dark wax in these areas (above), or apply dry pigments to freshly applied clear wax (center). When the wax is dry, burnish the high points with a cloth or a brush (below).*



either a couple of coats of paste wax or, for a higher sheen, a coat of shellac. Other applications include adding colored pigments or mica powders to clear wax to color the pores.

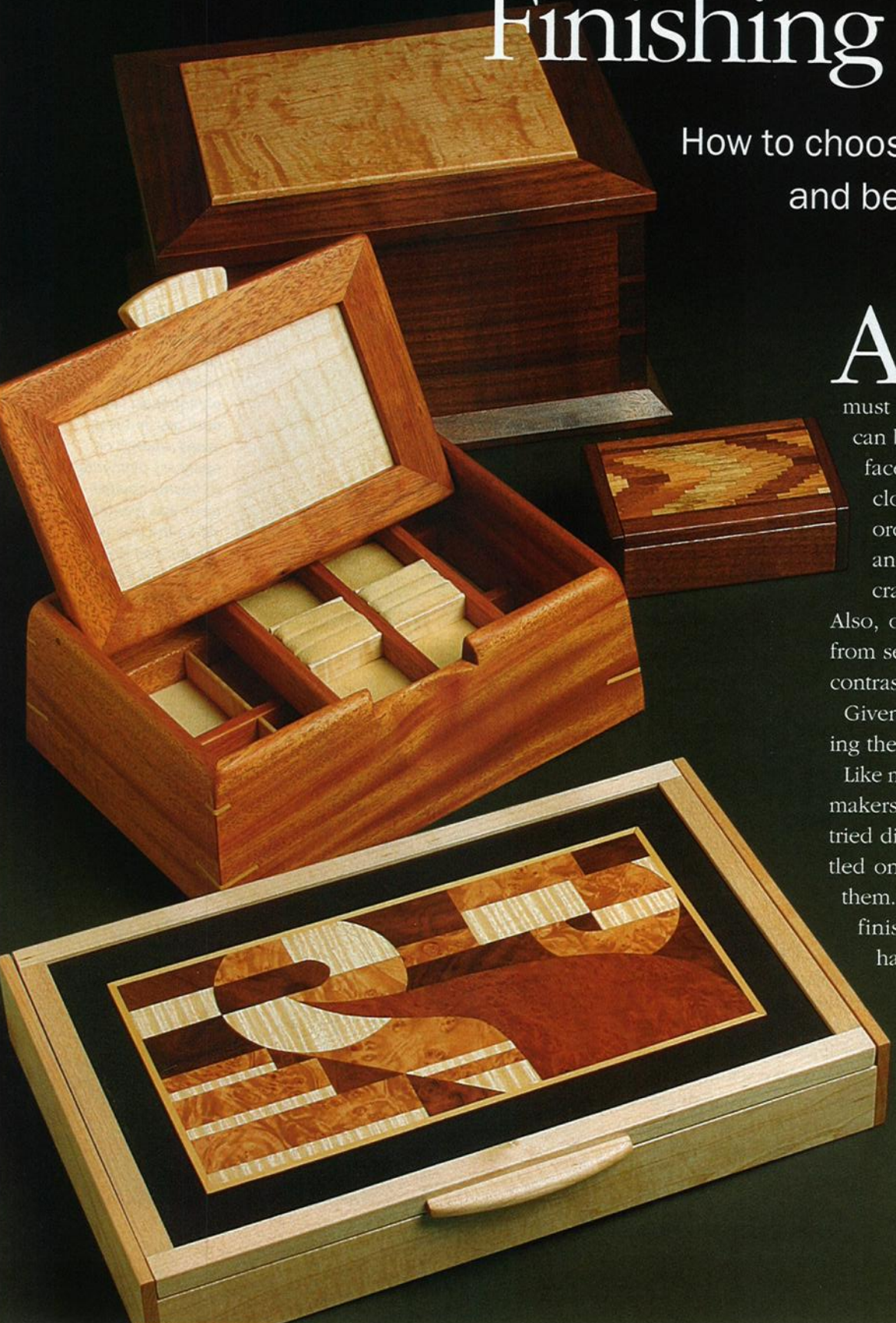
If your taste runs more toward period than contemporary, wax can give furniture an aged appearance. Using wax a shade or two darker than the wood will add accent lines around moldings and carvings. There are brown and black waxes sold as patinating waxes, but you can make your own or use dry pigment powders on top of a clear wax.

Don't use shoe polish. Many include silicone, which will play havoc with any film finish that you apply afterward. □

Peter Gedrys is a professional finisher and restorer in East Haddam, Conn.

The Ins and Outs of Finishing Boxes

How to choose the right finish, and beautify the interior



A box might look like a simple piece of woodworking, but don't be fooled. Small parts must fit precisely, and the results can be complex to finish. The surfaces inside and out must be as close to flawless as possible in order to withstand close scrutiny, and there are lots of nooks and crannies where finish can pool. Also, one small box may be made from several woods chosen for their contrasting grain, color, or figure.

Given all of those variables, choosing the right finish becomes critical. Like many other woodworkers, boxmakers Doug Stowe and Dave Shaw tried different finishes until they settled on the ones that work best for them. Stowe uses Danish oil. Shaw finishes his boxes mainly with hand-rubbed shellac.

The finished look of a box interior can also be enhanced by a luxurious lining of suede cloth or velvet. Woodworker Emily Palm uses those fabrics and wooden dividers inside her oiled hardwood boxes.

Danish oil: durable wipe-on finish

BY DOUG STOWE

A good combination. *This type of finish combines oil and urethane, which is harder than oil alone.*

I finished my first boxes with Deft brush-on lacquer, but because I worked and finished in the same space, the fumes were horrid and dust settled on the surface. I started using Watco Danish Oil, but it never really looked like the wood had a finish. I tried Minwax Antique Oil, but I wasn't happy with the smell.

When I discovered Deft Danish Oil, my problems were solved. Now I finish in the same room that I use to cut wood, and the odor is tolerable. The oil heightens the contrast between the local woods I use, making the inlay patterns more distinctive.

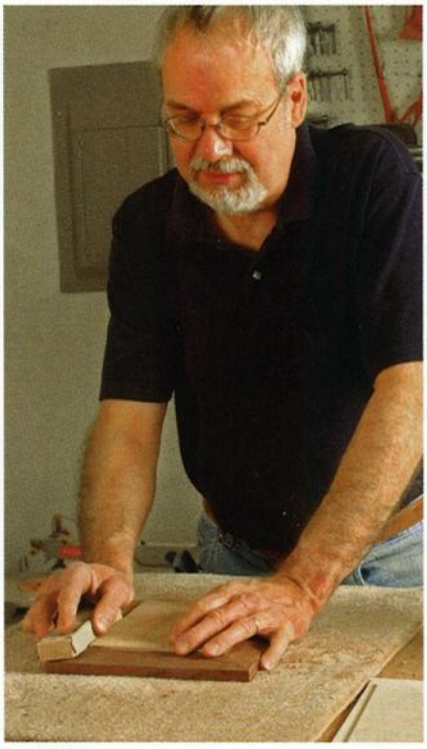
When designing a box, think about how and when you'll finish it. In my experience, larger boxes or complex designs of any size should be broken down into their essential components and finished before assembly. But with small, simple boxes, you can apply the oil after finish-sanding and assembly.

I sand on a 6x48 belt sander up to P180-grit, paying close attention to avoid putting too much pressure in one spot. I finish sanding by hand or with an orbital pad sander to P320-grit.

Then I apply a heavy coat of Danish oil. It often helps to rag on a second coat of oil on the outside. Most of the boxes I make are small enough to hold in my hand while being oiled. With a larger box, I oil the insides and sides, then flip it over onto sticks to oil the bottom.

About an hour later, I'll begin wiping the box to remove and redistribute excess oil. Using a rag slightly damp with oil helps to work the finish into the wood. If the boxes still seem wet, I'll go through them all again, paying extra attention to places where excess oil might collect, such as the areas around joints or floating panels.

I put small boxes or components on sticks and let them dry overnight. Next day, I repeat the oiling and wiping. I've found that it pays to be conservative on the second oiling. I generally put a third coat on the outside of most boxes. You can build the natural gloss sheen or use 0000 steel wool to dull it a bit.



Finish in stages. *With larger boxes, sand individual components and apply oil before final assembly.*

Flow it on and wipe it off. *Apply liberal amounts of oil with a rag (above right) or brush. After an hour, wipe off the excess oil (right). Repeat the oiling once for the interior, twice for the exterior.*

Doug Stowe, author of Taunton's Complete Illustrated Guide to Box Making *(The Taunton Press, 2005), works in Eureka Springs, Ark.*

Photos, this page (bottom three): Tom Begnal

Shellac gives you a few options

BY DAVE SHAW

Some years ago I used nitrocellulose lacquer on my boxes, but I could only spray that stuff outside. Worse, bugs would land in it, leaving interesting trails across the surface. I still use lacquer occasionally, but I've switched mainly to dewaxed shellac, whether I want something nearly invisible or a high-gloss French polish.

Begin by mixing fresh shellac to a 2-lb. cut. While the flakes dissolve, take the time to make the pieces of the box as flawless as possible. Steam out any dents. Scrape and sand the outside to CAMI 220-grit to remove all remaining blemishes. Also sand the pieces for interior dividers or trays to 220-grit.

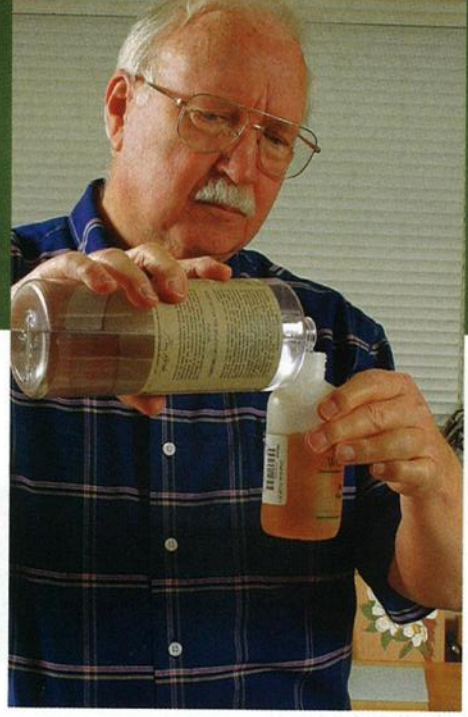
When I'm ready to finish, I dilute the shellac to about a ½-lb. cut. Exact proportions aren't critical, for this is a very forgiving finish.

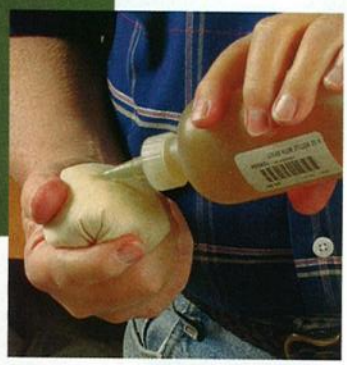
I get better, more uniform results if I apply the shellac before I glue up the box. Blue painter's tape keeps shellac out of areas to be glued. Use a pad to put a few thin layers of shellac on each piece. (Use a lint-free rag or paper towel to apply shellac to small pieces or to work it into grooves.) If I'm coloring the wood, I'll stop here to apply a dye. The shellac controls blotching. If not, the shellac dries in minutes, so you can pad on more coats almost immediately until you have the sheen you want. Stop when the wood begins to look shiny or when it stops changing color. Let the shellac dry and then finish-sand with CAMI 600-grit paper or, better, a gray abrasive pad.

For a very hard, clear finish, use shellac as a thin seal coat under spray lacquer. I've had good results with water-based lacquer and aerosols such as Behlen's Master Jet Spray Lacquer. Let the lacquered pieces cure for a week, then begin rubbing out the finish. If the sandpaper clogs too much, let the finish cure for another week.

My boxes always get a coat or two of Clapham's lavender-scented beeswax polish at the end. It gives the wood a wonderful sheen and makes the shop smell good.

Dave Shaw makes boxes, bowls, and furniture in Tucson, Ariz.





Dilute the shellac. *Mix dewaxed pale blond shellac to a 2-lb. cut, then add more alcohol until the liquid is a pale yellow (left). Make a pad by wrapping lint-free cotton padding in muslin (above) and apply the shellac.*

Build it up as much as you like. *The first pass of shellac (above) will begin to pop the wood grain. Keep rubbing on finish until it has the depth and sheen you want. Dowels, later used in joinery, make convenient holders (left). Before assembling the box, go over each piece lightly with a gray abrasive pad.*

Photos, except where noted: David Heim; box photos: Michael Pekovich

Padded lining adds a final touch

BY EMILY PALM

Lining a box with fabric not only protects the items inside, but also greatly enhances the overall look of the piece. In my boxes, I line the bottom and removable trays with thin foam pieces wrapped in velvet, synthetic suede, or other luxurious fabrics. I also fit fabric around thicker foam to create holders for rings and other small pieces of jewelry.

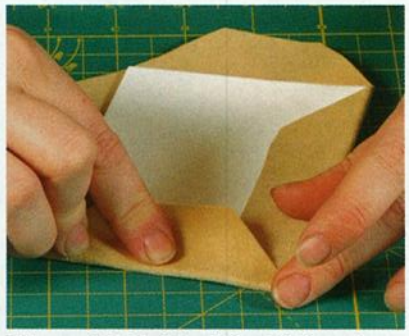
Choose the fabric with the same care you used to select the wood for the box. Because the color of wood can vary dramatically from board to board, what looked good next to, say, cocobolo last time might clash with it now. Keep in mind, too, that real suede will tarnish silver; synthetics make better lining fabrics.

I like to use Darice Foamies 2 mm foam sheets, available at craft and fabric stores. These sheets have one paper-backed adhesive side. You could use cardboard, but flexible foam is better. It makes the lining feel upholstered because it gives when you touch it.

Mark the foam sheets with the dimensions of the box or tray. Whenever possible, take measurements directly from the dividers fitted inside the box, rather than trying to measure interior dimensions of the box itself. Be sure to allow for the thickness of the fabric—as much as 1/16 in. per side for thicker velvets, as little as 1/64 in. per side for suede cloth.

Rich, protective lining. *Synthetic suede cloth feels like the real thing but won't tarnish silver.*

Cut the padding to size and glue on the fabric. *Fit the foam to the box and trays, leaving a slight gap to accommodate the fabric (above). Spray a light coat of adhesive on the back side of the fabric and on the side of the foam sheet that is not preglued (right). Palm puts paper towels and cardboard under the foam and fabric to catch overspray.*



Trim and fold. *Attach the fabric to the foam sheet, then miter the corners. Remove the backing from the foam sheet, then carefully fold over the excess fabric.*

Refine the fit. *As a final step, run a butter knife around the lining to smooth the edges in place.*

Tips for Finishing a Drawer

Getting great results where different parts and woods meet

BY JEFF JEWITT

When it comes to finishing, drawers seem to cause more problems than any other part of a project. Pitfalls include internal corners that either avoid finish or collect a puddle of it; the drawer's transition from the visible outside of the piece to the less-visible inside; and the need for the drawer to slide smoothly in a tight space. However, if you follow a series of logical steps, applying finish becomes straightforward.

Finish the drawer front first

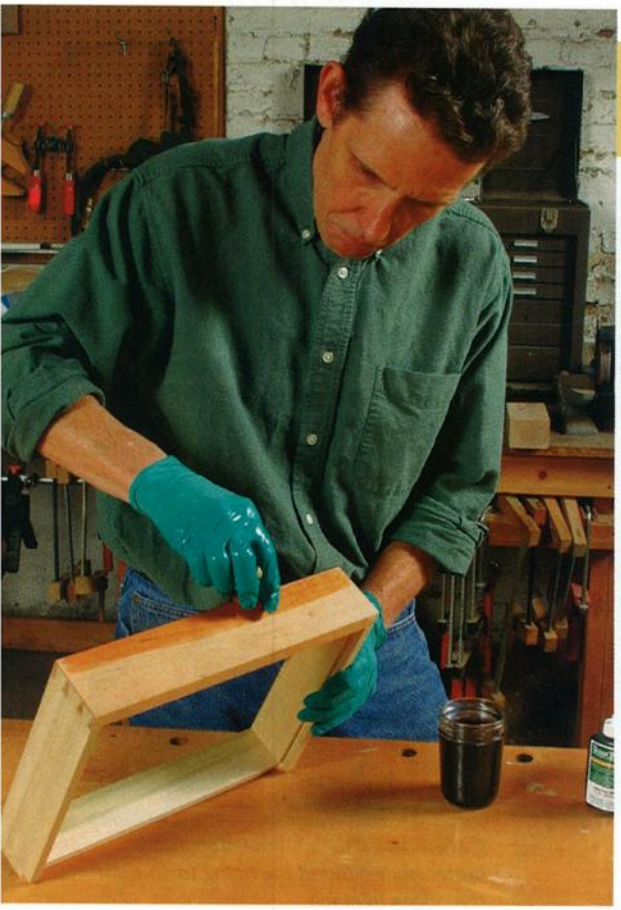
Most drawer fronts are made from a primary wood, with the sides, back, and bottom made from secondary woods. The stain (if applicable) and the clear coat on the drawer fronts should match the rest of the cabinet. The other parts of the drawer should get a minimal finish. This leads to the problem of how to make a clean transition, particularly if the sides are attached to the front with half-blind dovetails.

Staining? Isolate it—If the primary wood needs to be stained, do that before anything else. Apply stain first to the front and the top edge of the drawer front using a small piece of cotton cloth. For an even release of stain, dampen the cloth first with a liquid compatible with the dye's solvent, in this case water. Be careful to keep the stain from creeping onto the inside of the drawer front or the tops of the drawer sides.

The next step is to stain the dovetail pins on the drawer front. Don't run masking tape down the drawer sides and stain both the pins and the tails. This time-saving method looks awful. The best way is to use a #2 or #4 artist's brush (available at art-supply stores).

With a steady hand, apply the stain to the pins and the narrow strip at the front, staying just away from the tails. Avoid overloading the brush; this increases the risk of stain spilling over onto the secondary wood.

Applying the clear coat—If you are using a fast-drying finish such as shellac, lacquer, or waterborne finish, apply the finish to the drawer front with a brush



Selective staining

When staining the drawer front, apply the stain with a small piece of cloth (left). Then use an artist's brush to apply stain just to the dovetail pins and the thin strip of drawer front beside them.

Photos: Mark Schofield

or a pad. Using a small brush, apply the finish to the top edge of the drawer front and the thin strip in front of the pins. These may be visible when the drawer is closed.

If you prefer an oil-based finish, apply it in the same way, but you may have trouble isolating it to the pins because of oil's tendency to flow. If this happens, wipe or brush the finish along the whole side of the drawer. If you don't want a strong smell of finish inside the cabinet, wipe a sealer coat of shellac onto the drawer side when the oil-based finish has dried.

Never try to finish a drawer front with the pull attached. It is a recipe for runs. Instead, drill any necessary holes after the finish is applied, and attach the hardware. If you are turning a wooden knob, the easiest way to finish it is while it is still on the lathe.

A thin finish for the less-visible parts of the drawer

I like a minimalist approach to finishing the sides, back, and bottom of a drawer, particularly those used for clothes and linens where durability isn't an issue. I apply one coat of a 2-lb. cut of shellac, let it dry a couple of hours, and then lightly sand the surface with P600-grit sandpaper.

There are two ways to make this step easier. Finish the drawer bottom separately, as this avoids those difficult-to-finish, three-plane internal corners. And use a larger artist's wash brush with a very sharp, chiseled edge that is great for getting into corners without getting finish on an adjacent edge. If this is a kitchen drawer, apply several coats of a tough film finish such as lacquer or polyurethane to all of the interior surfaces. Last, apply paste wax to all the drawer surfaces, including the drawer front if appropriate, and buff them with a clean cloth. On the sliding surfaces left free of finish, rub a chunk of beeswax or a candle to keep friction to a minimum. □

Jeff Jewitt is the author of Taunton's Complete Illustrated Guide to Finishing *(The Taunton Press, 2005).*

Finish one section at a time

1. FINISH THE DRAWER FRONT AND PULL

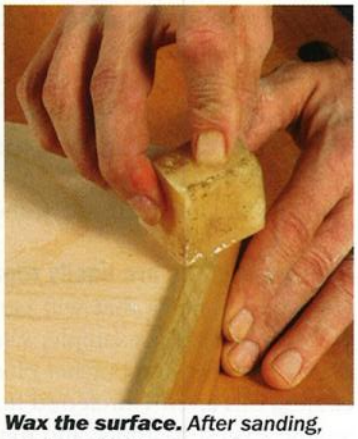
The face, top edge, and strip on the sides of the drawer front receive a finish (far left) that matches the rest of the piece of furniture. Pulls (left) should be finished before being attached to the drawer front.

2. SEAL THE REST OF THE DRAWER WITH SHELLAC

Inside the corners. *Use an artist's wash brush with a chiseled edge to get the right amount of finish into the corners. Avoid finishing the bottom of the drawer sides.*

Finish the bottom panel separately. *It is much easier to finish the bottom before it is inserted into the drawer because you don't have to contend with inside corners.*

3. APPLY TWO TYPES OF WAX



Wax the surface. *After sanding, apply and buff off a coat of paste wax for a smooth surface (left). Rub a block of beeswax or a candle on the bottom of the drawer sides for smooth sliding (above).*

Best Finishes for Foodware

It depends on how the piece will be used

BY MIKE MAHONEY

At college, my industrial arts professor cautioned me many times about the harmful finishes I was using for my wooden bowls. Specifically, he stressed that oil finishes with metallic driers were dangerous for food contact. Now that lead has been banned as a drier, studies have shown that almost all finishes are benign to humans: Ingesting fully cured finish is similar to eating a piece of plastic—the body won't digest it.

If safety is no longer an issue, how do you decide which finish to use? From the many finishes available, base your choices on durability, ease of application and repair, and the intended use of the piece.

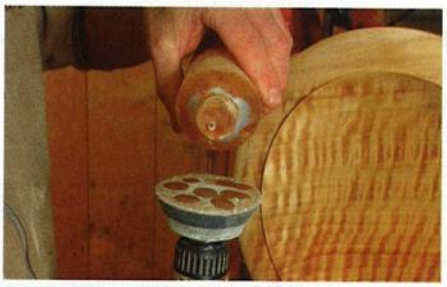
Penetrating oils are easily repaired

For wooden items that will get constant wear and tear (for example, salad bowls, plates, spatulas, and butcher blocks), penetrating oils are the preferred finish. They are the easiest to apply, and the ability to reapply them easily will keep your work looking great year after year.

With penetrating finishes in particular, you need to carefully sand away any tool

Expect wear and tear? Use oil

Pour on the oil. *Boiled linseed oil is a good penetrating oil. Flood the surface and use a disposable brush to ensure uniform coverage. After a few minutes, wipe off the excess.*



Sand in the oil. *Another way to apply oil is to place a few drops on a foam-backed sanding pad chucked into an electric drill (left), and then sand it into the wood with the workpiece slowly turning. This deepens the penetration and brings out any curl.*

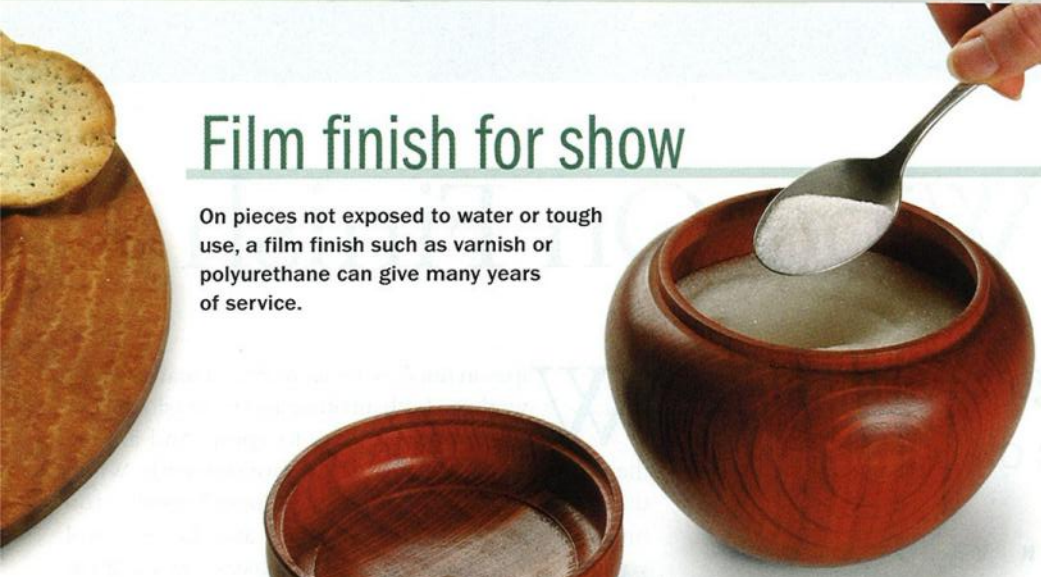
Use oil/varnish mixes sparingly. *If you apply too many coats, you'll build up a film, which is hard to repair.*

Renewable mineral oil. *Because it never forms a film, no matter how many coats you apply, mineral oil is easy to use. But it has to be renewed frequently.*

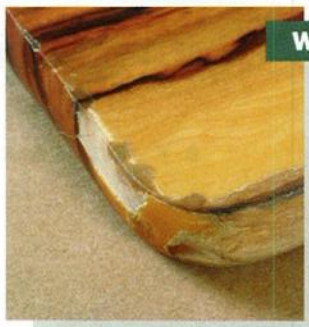
Photos: staff

Film finish for show

On pieces not exposed to water or tough use, a film finish such as varnish or polyurethane can give many years of service.



Dull the shine. *If you don't want the plastic look of a gloss film finish, rub out the final coat with 0000 steel wool.*



WARNING

Tough to repair. *Film finishes eventually will break down. Once water gets under them, they are almost impossible to repair.*

marks. Sand a turned piece on the lathe, in both directions if the lathe has a reversing switch. It also helps if you raise the grain with water and let the piece dry before a final sanding.

The two most popular oils are boiled linseed oil and tung oil. They are both curing oils and will slowly harden in the wood, reducing the need for reapplications. Boiled linseed oil is cheaper and more widely available, but it has a tendency to yellow the wood more than other oils. Pure tung oil gives a little more water protection but is harder to rub to an even sheen.

Oil/varnish blends such as Danish oil, if heavily diluted and thinly applied, are easy to apply and repair. Just don't apply so many coats that you build a film, as this will break down and be hard to repair.

Nut oils, such as walnut, macadamia, and almond, are more expensive and will cure more slowly and only partially. Mineral oil forms no film or sheen no matter how many coats are applied, but it requires more frequent renewal. Don't use olive or vegetable oils for finishing. They won't cure at all, and can go rancid under the wrong conditions.

Film finishes: Instant appeal but problems down the road

There's no denying the eye-catching shine of a film finish. But some topcoats, such as lacquer, shellac, and waxes, aren't tough enough for items that get regular use and occasional cleaning. These finishes may be fairly easy to repair, but eventually you'll tire of doing so.

The line on varnishes is more complicated. Items like spoons, rolling pins, or butcher blocks are rubbed, washed, knocked, cut on, and pounded in everyday use. A tough surface film would seem ideal. But when a varnish or polyurethane breaks down it is much harder to repair.

Still, these tough film finishes may be just fine for gently treated objects that contain dry goods, such as sugar bowls or lidded boxes for cookies.

Since oil/varnish finishes are very slow to dry, their odor can linger, sometimes for months. This is especially true on lidded containers. Instead of waiting for the odor to dissipate, you can leave the inside unfinished or finish it with quick-curing shellac.

A few tips for preserving woodenware

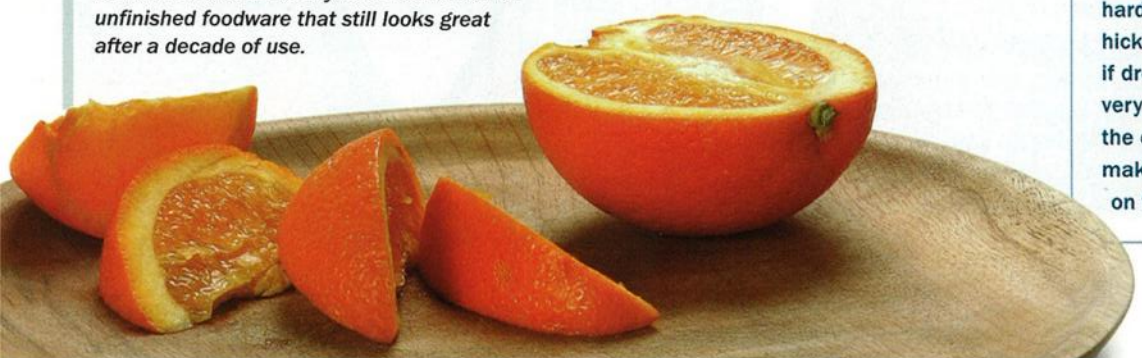
A third choice is to use no finish at all. The wooden plates in my kitchen have never had a finish. They are 12 years old and barely broken in yet. A closed-pored wood such as maple, cherry, or birch is best.

To help woodenware age gracefully, wash it gently by hand with mild dish soap but don't leave it in standing water. Also, keep it out of the microwave and the fridge. Some timbers, especially fruitwoods, are sensitive to cold and may crack. □

Mike Mahoney is a wood turner in Orem, Utah.

No finish at all

Natural wood. *Mahoney has a collection of unfinished foodware that still looks great after a decade of use.*



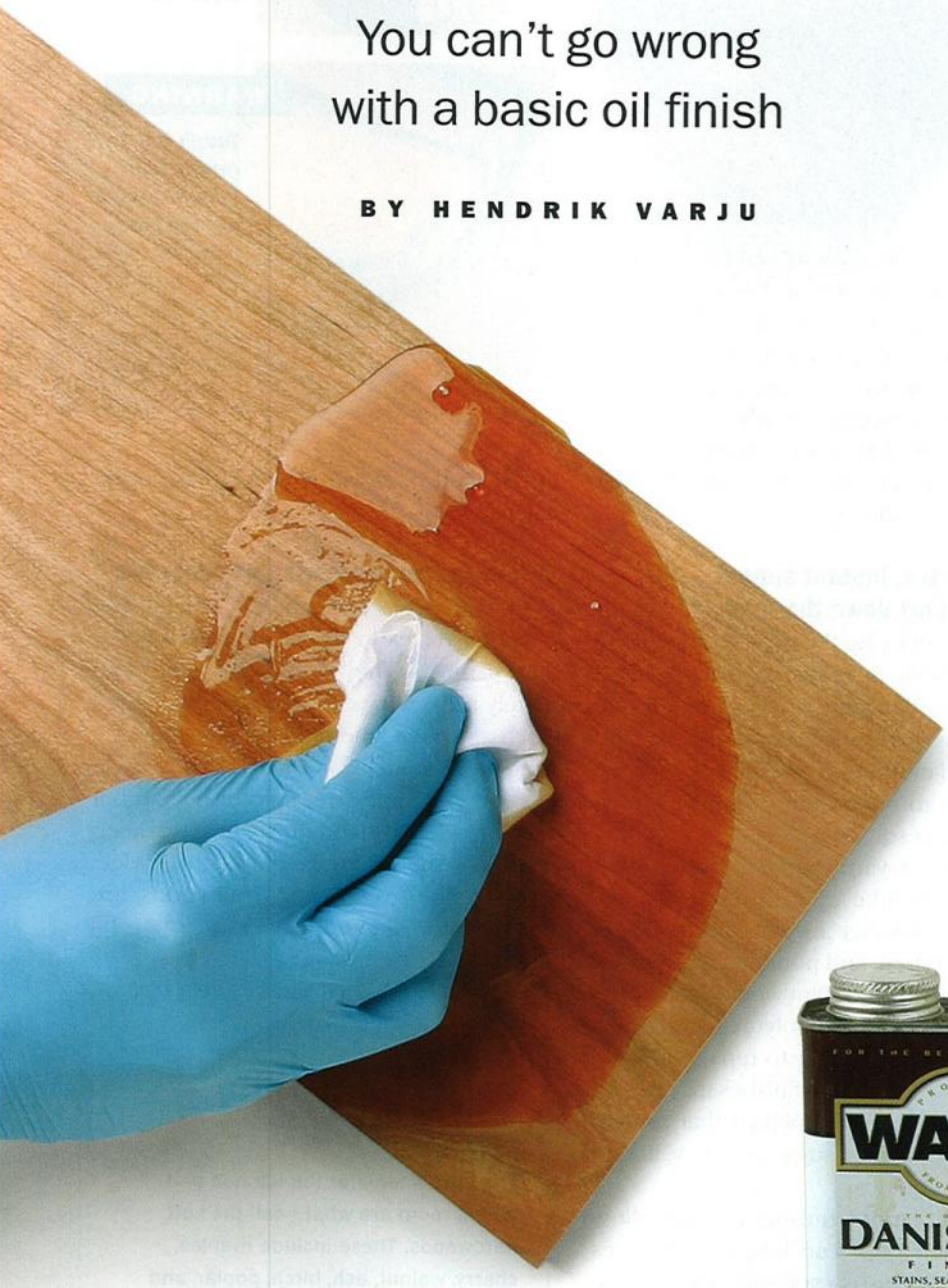
The best woods for foodware

The best woods for the kitchen and dining room are what I call the soft hardwoods. These include maples, cherry, walnut, ash, birch, poplar, and sycamore. These timbers are flexible and shock resistant. In contrast, the hard hardwoods such as locust, rosewoods, hickory, and Osage orange will shatter if dropped or knocked and won't last very long in the kitchen. White oak is the exception: Tough yet flexible, it makes excellent foodware. Red oak, on the other hand, is too porous.

Simple Wipe-On Finish

You can't go wrong with a basic oil finish

BY HENDRIK VARJU



Wipe-on finishes are a favorite of many woodworkers, both amateur and professional, because they are easy to apply. And among the very easiest to use are the oil/varnish blends. When using these finishes, the process doesn't involve too much more than the name implies, and the only tool you need is a clean cloth. That makes them a great choice for beginners and experts alike.

Mixture yields the best of both finishes

By itself, varnish is hard to apply (brush marks, sags, runs, and a magnet for dust) but offers enormous protection. Pure oil finish, on the other hand, is easy to apply (wiped on with a cloth, surplus wiped away, no dust problem) but offers minimal protection. Between these two extremes lies the oil/varnish mixes, made by combining linseed or tung oil with varnish.

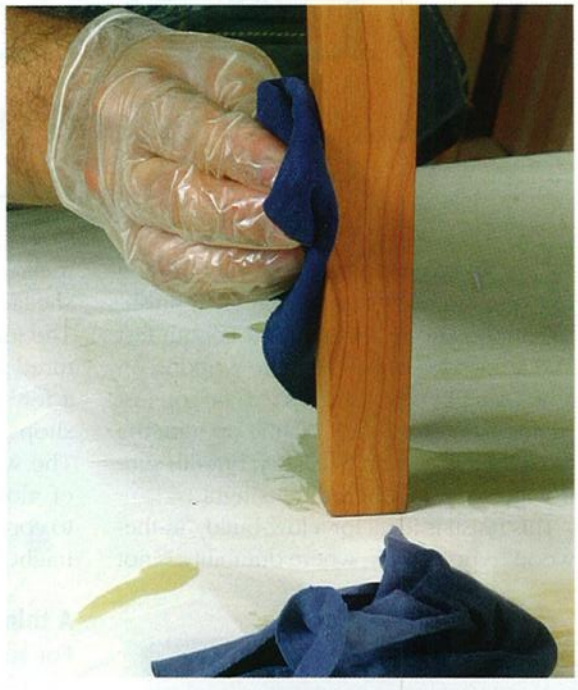
The resulting product is dead simple to apply but gives more protection than oil alone. The finish isn't technically a film finish or a penetrating finish; it's a hybrid that you might call "semi-film forming." It is moderately resistant to water, heat, and chemicals, and it offers some protection from wear and scratches. But the best part is that it's easy to repair and it keeps the wood looking natural. For a piece of fine furniture that won't be heavily used, you can't beat it.

A PERFECT COMBINATION

Many oil finishes are actually oil/varnish mixes. They are popular because they are easy to apply, so almost every hardware store will stock one or two brands. Three or four coats build a thin film, giving the wood a low-luster finish that is easy to repair and offers moderate protection.

Photos: Mark Schofield

Application is easy: Just wipe on, then wipe off



Don't be stingy. *Apply an oil/varnish blend liberally and allow it to soak into the wood (left). You can use a small paintbrush to get finish into tight spots. Once the finish soaks in, use a clean cloth to wipe off any surplus; otherwise, you will end up with a thick, sticky mess.*

Simple steps to low-luster beauty

Apply the blend generously and wipe it around with a cloth, a cheap brush, or a roller. Particularly with the first coat, you can apply more finish after 10 minutes or so if the wood has absorbed the first lot. An oil/varnish blend has a long open time, so it's easy to remove sags and runs. If you miss a spot, you can still apply more an hour later and it won't show a mark.

After the finish soaks in, but before it becomes tacky, wipe off the excess with a cloth, going with the grain. If you don't remove the surplus, it will stay sticky for many days and will dry with a wrinkled surface. Let each coat dry for 24 hours or until it no longer feels oily. A tiny bit of fine sanding with 600-grit paper helps make the surface smoother just before the final coat.

The final coat has an attractive hand-rubbed look and rarely needs to be rubbed to an even sheen. A coat of paste wax gives the surface a smooth feel.

Remember the spontaneous combustion risk with all oil finishes. Unwrap the finishing pad when you're done, leaving it flat or hanging it outside to dry. □

Hendrik Varju is a fine furniture designer/craftsman who operates Passion for Wood near Acton, Ont., Canada.

TIP

KICK UP YOUR FINISH WITH VARNISH

If your commercial oil/varnish blend is too thin, mix in some brushing varnish (like polyurethane) in a 3:1 ratio to add protection.

Done in a Day

Luster of oil and sheen of shellac—in a day or less

BY JEFF JEWITT

I've had to learn to do quick finishing jobs and make fast fixes in my refinishing business. This method is both fast and attractive, whether you're working on a holiday gift on Christmas Eve or you just prefer no-fuss finishes. I came up with the technique based on necessity, but I'm sure it will save you when time is tight.

This finish is ideal for a low-build, "in-the-wood" type of look, where durability is not the key factor. However, you can build the shellac to increase the level of protection. The ingredients—boiled linseed oil, denatured alcohol, a can of amber shellac, and a few rags—can be found in most woodshops or at the nearest hardware store. The wipe-on technique avoids the hassle of most oil finishes, which can take days to complete. In fact, it works so well that it might become your favorite finish.

A thin coat of oil lays the foundation

For surface preparation, scrape, plane, or sand the wood with the grain to P220-grit. Wipe with naphtha or denatured alcohol to remove dust, dirt, and sanding debris. The solvent will highlight potential problems like glue spots and scratches.

Applying boiled linseed oil is the first step in French polishing, a more tedious and time-consuming technique from which this finish is derived. In fact, you could call this a "down and dirty" French polish.

I'm a big fan of boiled linseed oil for this step, because it contains driers that cause it to cure faster than tung oil. Pour a small amount onto a small cotton cloth. Apply just enough oil to make the wood appear "wetted," which is about a teaspoon per square foot depending on wood species. Don't use the "flood on, let sit, then wipe" method. If you do, the oil will seep from figured areas through the thin shellac that is applied in the next step.

Remove excess oil with a clean rag, then lightly buff the surface with a gray synthetic abrasive pad such as 3M Scotch-Brite or Mirka Mirlon. The pad will pick

THREE QUICK STEPS

Oil, shellac, and wax are easy to find and just as easy to apply using this simple, three-step process. Don't be surprised if this fast finish becomes one of your favorites.

Photo (this page): Michael Pekovich

up residual oil and will smooth the wood surface further.

Pad on shellac right away

Normally, you would let the oil cure for 24 to 48 hours. You can wait, but if you go directly to the shellac application, it will speed things up and the oil will provide a bit of lubrication for the shellac. The thin coat of oil cures fine below the shellac.

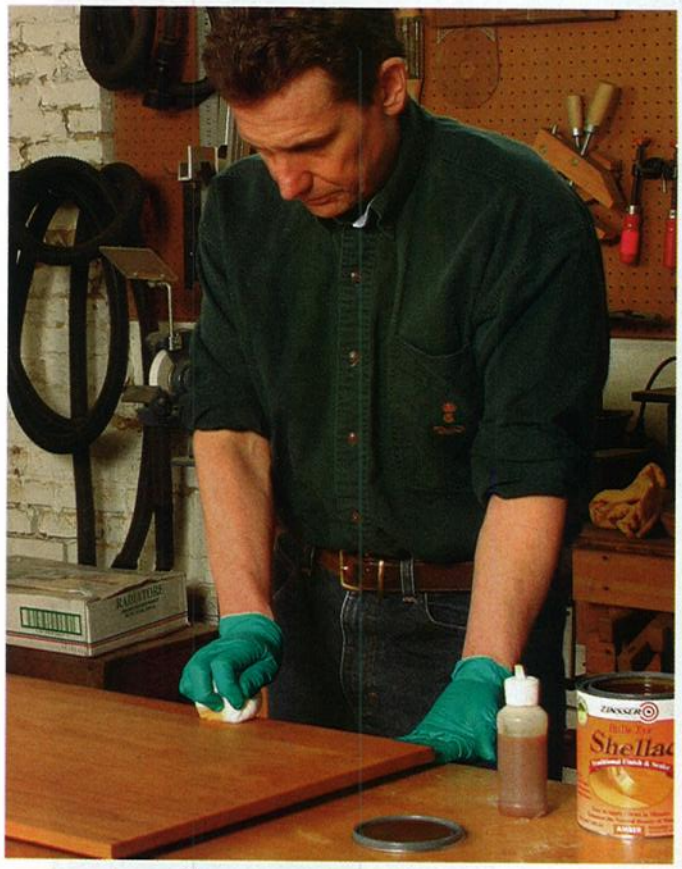
Plain, orange, waxy shellac (sold in a can as amber shellac) works well and is easy to find. The brand I use comes in a 3-lb. cut (3 lb. of shellac flakes to 1 gal. of alcohol) that I dilute by mixing 2 parts denatured alcohol with 5 parts shellac. Put the mixture in a squeeze bottle with a dispensing spout.

I use a padding cloth to wipe on the shellac. It should be as absorbent, clean, and lint-free as possible. Old, clean T-shirts work fine. Cotton is preferred, because polyester does not hold or absorb liquids as well. Wad up the cloth so that the

BEGIN WITH A LIGHT COAT OF LINSEED OIL

Because this finish does not provide time for the oil to dry, compensate by using a whisper-thin coat. Use just enough to bring out the beauty of the wood. Immediately remove any residual oil with a clean, lint-free cloth (left). A good rubdown with a synthetic pad (below) will smooth the surface and add a nice sheen.

Photos, except where noted: Tom Goffe



WIPE ON SHELLAC

Thin the shellac you'll use by mixing 5 parts shellac with 2 parts denatured alcohol. This thinner shellac is easier to apply, especially on small or intricate surfaces. Wipe it on thinly with a cloth pad, starting with flat surfaces (above) and then working the sides and edges (right). Use 600-grit sandpaper to smooth out application marks or remove debris (facing page).

bottom part is as smooth and free of wrinkles as possible. Make the pad a manageable size. Large pads are great for big, flat surfaces but don't work for smaller and more intricate projects.

Dispense about 2 oz. of denatured alcohol into the pad and compress the pad with your hand several times to work the solvent through it. Then squeeze the pad to remove excess solvent. Pour about 1 oz. of shellac solution onto the pad bottom.

Padding shellac simply means wiping it on thinly with this cloth pad. It is best to practice on a flat surface to get a feel for applying it smoothly and evenly.

Finishing different surfaces requires an assortment of techniques

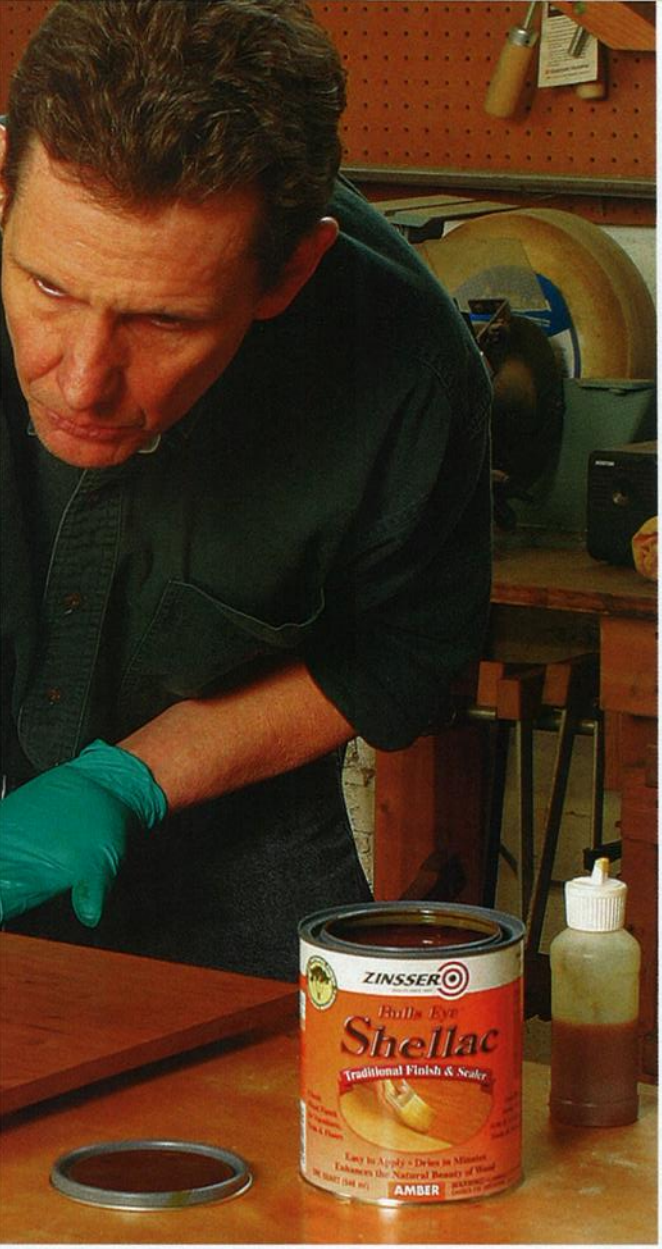
For flat surfaces, bring the pad down lightly near one edge and drag it across the top and off the opposite edge, like an airplane landing and then taking off again. Come in from the other side and repeat the stroke. Continue down the board in alternating stripes, with the grain. When you reach the bottom, start again at the top. Shellac dries quickly enough for you to repeat the sequence rapidly. Work the sides and edges in a similar fashion. As the pad starts to dry out, reload it with shellac.

For complex surfaces such as furniture interiors, tight corners, or other challenging areas, you'll need to modify things a bit. Start with the pad anywhere that's convenient and move it toward corners, right angles, and such. Always keep the pad moving. When you recharge, don't put too much shellac in the pad or you'll pool it. Bring the pad down on the surface and immediately begin to move it using just the pressure of your fingers or the weight of your arm.

To finish routed or other three-dimensional surfaces, wad up the cloth and compress it into the profile of the edge. Use a small, well-wetted portion of the pad to get the shellac into small or tight areas. But again, don't get the pad too wet or you'll create problems.

It probably took you longer to read about the shellac application than it will to actually do it. For a medium-size project like a small cabinet or table, I spend only about 30 minutes with the shellac. Smaller projects are a little harder, because you risk returning to an area before it dries, and dragging the gummy shellac. Move the pad more slowly, or try using a smaller pad.

You may encounter streaks or fibers in the sticky shellac. Any application marks

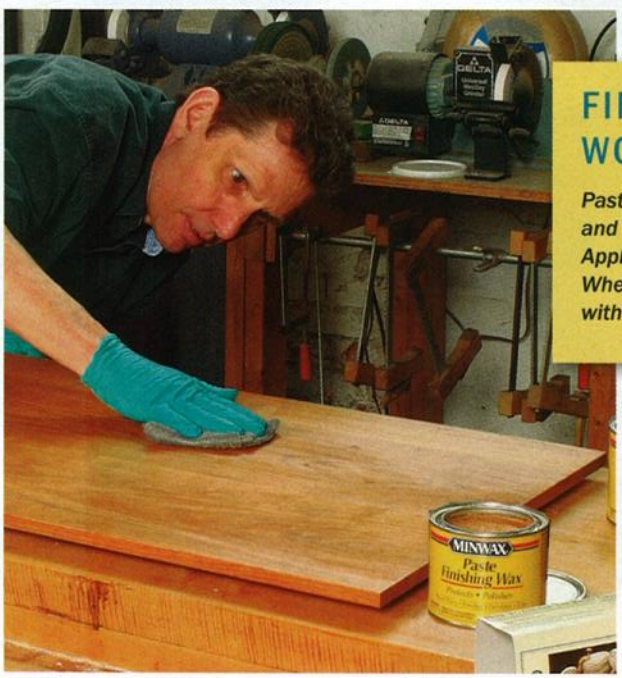


or debris can be rubbed out with some 600-grit (CAMI grade) sandpaper followed by 0000 steel wool after the shellac has cured for about eight hours. Because there are no "coats" of finish in the conventional sense, just keep applying the finish to achieve the look you want.

Applying the final touch

Near the end of the process, if you use all the shellac in the pad and keep rubbing with the dry pad, it will burnish the surface and give it a nice soft glow. For a lower luster and extra protection, wait a day and then apply some paste wax with 0000 steel wool. Buff the wax with a soft cloth. □

Jeff Jewitt is a professional finisher and author of Taunton's Complete Illustrated Guide to Finishing *(The Taunton Press, 2005).*



FINISH WITH STEEL WOOL AND WAX

Paste wax adds a more even sheen and a nice feel to your project. Apply it with 0000 steel wool. When the wax appears hazy, buff it with a soft, clean cloth.

Clearest of the Clear

Three finishes that won't add a yellow tint to white woods

BY PETER GEDRYS

The yellow or amber cast of most "clear" finishes often enhances the final appearance of a finished piece. However, sometimes you want a clear coat to be just that, as clear as possible with minimal alteration to the color of the project. You may want to preserve the just-planed look of maple or pine, or to keep the distinctive appearance of wood that has been bleached or pickled. If you have found the perfect blue for a built-in bookcase, you don't want a coat of varnish with a typical yellow cast reminding you that blue plus yellow equals green.

The earliest demand for very clear topcoats came from artists who didn't want their works viewed through a yellow film. They used clear resins such as mastic and sandarac dissolved in alcohol. Modern chemists have greatly improved and expanded the choices. The three I've selected for their clarity are water-based finishes, clear shellac, and a solvent-based lacquer. Each has pros and cons, but the first question to consider is the degree of protection you expect. Does the finish have to resist heat and abrasion? Will it get physical abuse or is it purely decorative? Think about your finishing skills and the tools available to you—all three finishes can be sprayed, but the shellac and lacquer should be sprayed in an explosion-proof booth.

Peter Gedrys is a professional finisher and restorer who lives in East Haddam, Conn.

An oil-based, yellowing finish would have ruined the look of this bleached ash tabletop.

Water-based finishes are very clear

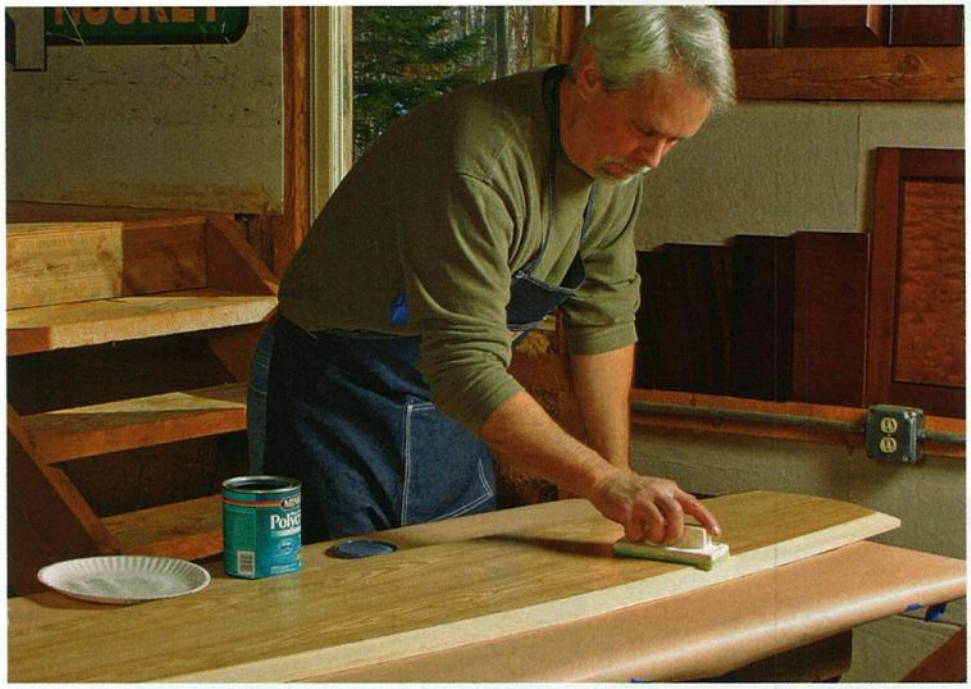
An oddity a generation ago, water-based finishes are widely available today. Spurred by environmental laws, most major coatings manufacturers now offer some type of water-based finish, and some specialize in them. But amateur woodworkers have been slow to accept these finishes. One reason is their complete lack of color; many woodworkers are used to the finish warming the wood's appearance. The application of water-based finish also requires a slight change in technique from the methods used to brush on oil-based finishes. However, if you want a totally clear finish, it is worth learning how to apply a water-based coating.

Just like solvent-based finishes, some water-based finishes are designed to be brushed, others to be sprayed. Make sure you have the right kind. There is no substitute for reading the directions. You can apply a water-based finish with a good synthetic-bristle brush (natural bristles absorb the water and go limp), a disposable foam brush, or my choice for large surfaces, a paint pad. The secret is to lay down an even coat of finish straight off the applicator; do not go back and rework the surface. Water-based finishes start to get tacky far more quickly than oil-based ones, and if you try to rebrush them, your learning curve will get very steep.

A technique that works well with pads is to pour some finish onto a paper or plastic plate and charge the pad by dipping it in the finish. Then, lightly touch it on another plate lined with a couple of paper towels. As the towels become saturated, just lay the pad on this second plate to recharge it. Practice your technique on scrap before tackling your project.

Don't be put off by the milky, bluish cast when you first apply these products. They will become clear as they dry. As with any finish, thin coats are best. Lightly sand between coats with P220- or P320-grit paper and remove the dust. Never use steel wool between coats, because the minute fibers left behind will rust, and the only way to fix that is to sand the surface and start over.

A family of finishes. *Types of water-based finishes include acrylic, polyurethane, varnish, and shellac. Among the clearest of finishes, they can be sprayed or applied with paint pads, foam brushes, or brushes with artificial bristles. Advantages include fast drying time, minimal odor, and easy cleanup with water.*



Padding wide areas. *A paint pad works well when applying a water-based finish to a large area. Charge the pad on a plate containing the finish, and then remove the excess by touching it on another plate lined with paper towels.*

A choice of brushes. *When applying a water-based finish to narrow surfaces, use either a foam brush or an artist's brush with man-made bristles.*

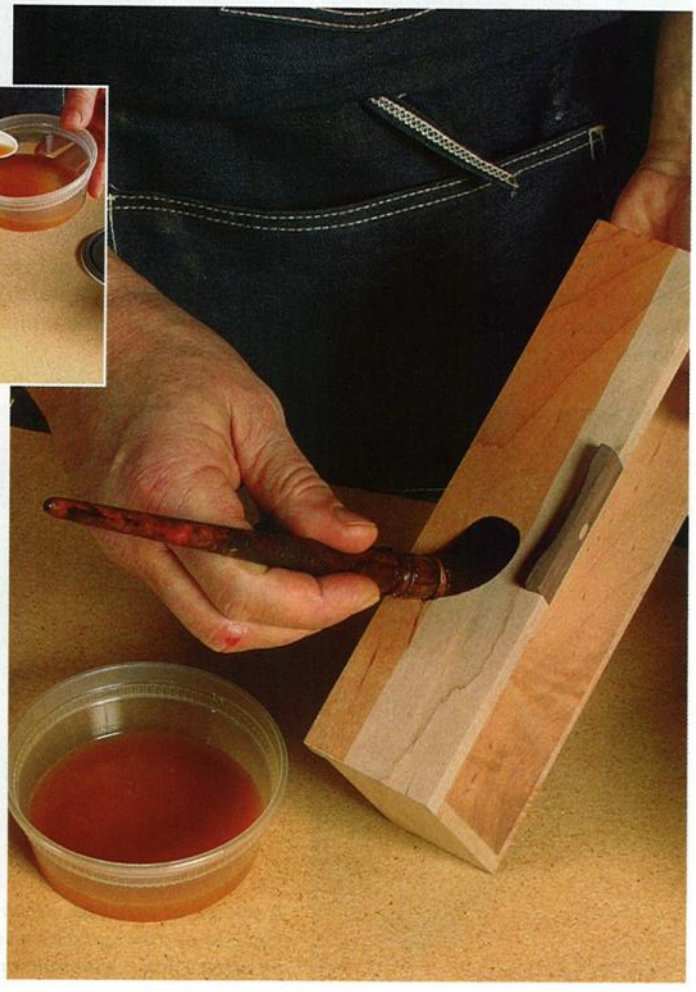
Shellac is easy to apply

Clear but not the clearest. *Clear or blond shellac, which is actually pale yellow in color, will have a minimal impact on the color of the wood if only a thin coating is applied. Shellac can be applied with fine-haired brushes dedicated to this type of finish, or padded on with a French-polishing rubber.*

To achieve its pale yellow color (not the water-white of water-based finishes), clear shellac is bleached rigorously. This robs it of some of its natural hardness, but it makes a fine finish for objects not subject to heavy use.

Shellac can be sprayed, padded, or brushed. Most woodworkers find it easier to apply shellac by brush or pad than they do water-based finishes. With all three methods you'll probably need to thin the shellac. Zinsser's clear shellac comes as a 3-lb. cut (3 lb. of shellac flakes to 1 gal. of alcohol). To get a brushing consistency, thin it by mixing four parts of shellac to three parts of denatured alcohol. After you've used shellac for a while, you'll find that you develop a feel for this by observing the viscosity of the liquid. Just keep in mind that two thin coats generally are better than one thick coat.

Always thin it. *The ideal brushing consistency for shellac is about a 1½-lb. cut. If you are using Zinsser's clear shellac, dilute it with denatured alcohol in a separate container.*



A dedicated brush. *You can use a variety of brushes to apply shellac, either flat or round, natural or artificial bristles, but you should use them for shellac only.*

For large surfaces, a flat brush with very fine synthetic bristles such as Taklon works nicely. However, on smaller or shaped pieces, nothing beats a good round mop brush. They can be obtained in a variety of bristle types, sizes, and price ranges. I have a squirrel-hair mop that I've used for years. The unique quality of these brushes, besides laying down a very precise coat, is their memory; I rinse the brush in alcohol and shape the bristles into whatever shape I'm working on. If the project is mostly flat, I'll simply flatten the bristles out and let them dry. If I'm using the brush for moldings and such, I'll shape it into a point.

You can use the same brush for different grades of shellac, but don't use it for other types of finish. You don't have to clean a dedicated shellac brush after use; simply let the brush harden. The next time you need it, place the brush in alcohol for a few minutes and you're ready to go.

To apply a thin coat of shellac just to seal the wood, use a French-polishing pad made of a cheesecloth core wrapped in a piece of thin fabric such as linen, muslin, or a well-worn cotton sheet. To charge the pad, open it and apply a bit of finish to the cheesecloth. The shellac will cover the wood quickly and will leave no sags or runs.

Pad on a seal coat. *If you just want to seal the wood, use a French-polishing pad to apply a thin coat with no risk of drips or runs.*

Photos, except where noted: Mark Schofield; opening page and product shots: Justin Miller

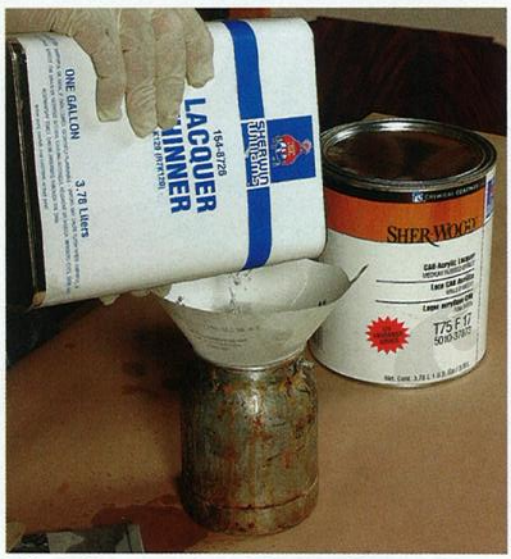
Lacquer is durable

Lacquer became popular in the first quarter of the 20th century because it embodied the same fast-drying properties as shellac yet was less susceptible to damage from heat and alcohol. Over the years, chemists have come up with a variety of lacquers. The most common brushing lacquer is nitrocellulose, but like super-blond shellac, the clearest still have a pale-yellow cast, and they get yellower as they age. To get a truly water-white finish, you need to use a cellulose acetate butyrate (CAB) lacquer. Also sold as CAB acrylic lacquers, they must be sprayed.

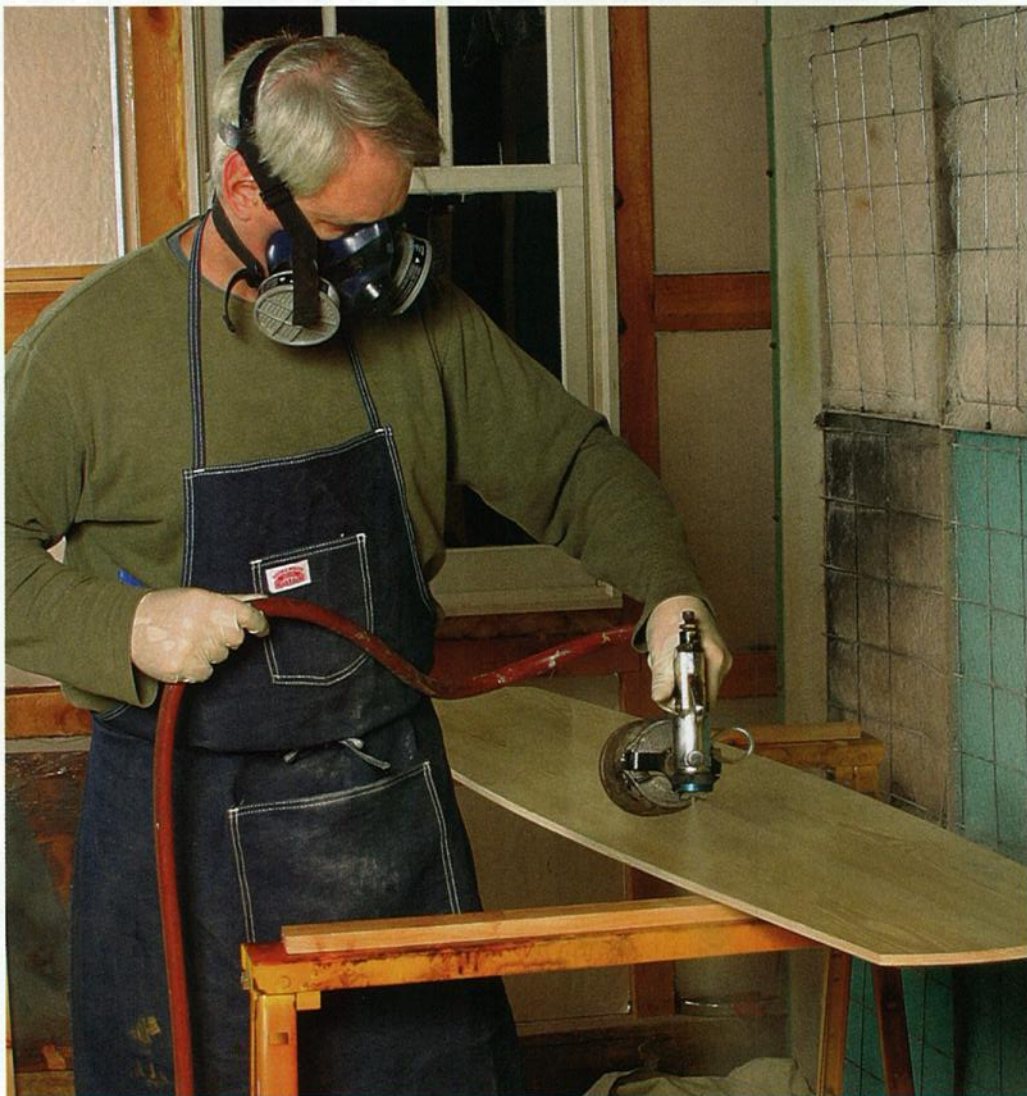
Good ventilation is a must when using lacquer. Its extreme flammability requires it to be sprayed in an explosion-proof booth. If you're not set up to spray lacquer, there are a variety of aerosols available. While they won't produce the same quality of finish as a commercial lacquer, they can be used successfully on small projects. Use a light touch when applying them.

Despite these drawbacks, nothing beats sprayed lacquer for a clear finish on a surface subject to wear and tear.

Lacquer can be brushed or sprayed. *Most brushing lacquers are nitrocellulose and have a slight yellow cast that increases with age. The clearest lacquer, CAB acrylic, must be sprayed. Aerosol versions are fine for small projects.*

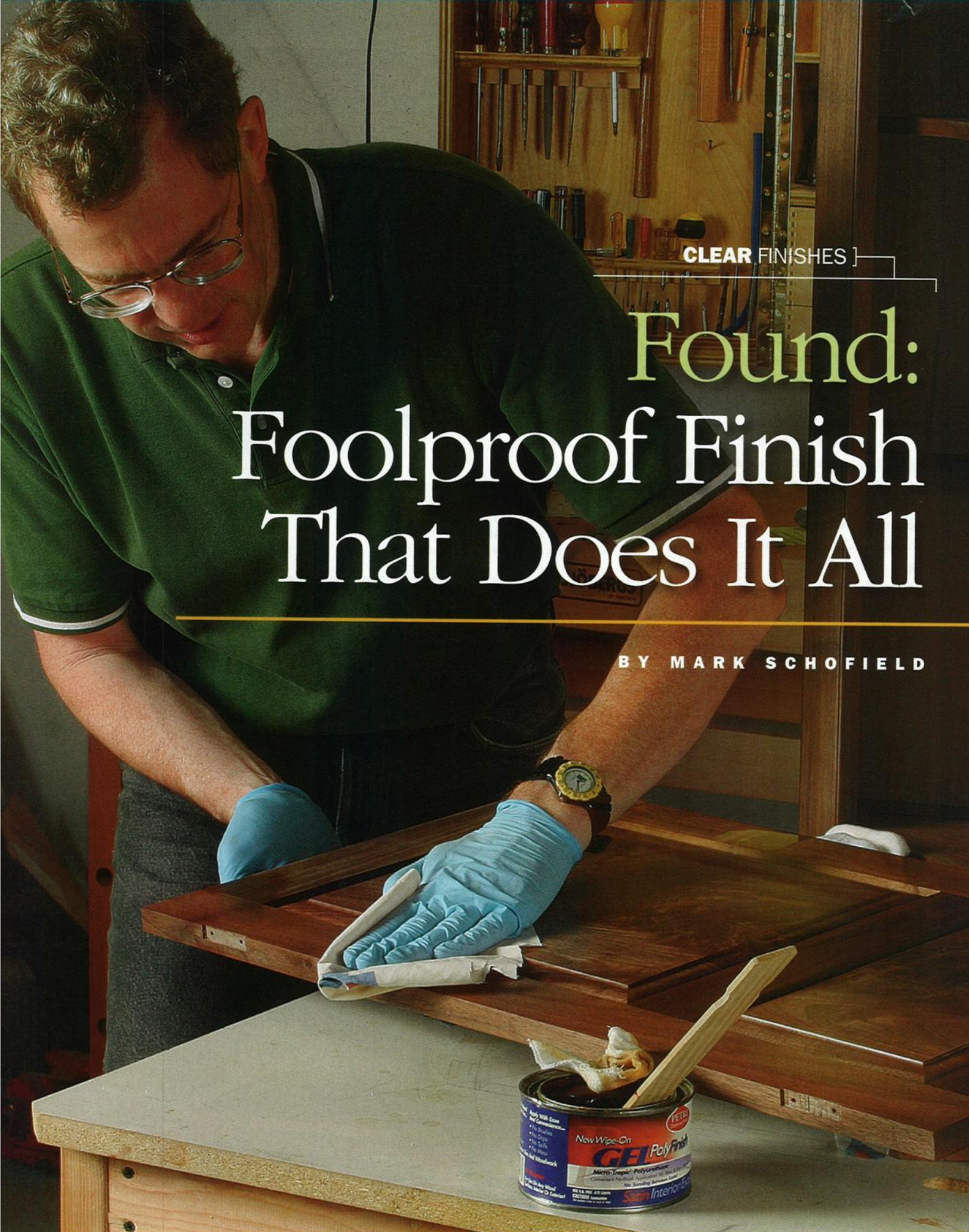


Thin before spraying. *It is a good idea to thin most finishes before spraying the first coat so that it flows more easily onto the wood. CAB acrylic lacquer must be sprayed, but it provides a tough, non-yellowing clear coat suitable for tabletops or kitchen cabinets.*



Found: Foolproof Finish That Does It All

BY MARK SCHOFIELD



When I joined *Fine Woodworking* in the summer of 2000, I was made responsible for the finishing articles. The editor made it seem like an honor, but in truth I don't think any of my colleagues wanted the job. Like most woodworkers, they'd rather cut wood than finish it. But today, after hundreds of hours watching finishing experts such as Peter Gedrys, Jeff Jewitt, Teri Masaschi, and Chris Minick work their magic, I have a confession to make. I like finishing.

I haven't completely bought in, however. While I'll attempt a perfect French polish, I can still relate to my fellow woodworkers who above all want a finish they can't mess up.

To meet this need, I have developed what I call the "*Fine Woodworking* foolproof finish." You first seal the wood with shellac, then wipe on three or more coats of gel varnish, and complete the finish with a coat of paste wax. You get a medium-luster finish that can be built up to give varying degrees of protection. I'll also show you how to beef up the protection by adding several coats of brushed-on liquid polyurethane for a durable tabletop finish. In both cases, I promise you'll be proud of the results.

It all begins with careful preparation

I've lost track of how many projects I've seen (including one or two of my own early efforts) that prominently display the telltale tracks of jointer or planer knives. Like most finishes, this one doesn't hide poor preparation; it magnifies it. So the first task is to prep the wood's surface.

If you have mastered the bench plane and/or the scraper, you can remove machine marks fairly quickly. Then use a random-orbit sander with P180-grit sandpaper followed by P220-grit paper, and finally hand-sand with the grain using P220-grit paper wrapped around a sanding block. Remove the dust with a vacuum or compressed air. If you don't handplane, start power sanding with P100-grit, move to P150-grit, and then follow the steps above.

Simple to apply, the basic version works for almost everything, and you can build it up for tabletops

The second step is to create a sample board on scraps from the project. After making this cabinet, I could tell after wiping the bare wood with denatured alcohol that the walnut crotch used for the panels would appear darker under a finish than the walnut used for the rest of the project. I did the full finishing sequence on samples of both woods and found that a dark wax would bring the plain walnut close enough in color to the crotchwood (which gets clear wax).

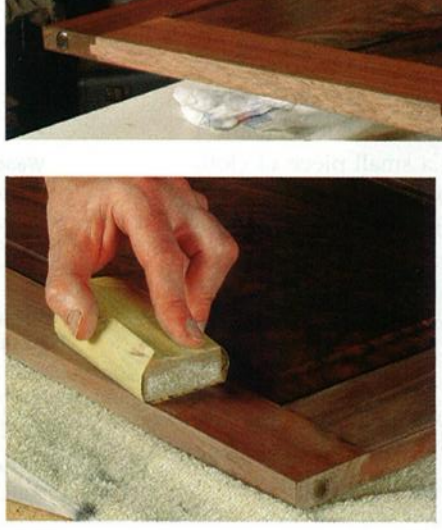
Seal with shellac, then apply gel varnish

If your project includes a floating panel, it is always a good idea to finish it before inserting it into the frame. In this way you won't see a strip of unfinished wood when seasonal changes cause the panel to shrink. I also finish the inside edges of the frame

Basic version

STEP 1: WIPE ON SHELLAC

Dip and squeeze. *Fold up a small piece of clean cotton cloth and dip it into a can of dewaxed shellac. Squeeze out the surplus so that it doesn't drip.*

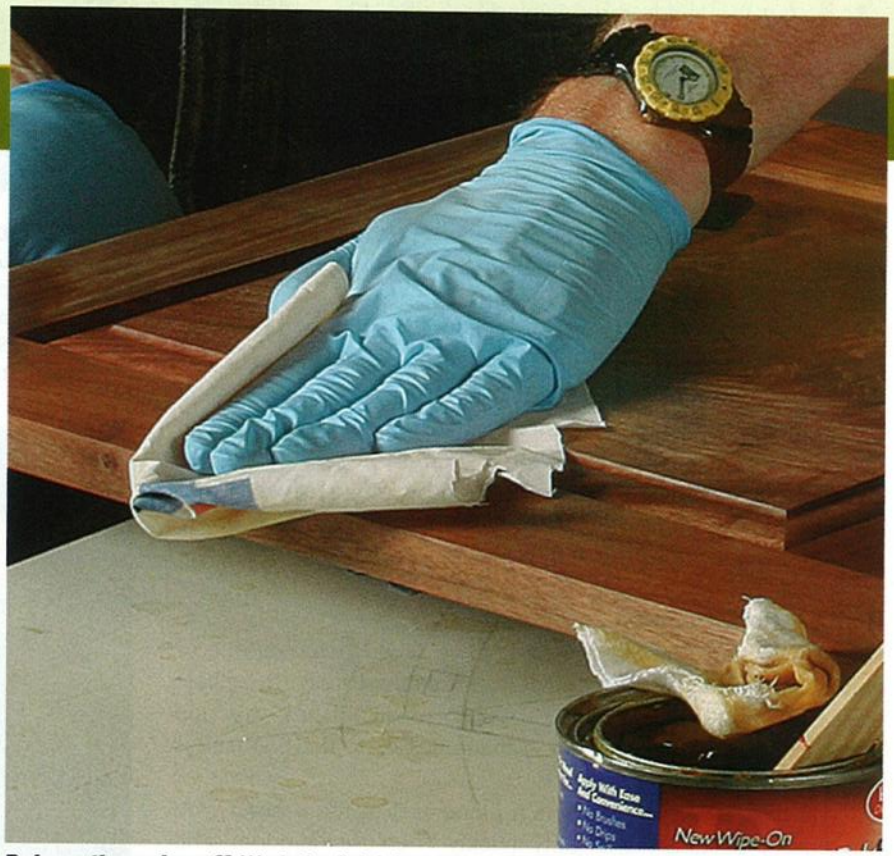


Seal the surface. *Wipe the cloth over the surface no more than a couple of times to leave a thin film of shellac on the wood (above). After it dries, use P320-grit sandpaper wrapped around a sanding block to smooth the surface (left). Remove the dust with a vacuum or compressed air.*

Photos, except where noted: Michael Pekovich

STEP 2: WIPE ON VARNISH

Use gel varnish. *The easiest way to control how much gel varnish goes onto the cloth is to place it on with a stirring stick.*



Rub on, then wipe off. *Work the finish into the wood using small, circular movements, then wipe with the grain to remove any thicker deposits (left). Don't try to cover too large an area or the gel varnish will become tacky before you can buff it. Use a clean cotton cloth to wipe away the surplus (above), turning the cloth frequently to keep exposing a clean surface.*

components with shellac and gel varnish before assembling them. This is much easier than trying to finish the narrow strip of frame and not get finish on the panel.

I've found that giving bare wood a single coat of dewaxed shellac has a number of benefits. On blotch-prone woods like cherry or pine, shellac helps prevent the uneven shading you can get from applying gel varnish to bare wood. On dyed wood, the shellac prevents pulling away some color when you rub on the gel varnish. And finally, sealing the wood with shellac and then sanding it gives a smoother base than bare wood for the gel varnish. Use a dewaxed shellac, like Zinsser's SealCoat. It comes as a 2-lb. cut, and I apply it as is, by dipping a small piece of cloth in the can, gently squeezing out the surplus, and then wiping the wood with the cloth. A couple of strokes over each area is usually sufficient. Let the shellac dry for about 30 minutes, and then lightly hand-sand the surface with the grain using P320-grit sandpaper. Vacuum or blow the dust out of the pores.

A gel varnish (also known as gel polyurethane or gel topcoat) has much the same resin, oil, and mineral spirits as a liquid clear finish, plus a thickening agent. This makes it much easier and less messy to wipe on. And because the product is designed to be wiped, it needs no thinning. Best of all, each layer dries too quickly to attract dust, so there is no need to sand between coats.

To apply, you simply dip a cloth into the gel, work it into the wood, and remove the surplus with a clean cloth. There are a few tricks to getting the best results. First, don't apply too much gel or work on too large an area at once. The varnish gets tacky in minutes and becomes progressively harder to remove. If you find yourself trying to wipe away gel the consistency of lard, simply dampen a cloth with mineral spirits, wipe away the gel, let the surface dry, and then apply the finish again.

Start with an area of about 2 sq. ft. You can increase the area if you find you are having no trouble removing the surplus. I rub the gel well into the wood. After you first wipe off the surplus, small wood pores appear filled; but as the gel cures, it sinks down to line the inside of the pores, leaving an open-grain look.

When removing the surplus gel, keep re-folding the cloth so that you don't smear the finish. The final rubdown should be with the grain. You can let the

Sources of Supply

Woodworker's Supply
woodworker.com
Zinsser SealCoat, gel finishes by Bartley and General Finishes, and colored waxes by Briwax, J.E. Moser, Liberon, and Fiddes

Highland Woodworking
highlandwoodworking.com
Zinsser SealCoat, gel finishes by Petri and Bartley, and Sheradale brown wax

Antiquax
antiquax.com
Antiquax brown wax

STEP 3: APPLY WAX

Colored wax can be used to subtly change the tone of a whole piece or to harmonize sections. I used a really dark brown wax on most of the walnut but a clear wax on the panels. Allow the wax to dry for 20 to 30 minutes and then buff the surface with a clean cloth.

finish cure overnight, but in reasonably warm and dry conditions you can apply two coats in a day. To avoid spontaneous combustion, always spread used finishing cloths outside to dry before throwing them away.

You should apply at least three coats to build an even luster. On a piece like a side table, where the top will get slightly heavier use, you can apply four or five coats. But don't try to build up a plastic-looking finish. In theory, you could wipe on enough coats to protect a kitchen tabletop, but liquid polyurethane would be quicker. By the way, all gel varnishes leave a satin finish.

Top it off with wax

After the last coat of gel has cured for at least three days, I give the workpiece a coat of paste wax. Peter Gedrys describes the numerous benefits of wax on pp. 34-39). Although gel varnish, applied and wiped off correctly, leaves a very smooth surface, it still has a slight grab to it when you touch it. Nothing beats the silky feel of a surface that has been waxed and buffed. Wax also gives some scratch protection, since objects are more likely to slide across the surface than to dig in and scratch it. And wax conceals any differences in sheen, though these should be minimal if you removed all the surplus gel.

Finally, dark wax left in corners and crevices emphasizes the three-dimensional aspects of the piece, and it can cover up minor blemishes in craftsmanship. You may never build the perfect piece, but at least it'll have the perfect finish.

Mark Schofield is the managing editor of Fine Woodworking.

APPLY CLEAR WAX THINLY

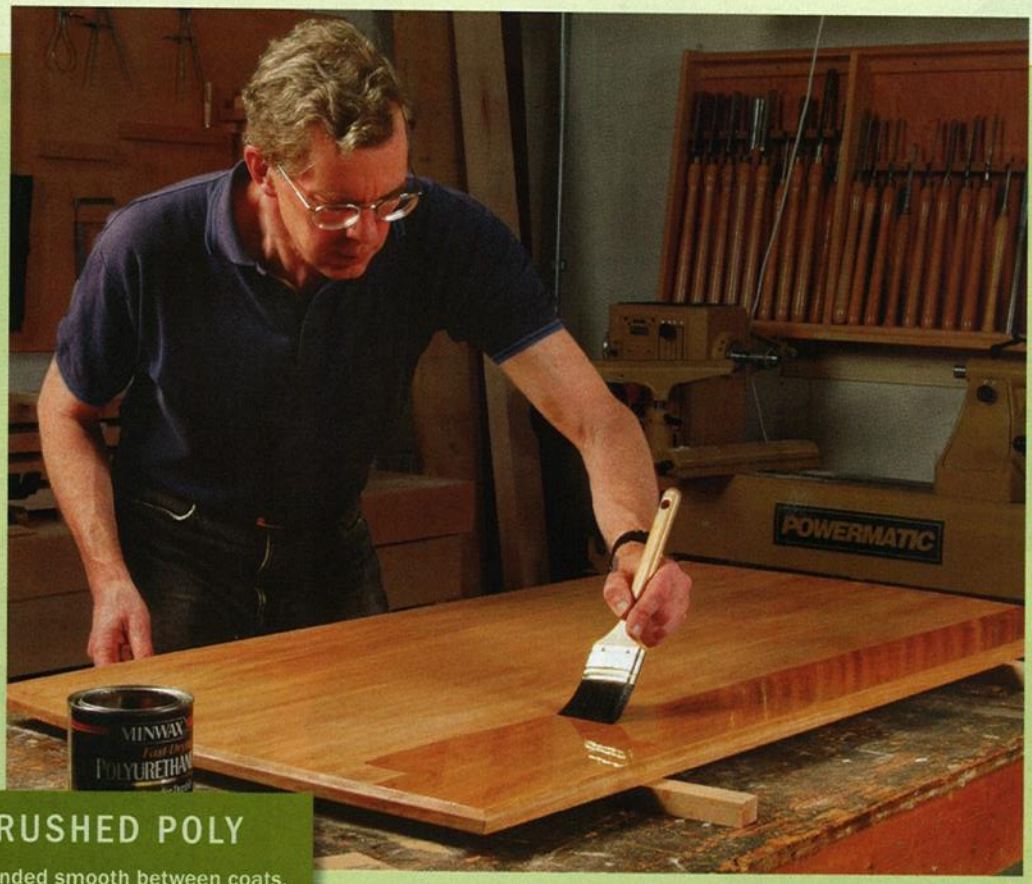
Wax goes inside. *Fold over a piece of cheesecloth a couple of times and then place a lump of paste wax in the center (left). Gather the corners of the applicator and then press down until the wax begins to ease out through the rounded face of the applicator. To avoid having light wax show up in the pores of dark wood, use light pressure on the applicator.*

WORK DARK WAX INTO PORES

Apply it directly. *If you want dark wax to enter the pores to change the tone of a piece, wipe the cloth directly into the wax (left). Work it into the wood and then wipe with the grain to remove the surplus (right). Buff the wax, clear or dark, until the surface is silky to the touch (below).*

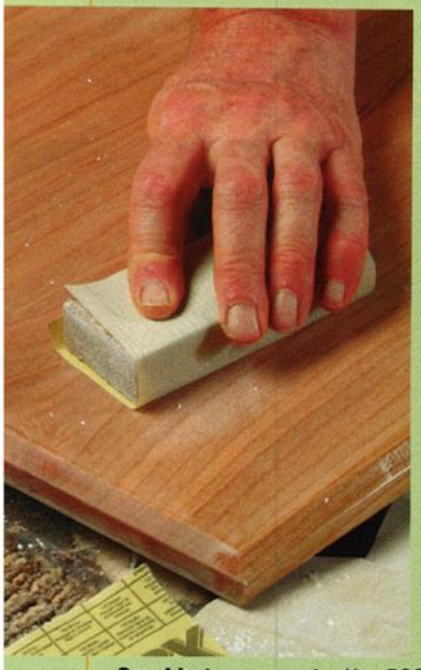
Tabletop version

For projects like kitchen cabinets or dining tables that need extra protection, you could wipe on many more coats of gel polyurethane, but it's much quicker to brush on several coats of liquid polyurethane instead and then switch to the wipe-on gel for the final few coats. You'll get the rapid build of a brushed finish without any brush marks or dust nibs. You can also use both finishes on the same project. For this table, I used the durable finish for the top and feet and the simpler wipe-on-only finish for the rest of the piece.



BUILD THE BASE WITH BRUSHED POLY

Three or four coats of liquid polyurethane, sanded smooth between coats, are enough to give the wood real protection without a thick, plastic look.

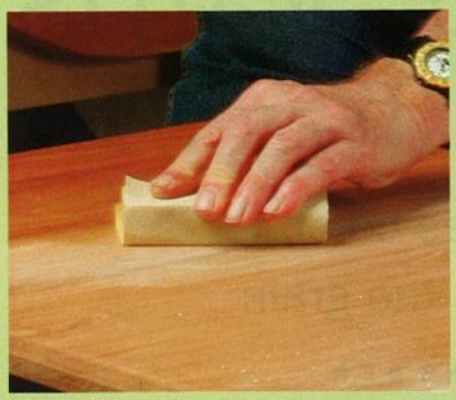


Sand between coats. *Use P320-grit stearated sandpaper, working until the whole surface is smooth to the touch. Don't try to sand out every small depression in the surface. Wipe clogged sandpaper on a coarse carpet remnant to clear it, but switch to a fresh piece of sandpaper as soon as it stops cutting.*

Brush technique. *Start a few inches from one edge and brush off the far end (top); then repeat in the opposite direction, moving slowly to avoid bubbles (above). You are not looking for a perfectly flat surface, but high points and depressions should be well covered with finish (left).*

Photos, this page (middle three): Matthew Kenney

SANDPAPER AND STEEL WOOL SMOOTH THE TRANSITION



Final sanding. *Use P400-grit sandpaper to smooth the final coat of brushed-on poly. Don't try to sand down to a perfectly flat surface. To dull the small, shiny depressions and leave the surface with an even sheen, rub the surface with good-quality 0000 steel wool.*

WIPE ON A FEW TOPCOATS

Thin coats of quick-drying, wipe-on gel poly give the top surface a medium sheen devoid of dust nibs and brush marks.

Apply the gel in circles. *Cover a few square feet in an even layer before buffing off the surplus with a clean cotton cloth. The result: a smile-inducing, flawless finish (below).*

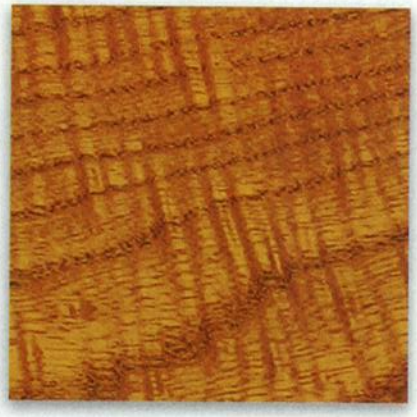
Dyes and Stains Work Better Together

One enhances color, the other pops the grain

BY PAUL SNYDER

Dye only. *Dye adds a uniform color change to the whole surface of the wood. The translucent color in dye will highlight a wood's figure without obscuring it.*

Stain only. *The pigments in stain lodge in open-pored woods, emphasizing the grain structure. Because they add less color to tight-grained areas, stains do not add color evenly to a board.*



Dye followed by stain. *A combination of dye and stain enhances both the curl and the grain, while the bright dye shining through the darker stain gives the wood a look of greater depth.*

You may think that the only reason to dye or stain a piece of furniture is to change its color, but you also can pop the curl in curly maple, enhance the rays of quartersawn white oak, and give fresh-cut, pallid cherry the deep glow of an 18th-century antique. But you'll need to combine dyes and stains to get these results. Dye actually tints the wood, while stain is fine pigment suspended in a solvent and tends to lodge in the pores, highlighting the grain lines. So the two have very different effects on wood.

Different effects using dyes and stains

Some manufacturers tout combination dyes and stains as one-step solutions to coloring wood, but applying these elements separately will give you greater latitude over the final appearance.

The color of the dye has a big impact on the look of the finish. Brighter colors, such as golden brown, red, yellow, amber, and orange create highlights that transmit through a wide variety of stains, increasing the depth and visual appeal of the wood. A stain applied over the dye adds color, either by contrasting or harmonizing with it, and defines the grain and pore structure. Examples are dying walnut or mahogany yellow and then applying a dark stain, or using a red dye to enhance that tone in mahogany.

Enhance the natural look of a wood—Using colors that occur naturally in wood as it ages, you can give your piece an antique appearance. Use a dye the underlying color of the antique to bring out the figure and the luster. Then use a stain to tweak the color, enhance the grain, and add depth.

Replicate dark woods—This two-step method also can be used to get a deep, dark color such as ebony or dark mahogany from a different wood species. Often a dye or stain alone won't produce these deep shades, but using a dye and a stain in the same color range will make the final color much darker.

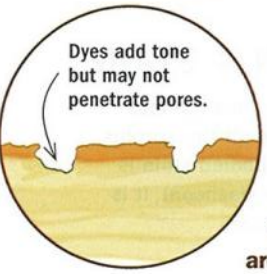
For subtle color change, try glazing with stains

Until now I've talked about applying stain directly to dyed wood. When a stain is applied over a coat of clear finish, it is known as a glaze. You can buy purpose-made glazes, or you can use a heavy-bodied stain such as a gel stain.

First apply a washcoat—Before using a glaze, seal the wood to prevent stain from penetrating it (possibly causing blotching),

Photos, except where noted: Michael Pekovich; this page, top left: Mark Schofield

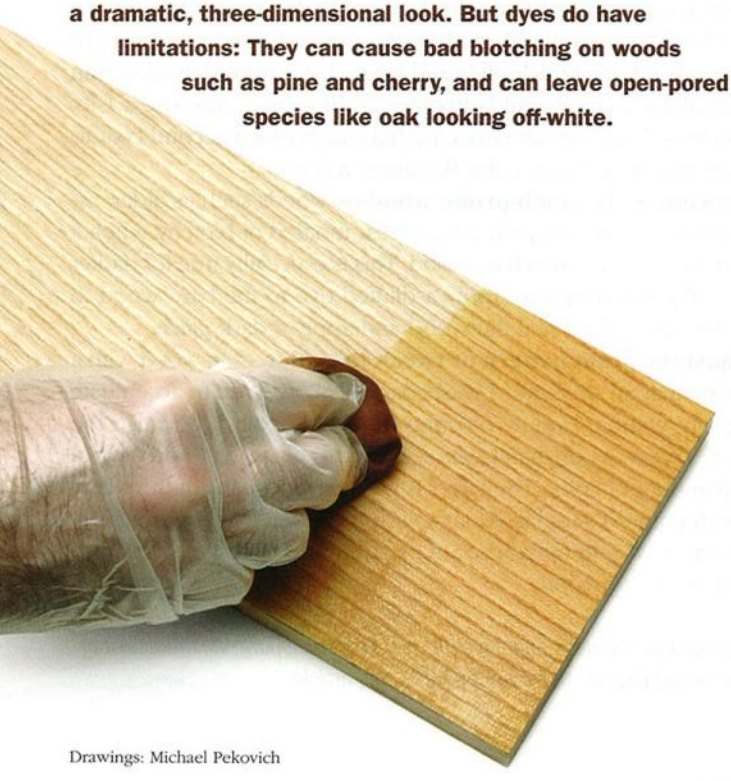
The difference between dyes and stains

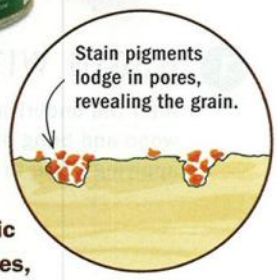


DYES DISPLAY FIGURE

Dyes are made up of molecular-size particles that attach themselves to wood fibers. Because dye particles are microscopic, they are essentially transparent and can add a lot of color without loss of grain definition. Dyes are available in liquid form or as powders to be dissolved in a solvent such as water, alcohol, or oil. Unlike pigments in stains, dye molecules stay in solution and don't settle to the bottom of the container.

Because dyes are transparent, they enhance the figure and make wood shimmer (an effect known as chatoyance). On highly figured woods like curly maple, dye produces a dramatic, three-dimensional look. But dyes do have limitations: They can cause bad blotching on woods such as pine and cherry, and can leave open-pored species like oak looking off-white.



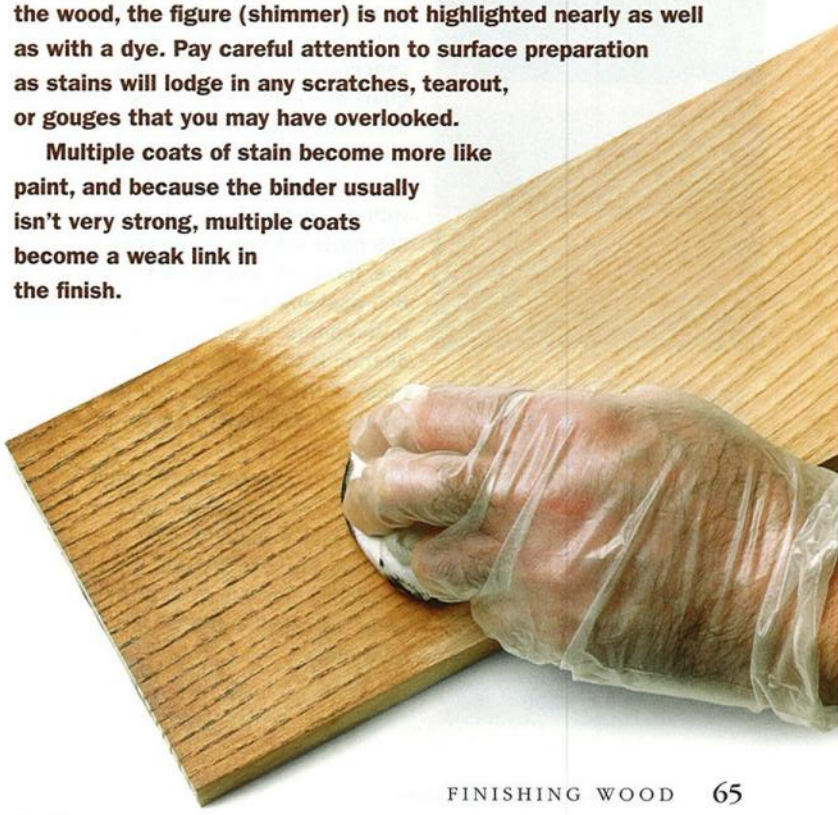


STAINS ENHANCE GRAIN

Stains consist of colored pigments combined with a binder that glues them to the wood. The binder can be oil, varnish, or acrylic (water-based), in liquid or gel form. Unlike dyes, which penetrate the wood, the pigments in stains color the wood by lodging in the grain and pore structure. This makes them a good choice for open-pored woods such as ash and oak. On tight-grained woods such as maple, the pigments find very little structure to lodge in, so most of the color is removed when the excess is wiped off, and the result is uninspiring.

Although stains accentuate the grain and pore structure in the wood, the figure (shimmer) is not highlighted nearly as well as with a dye. Pay careful attention to surface preparation as stains will lodge in any scratches, tearout, or gouges that you may have overlooked.

Multiple coats of stain become more like paint, and because the binder usually isn't very strong, multiple coats become a weak link in the finish.



Drawings: Michael Pekovich

1 BEGIN WITH A DYE

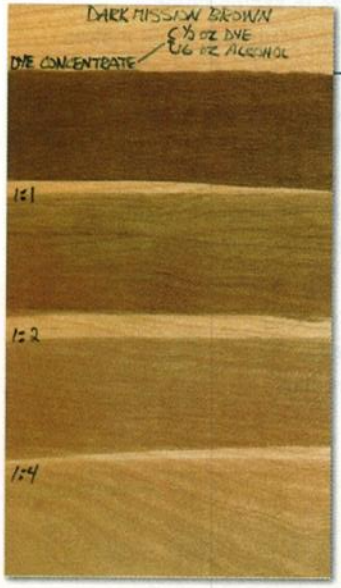
Alter the underlying color of the wood and bring out any figure by applying a dye to the bare wood.

2 A WASHCOAT IS OPTIONAL

A thin coat of finish, known as a washcoat, can be used at this point to seal the wood and control the stain's penetration. Dewaxed shellac is ideal for this step.

3 WIPE ON A STAIN

After working the stain into the grain, wipe off the surplus. When a thick-bodied stain is applied over a washcoat, it is known as a glaze.



TEST THE STRENGTH OF YOUR DYE

Before using a dye, you should test it in various dilutions on a color-step sample board. Dyes in small containers (for example, 2 oz.) are very concentrated and are designed to be diluted to a "standard" concentration of 1 oz. dye per quart of solvent. To use less dye, start with ½ oz. dye and 16 oz. solvent. After testing the standard concentrate, thin it with equal parts solvent, then two parts solvent to one part dye, then 4:1, and possibly 8:1, applying each dilution to the board. If the standard dilution is too weak, add more of the undiluted dye, but measure precisely and record the amount.

Dyes in larger bottles usually aren't as concentrated. With these, make a step board starting with dye straight from the bottle and thin from there. Keep the step boards for future reference.

Sources of dyes, stains, and shellac

WOODWORKER'S SUPPLY
woodworker.com
800-645-9292

HOMESTEAD FINISHING
homesteadfinishing products.com
216-631-5309

but not so much that the pores are filled (unless you don't want to accentuate the grain patterns). Dewaxed shellac works well for this first step, known as a washcoat, because it can be thinned while still providing a continuous seal. Thin the shellac to a ½-lb. cut or a 1-lb. cut. If you use Zinsser's SealCoat, dilute it with denatured alcohol in a 1:1 ratio for a 1-lb. cut or 2:1 ratio for a ½-lb. cut. If you make shellac from flakes, a 1-lb. cut is about 10% flakes by volume. For example, to make 8 oz. of shellac, pour 7.2 oz. of alcohol into a measuring container and add flakes until the level reaches 8 oz. Use a ½-lb. cut on woods with a fine pore and grain structure in combination with a thick oil-based glaze. For a water-based or thin oil-based glaze, a 1-lb. cut helps prevent blotching. Also use a 1-lb. cut for wood with larger pores, perhaps applying a second coat to further limit how much color the glaze will add.

Working with blotch-prone woods—Woods such as alder, aspen, birch, cherry, and pine may appear mottled or blotchy when a dye or stain is applied to bare wood. This is especially true for darker colors. The solution is to apply a diluted dye to the bare wood to pop the figure, then seal the wood and apply a dark glaze.

Adjust the grain pattern or tweak the color—On wood with a prominent grain structure, a washcoat will allow glaze to accentuate the grain, without unduly coloring the whole board. Because the surface of the wood has been sealed, the glaze will add only a small amount of color. The effect is rather like looking at the wood through colored sunglasses. Just as some sunglasses improve the contrast of everything you see, a glaze should have the same kind of effect on the wood.

Paul Snyder is a professional finisher near Fredericksburg, Va. Professional finisher Peter Gedrys also contributed to this article.

Recipes for dyes and stains

Mission oak

Transform pale white oak into the rich, deep brown reminiscent of fumed oak without using hazardous concentrated ammonia.

White oak is a terrific wood to work with because it takes colors and finishes in a very predictable fashion. This white oak table, for example, offers a great demonstration of how to create a deep, rich brown reminiscent of fumed oak, the signature finish of so many Arts and Crafts pieces.

The process starts with a water-based dye, which is used to lighten up or subdue the base or background color of the wood. Water-based dyes are inexpensive and come in a huge range of colors. The choice for this table was Lockwood's English Brown Oak, a cool, deep brown. Dissolve ½ oz. of powder in 8 oz. of warm distilled water, let it cool, and then filter it.

THE RECIPE

- Lockwood #871 English Brown Oak water-soluble dye
- General Finishes Brown Mahogany gel stain
- Oil-based varnish

After sanding the table to P180 grit, blow the dust out of the pores, wipe the surface clean with a dry cloth, and apply the dye with a small pad. Use a brush to help dab the dye into corners. Be generous applying the dye, but wipe off the excess. Once the dye is dry, wipe on a coat of gel stain directly over it and wipe off the surplus after a couple of minutes. This helps make the grain and pore structure more pronounced, while leaving the ray-fleck pattern pale. The stain used here is General Finishes Brown Mahogany, a deep, warm brown. This dye-and-stain combination results in a deep, aged brown like you'll find on many antiques.

Allow the gel to dry completely (about 24 to 36 hours) before applying a topcoat. If you're not sure it's dry, do the smell test: If there is a strong, discernible smell of oil, wait. This table received three coats of an oil-based varnish to give decent protection. If you want to use a water-based finish, seal the gel stain first with a coat of dewaxed shellac. Zinsser's SealCoat works well.

DYE COLORS THE WOOD

Filter first. *Before using the dye, pour it through a fine paint filter to remove any lumps of powder.*

Apply dye liberally. *Use a folded piece of cloth or paper towel to dye the wood (above). After a minute or two, wipe off the surplus with a clean cloth (right).*

GEL STAIN POPS THE GRAIN

Wipe on, wipe off. *Applied straight to the dyed wood, the gel stain packs the pores and emphasizes the grain pattern of the white oak.*

Photos, pp. 67-69: Mark Schofield

Antique pine

Sealing the surface is the secret to an even color on this notoriously blotch-prone wood.

If white oak is predictable when finishing, pine is anything but. A soft wood, it can take dye in a very uneven way and leave dark blotches. If the dyed sample boards indicate blotching, apply one or two washcoats of a 1-lb. cut of SealCoat shellac (three parts shellac with two parts denatured alcohol). When the shellac is dry, sand it with P220-grit paper and clean off the dust.

For this shelf, use Early American Maple medium-yellow dye, mixing roughly ¼ oz. of powder in 8 oz. of water so that it will have just enough color to give the pale pine a little boost. When dry, apply a coat of undiluted SealCoat, and when this is dry, sand it with P320-grit paper to flatten the surface.

Now that the surface is sealed, the gel becomes a glaze. Instead of quickly soaking into the wood, it sits on the surface and you can move it around. You can leave it denser in corners to simulate aging, or even remove it altogether if you don't like the appearance. When using any stain in this way, you need to dilute it by about 10% with mineral spirits to extend the working time. Don't overthin, or the gel will become watery and you'll lose the color strength. Instead of mineral spirits, you can add a little colorless glaze base such as Benjamin Moore's Studio Glaze to get even more working time and control over the color. The gel-stain glaze can be applied with a pad or brush, but if you choose a pad, use a dry China-bristle brush to feather out any application lines. Let the glaze dry prior to topcoating.

Because the shelf won't see as much wear and tear as the table, use SealCoat shellac as a topcoat (three coats). When brushing on the first coat, use as few brush strokes as you can. If you work the shellac too much, it could pull the pigment and leave a patchy appearance. When the third coat is dry, lightly sand the surface with P320- or P400-grit paper. A coat of wax is an optional final finish.

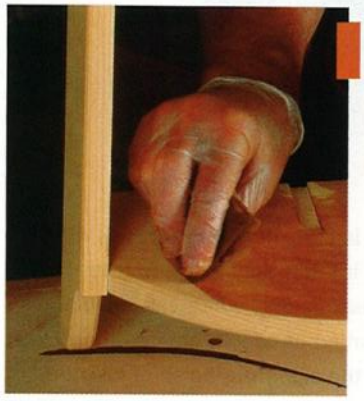
THE RECIPE

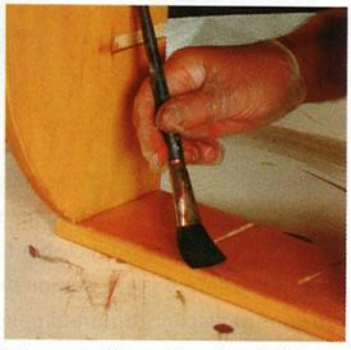
- Lockwood #142 Early American Maple Medium Yellow water-soluble dye
- General Finishes Prairie Wheat gel stain
- Blond shellac

SEAL FIRST

Sealing is the solution. *This pine needed only a thin, 1-lb. cut of shellac. Wipe it on, let it dry, and then apply the dye.*

DYE, THEN SEAL AGAIN





Yellow adds depth. *Wipe the sealed pine with the yellow dye (left). Apply a 2-lb. cut of dewaxed shellac (right), or undiluted SealCoat, to seal the dye before using the gel stain as a glaze.*

STAIN BECOMES A GLAZE

Reversible color. *When applied to a sealed surface, the gel stain becomes a glaze and can be wiped on and off until the appearance is just the way you want it.*

Glowing mahogany

A vibrant dye brings the wood to life while a layer of dark gel stain adds depth to the appearance.

Instead of the normal mahogany brown, let's have a little fun with this mahogany jewelry box (bartleycollection.com). Start with a Bismarck Brown, but don't be fooled by the name; this alcohol-soluble dye is a deep, fiery red.

With an open-pored wood like mahogany, sealing is optional. If you want to emphasize the pore structure, skip this step. Just be aware that the gel will be darker on raw wood. In this case, the grain pattern was nothing special so Gedrys sprayed on a single coat of SealCoat shellac and then used Bartley Espresso for the glaze (gel stain). Add a second coat of glaze to the bracket feet to deepen them. After applying the glaze coats, let the piece sit for a few days to dry completely and then seal it with shellac.

You now have a choice. For a high gloss, rubbed-out finish, you can fill the grain and spray on two or three coats of solvent lacquer. If you don't have a spray outfit, aerosol cans are fine for a small project like this. For a softer sheen, smooth the finish with 1,000-grit CAMI-grade wet-or-dry sandpaper or a 1,000-grit Abralon pad, and then rub it down with 0000 steel wool and wax.

THE RECIPE

- Lockwood #350 Bismark Brown alcohol-soluble dye
- Bartley Espresso gel stain
- Solvent-based lacquer

SOURCES OF SUPPLY

LOCKWOOD POWDERED DYES
wdlockwood.com

GENERAL FINISHES GEL STAIN
generalfinishes.com

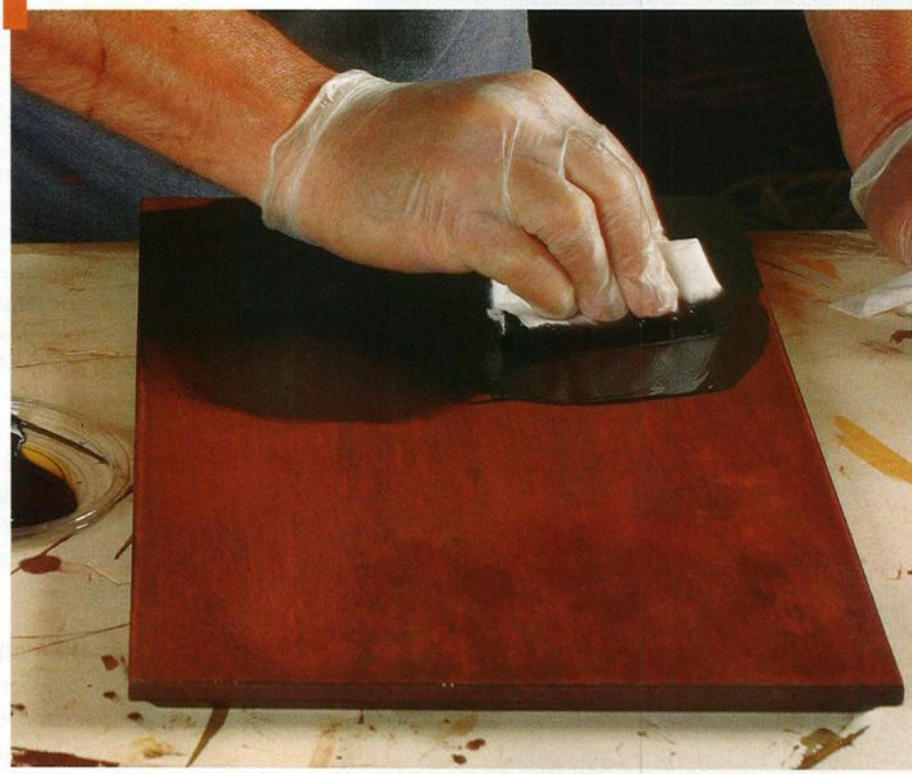
BARTLEY GEL STAIN
bartleycollection.com

TRY AN ALCOHOL-BASED DYE

A brighter option. *Powders dissolved with denatured alcohol are more vibrant.*

Seal by spraying. *When sealing an alcohol-based dye with shellac, spray it on. Brushing or wiping could pull the dye and leave a blotchy appearance. SealCoat is available in an aerosol can.*

GLAZE IS A COOLER BROWN

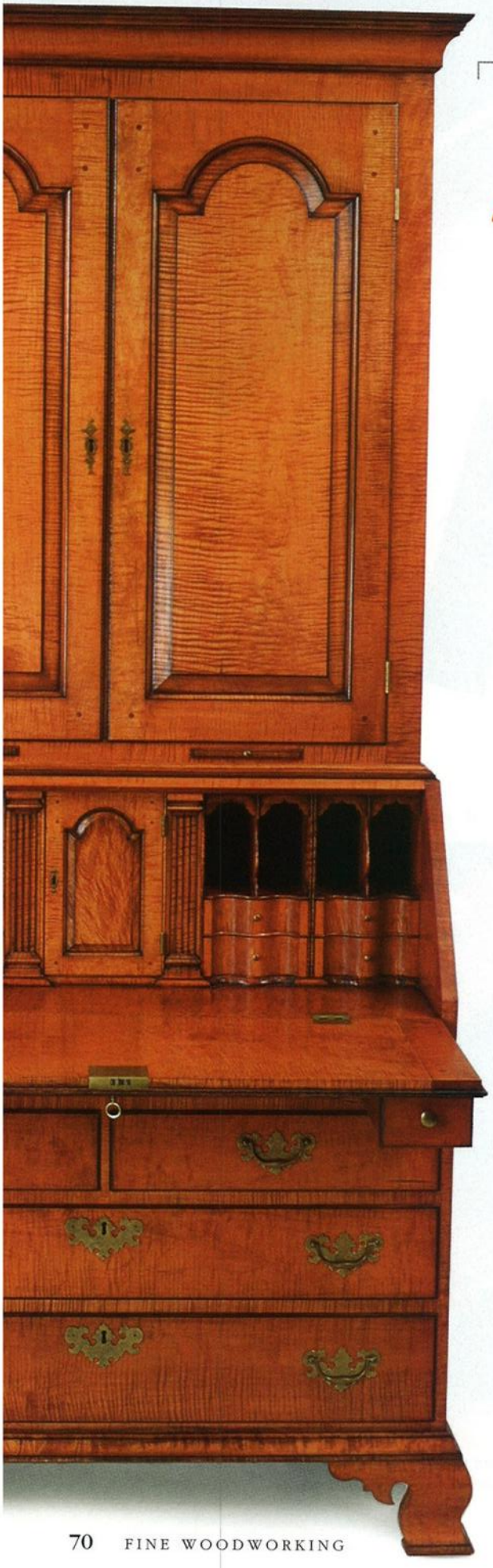


Another shot of color. *Wiped on over the shellac, the Espresso gel stain becomes a glaze. Use a dry brush to remove pad marks.*

Add 200 Years to Tiger Maple

Four hand-applied steps make your piece an instant classic

BY LONNIE BIRD



I've always admired the distinctive stripes, three-dimensional depth, and rich amber color of antiques made from tiger maple. The challenge is to replicate this century-old appearance on creamy-white, fresh-cut maple. The steps I take to transform tiger maple aren't difficult and can be done by hand, but the process will stretch over days as you wait for each step to dry. Of course, that's a lot quicker than waiting for the piece to become an antique.

The finish rewards good surface preparation

It's important to remove all marks left by saws, planers, and jointers because this finish will display them prominently. A bench plane is the fastest way to get rid of these marks and beats the tedium, dust, and noise of machine sanding. However, be cautious when handplaning tiger maple as the dramatically figured grain tears out easily. I avoid this problem by using a razor-sharp plane equipped with a high-angle frog to give a cutting angle of 50°, sometimes referred to as a York pitch. You can achieve the same angle by grinding a 38° edge on a bevel-up low-angle plane.

Sometimes, despite your best efforts, you still will get minor tearout. I use a sharp card scraper to smooth it away and blend the area with the surrounding surface. Of course, some surfaces, such as curved legs and moldings, can't be planed. I scrape these areas and then lightly hand-sand with P220-grit sandpaper to smooth the surface further and remove any facets left by the scraper. I use the same paper to lightly sand the flat areas that were planed; otherwise they'll accept the dye differently than the sanded areas.

Dye and then oil the wood to develop the figure

The widest selection of dye colors comes in powder form in formulas that can be mixed with water, alcohol, or oil. I use water-based dyes because they make it easier to control lap marks and streaking than faster-drying, alcohol-based dyes, and they are reportedly more lightfast than oil-based dyes. The disadvantage is

Photos: Mark Schofield

STEP 1

Pop the figure with dye

RAISE THE GRAIN

To prevent a water-based dye from raising the grain, pre-raise it by wiping the wood with a damp cloth (right). After the wood is dry, lightly sand the surface (far right).

APPLY THE DYE

A quick way to test how the dye will look is to use a stirring stick made from the same wood as the workpiece (below). Then brush on the dye (right) and wipe with a clean cloth while still wet.

A tip for end grain

To keep the end grain from absorbing too much dye and becoming too dark, wet it first with water and immediately apply the dye. This will dilute the color.

STEP 2

Add luster with oil

Apply a generous amount of oil to the wood, let it soak in for a few minutes, and then wipe off the surplus. This gives greater depth to the appearance of the wood.

that the water in the dye raises the grain, so I pre-raise the grain by wiping the wood with a damp cloth. Once the surface is dry, I lightly sand the wood with worn P220-grit or P320-grit sandpaper to smooth the fuzzy grain before applying the dye.

Another advantage of powdered dyes is that you can control the intensity of the color. The manufacturer recommends 1 oz. per quart of warm water, but I start with half that strength. Experiment on scrap tiger maple until you find a color you like. Two of my favorites from the Moser brand (woodworker.com; 800-645-9292) are russet amber maple and honey amber maple. Both yield the golden color of old maple furniture. For this project, I prefer the redder tones of the russet dye.

I dye the edges of floating panels before inserting them into their frames. This way, if seasonal movement causes a panel to shrink, I'm spared the embarrassment of undyed edges appearing. To reduce the chance that drips or runs will go unnoticed, I dye small areas one at a time and wipe spills immediately. If you do have faint drip or lap marks, go over the entire piece with a damp cloth when you've finished dyeing it. Don't get the wood dripping wet, as too much water can cause surfaces to warp and panels to swell. When satisfied, let everything dry overnight.

One reason oil finishes are so popular is that they enhance wood's natural appearance. They have the same effect on dyed wood. I flood the surface with an oil finish such as Waterlox or Formby's Tung Oil, making sure to cover all the crevices and details. After a few minutes, wipe away the excess. Let the finish cure overnight and dispose of the oily rags in a safe manner.

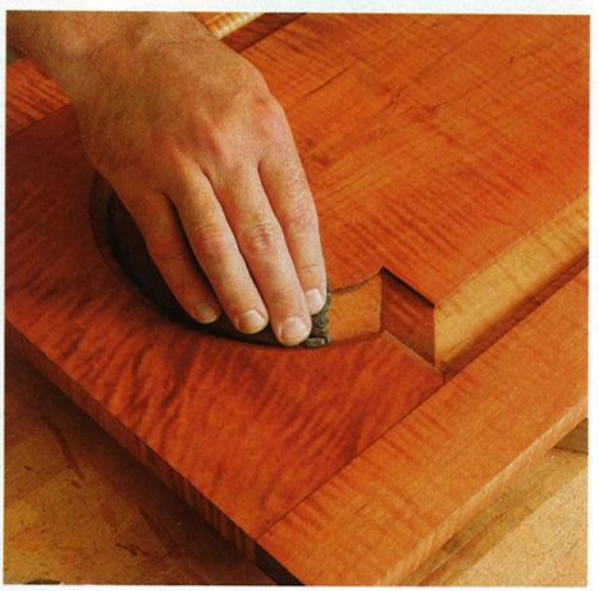
Amber shellac topcoat adds more color

The amber shellac I use is made by Zinsser and comes as a 3-lb. cut. I reduce it to a 1-lb. cut by combining one part shellac with

STEP 3

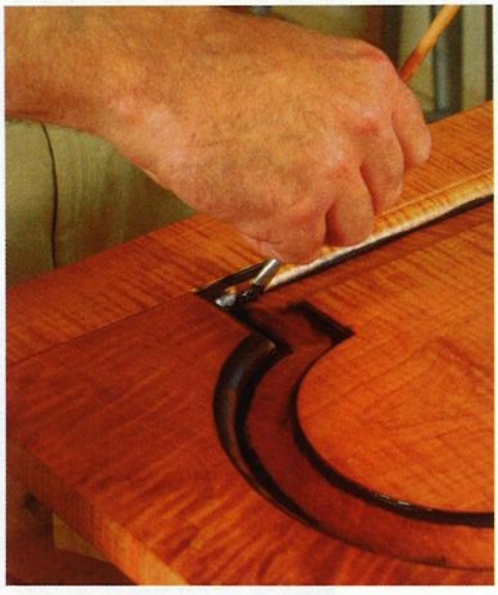
Seal with shellac

Use several coats of thin shellac to give the wood a thinner, more natural topcoat (left). After the shellac has dried, smooth the surface with 0000 steel wool (below).



STEP 4

Bring out the details with glaze



Use the pigment from oil-based stain as a glaze (above). Push the glaze into all the corners and crevices of the workpiece with an artist's brush (right). Wipe away the surplus before it dries (far right). If the glaze becomes too tacky, dampen the cloth with mineral spirits or turpentine.

two parts denatured alcohol. Adding more alcohol will allow the finish to flow out better before setting up. It also lets the shellac flow into the grain, giving more of an in-the-wood finish, which I prefer over a film finish.

After each coat of shellac has dried, I rub the finish with 0000 steel wool, being careful not to rub through the finish. I then vacuum the surface thoroughly. Two or three coats of shellac are usually enough. Any more and the finish may begin to look thick, especially in crevices and details.

Glaze, shellac, and wax complete the finish

It's the details that often make a piece of handcrafted furniture successful. Moldings, corners, and even simple carvings catch light and create interesting shadowlines for a visual treat. Glazing can accentuate these details even when the lighting doesn't cooperate. Although you can mail-order ready-made glaze, an easier source is an oil-based stain from the local paint or hardware store.

It's important to choose a stain that is darker than the dye yet complements its color. For my maple finishes, I use Moorish Teak stain from Zar. With the contents unstirred, pour off the excess oil, leaving an oil and pigment mixture with the consistency of mud at the bottom of the can.

Apply the glaze to the moldings, carvings, and other details with a small artist's paintbrush. Long before the glazing dries, wipe away the excess. A cloth moistened with mineral spirits or turpentine speeds the process or enables you to wipe away all traces of the glaze should you change your mind. Because the shellac is dissolved with alcohol, the mineral spirits will have no effect on it.

After the glaze has cured overnight, I apply another coat of shellac for a protective seal. Finally, I rub out that coat using 0000 steel wool and complete the finish with a coat of paste wax. □

Lonnie Bird teaches woodworking at his shop in Dandridge, Tenn. For information on classes, go to lonniebird.com.

A final coat of shellac. *After the glaze has cured overnight, seal it with a final coat of thin shellac. Finish with a coat of wax.*

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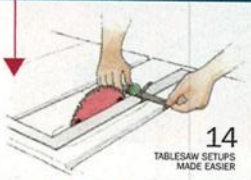

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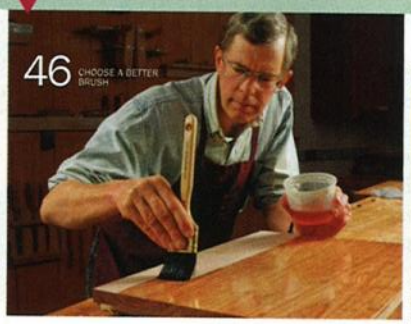

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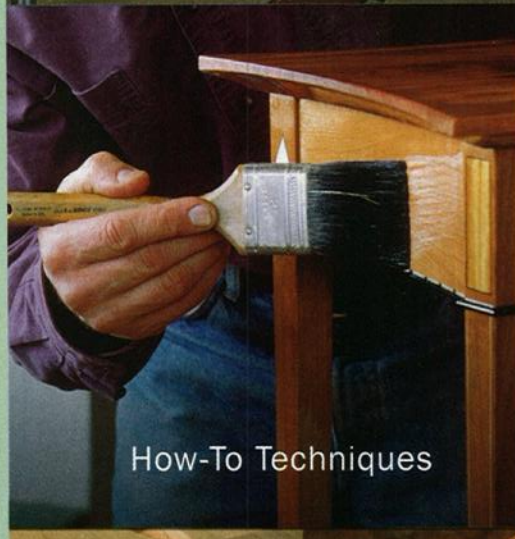
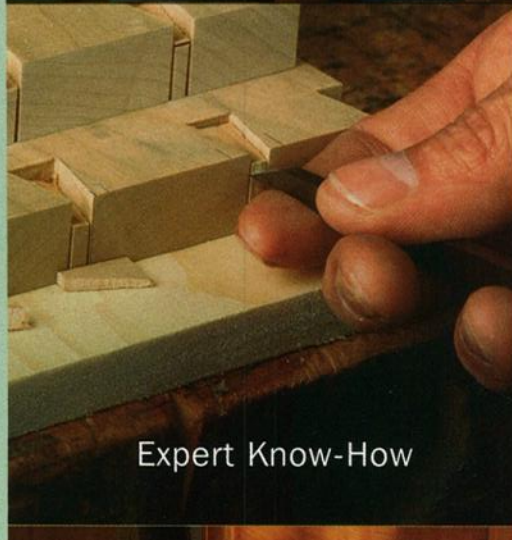
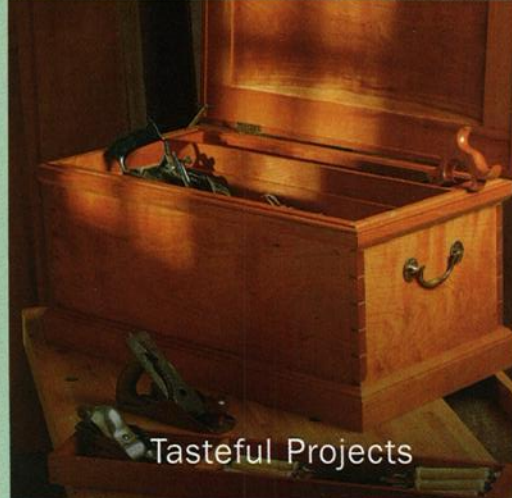






Cherry Without Blotches

How to cure this popular wood's Achilles' heel

BY MARK SCHOFIELD

Cherry's popularity for fine furniture is no surprise: It is hard but not heavy; it cuts easily with power tools or by hand; the grain is restrained but interesting; and over time it takes on a beautiful, deep, red-brown color.

However, like a scorpion, there is a sting in the tail for the unwary. Many woodworkers apply an oil-based clear finish only to see the wood break out in dark, ugly blotches. Those who stain the wood, intending to turn pallid, freshly cut cherry into the rich look of a 200-year-old antique, can see even worse results.

Not all cherry behaves like this. You can learn to spot the problem areas in advance, and pretreat your project before you apply a stain or a clear coat. When you start with a wood as nice as cherry, it's worth learning how to finish it.

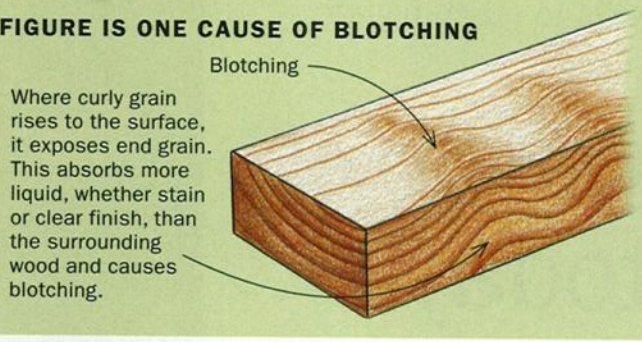
Everyone agrees blotching is caused by uneven absorption of a liquid, whether dye or clear finish. There is less agreement on the causes. Some say it is resin deposits from kiln drying; others point to alternating grain, similar to that found in curly wood. Either way, to find these blotch-prone areas, wipe all of the wood

Alcohol reveals trouble spots

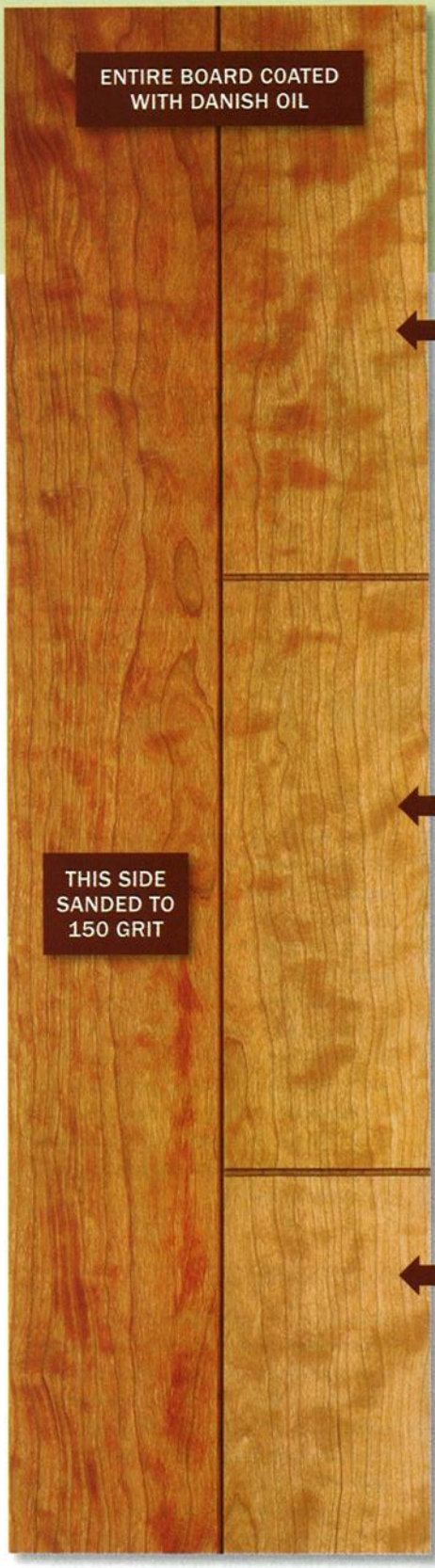
It is very difficult to spot blotch-prone areas on bare boards, especially after sanding. The best way to find them is to wipe the wood with denatured alcohol. This will leave blotch-prone areas that are darker than their surroundings and take longer to dry.

Danger ahead. *Wiping the wood with denatured alcohol reveals darker, blotch-prone areas.*

FIGURE IS ONE CAUSE OF BLOTCHING



Photos, except where noted: Mark Schofield; drawings: John Tetreault



3 ways to reduce blotching from clear finishes

Oil-based finishes are the most likely of the clear finishes to cause blotching on cherry. These include wiping varnish, oil/varnish mixes, Danish oil, and polyurethane, and the blotching can occur whether the finish is wiped, brushed, or sprayed on. The sample board shows how Watco Danish Oil is affected by various treatments.

1. FOR MINIMAL BLOTCHING, KEEP ON SANDING

If the alcohol test reveals that only minimal blotching is likely, the simplest method of blotch control is to sand to a higher final grit. Instead of stopping at P150- or P180-grit sandpaper, carry on through the grades until you reach P400 grit. This smooths and burnishes the wood, making it less able to absorb a liquid. It will still allow the deep, lustrous look associated with oil-based finishes, but it does involve more time sanding—a task that few of us find appealing.

2. A WATER-BASED CONDITIONER SEALS IN MODERATE BLOTCHING

Minwax's Water-Based Pre-Stain wood conditioner feels and looks like a greatly thinned water-based clear finish, and dries to a thin film on the surface. Brush on a single coat, let it dry thoroughly, and then sand it with P320-grit paper. Remove the dust and apply the oil-based clear coat of your choice. This method works well on wood with moderate blotching, yet the results still resemble a penetrating finish. Don't be tempted to thin a water-based finish by 50% and use that as a blotch controller; it won't work.

3. NOTHING BEATS SHELLAC ON SEVERELY BLOTCHY WOOD

If the alcohol test reveals severe blotching is likely, stop sanding at P180-grit and apply a single coat of a film finish that has been heavily thinned. Known as a washcoat, the most common choice is a 1-lb. cut of dewaxed shellac. The blotch-prone areas will soak up the washcoat more than the rest of the wood. After the washcoat dries, sand it lightly with P320-grit sandpaper. You'll remove much of the sealer but leave the blotch-prone areas lined with it, allowing the surface to absorb clear finish more evenly. This will almost eliminate blotching, but the reduced oil penetration will also leave more of a film-finish look.

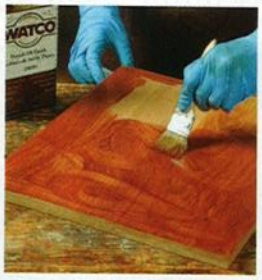
Online Extra

Watch Mark Schofield apply a high-gloss finish to curly cherry. Go to **FineWoodworking.com/finishing-wood.**

3 safe ways to add color to cherry

Coloring cherry can help achieve an antique look or blend boards of different tones. Schofield tested several dyes and stains on sample boards using different blotch-control methods. The board at left compares three coloring techniques combined with the best blotch controller—a washcoat of shellac.

TINTED OIL ADDS MINIMAL COLOR WITHOUT FUSS



Penetrating pigment. *Tinted oil was liberally applied (above) and then wiped off (right). The washcoated side didn't blotch; the bare-wood side did.*

Watco's cherry Danish oil is a pigmented stain, and as expected caused severe blotching on bare cherry. However, on blotch-prone cherry washcoated with shellac, the result was a light but even application of color. If you want only a slight change in your cherry's tone (remember, cherry will darken as it ages, even under a dye) and prefer the look of a penetrating finish, this is the way to go.

GEL STAINS ADD EXTRA COLOR WITH EACH COAT

While Bartley's Pennsylvania cherry left bare wood blotchy, it left wood washcoated with shellac evenly colored and blotch-free, but with the grain slightly highlighted. Each coat of gel stain adds incremental color with minimal fuss, so if you are looking for an easy way to harmonize different-colored boards, try a gel stain. However, because gel stains are mostly pigment-based, each extra coat after the second or third will gradually make the finish more opaque, hiding the wood's figure.

WATER-BASED DYES OFFER CLARITY AND COLOR CHOICE

With dyes, the particles of color are far smaller than in pigment stains, so they remain suspended in the liquid (there's no need to stir the container) and they don't collect in the wood pores, highlighting them. However, they will still create darker areas on blotch-prone wood, so pretreating is advisable. A washcoat of shellac will reduce the overall impact of the dye when compared to bare wood, but you can get around this by mixing a more concentrated batch.

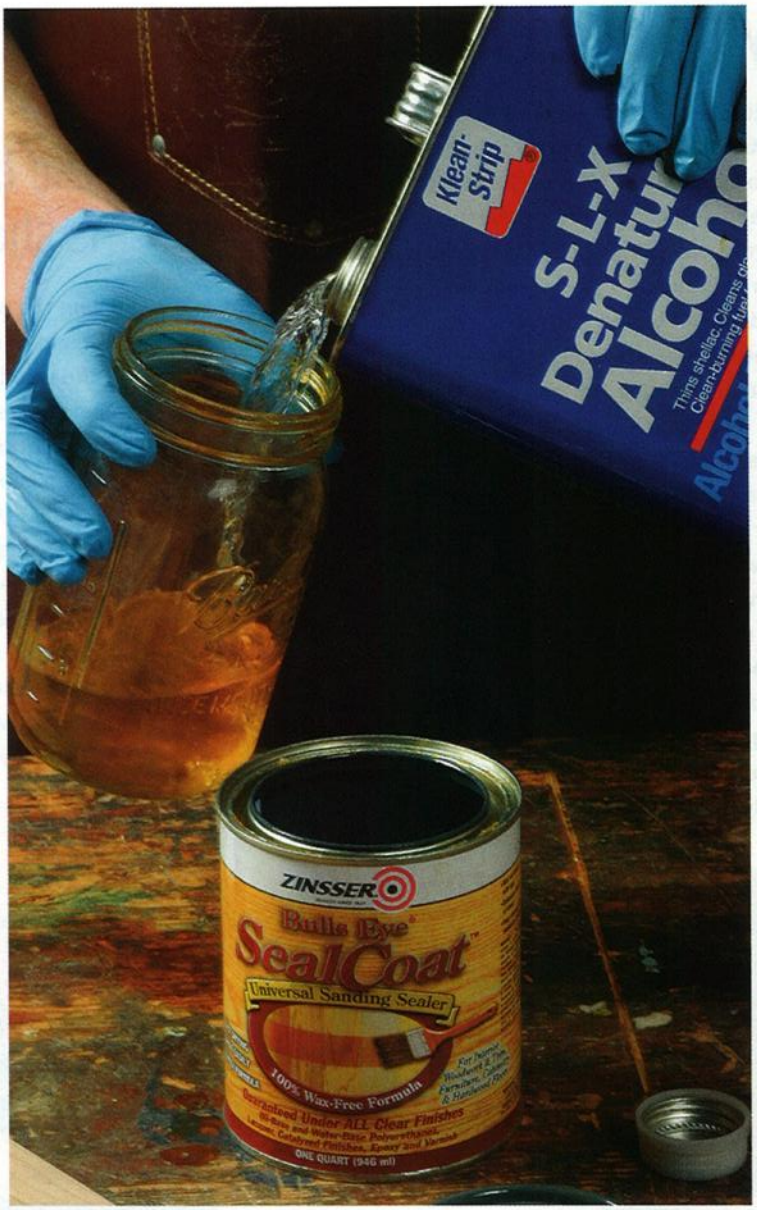
with a cloth soaked in denatured alcohol. Most of the wood should stay a uniform shade, but certain parts may soak up the alcohol, turning darker. These areas will take longer to dry, and will blotch when dye or oil-based finish is applied.

But forewarned is forearmed. To control blotching, you can use a variety of products and techniques to pretreat the wood before applying a dye, stain, or clear finish. However, even if there are only one or two problem areas, you'll need to treat the whole workpiece to achieve an even appearance when finished.

The objective of all blotch prevention is to even out the absorption capacity of the wood, and there are at least a dozen products and techniques that claim to achieve this. Most do it by burnishing or semi-sealing the surface. The second method is to saturate the wood with another liquid prior to applying the finish.

I tested those products and techniques using several sample boards of blotchy cherry. Also, Dan Faia's tea table at the end of this article is a case study in how to control blotching when adding color (and age) with dye. The bottom line? Never apply any pigment stain or dye to blotch-prone cherry that has not been treated with a washcoat. Whatever dye or clear finish you use, try it on a sample board from scraps of wood left over from your project. Discover the hidden surprises there and not on your cherry workpiece.

Mark Schofield is managing editor of Fine Woodworking.



Shellac prevents problems. *A thin coat of shellac, known as a washcoat, is the most effective form of blotch control. However, it is important that you use dewaxed shellac, as waxy shellac can prevent some topcoats from adhering. Among the types made by Zinsser, make sure you choose SealCoat, which is dewaxed, and dilute it 50% with denatured alcohol.*

Avoid oil-based pigment stains for cherry

Walk into any hardware store or home center and the first choice for coloring wood will be rows of wood stains. The choice of colors is extensive and the application method (apply, leave on for five minutes, and then wipe off with a clean cloth) seems simplicity itself. Just say no. On this sample board, I applied a single coat of Minwax Wood Finish, an oil-based pigment stain. On the right-hand side of the board that was sanded to P150-grit, it brought out the worst in this blotchy cherry. Various methods of blotch control on the left-hand side had mixed results. From top to bottom: An oil-based conditioner and a water-based one reduce but don't eliminate blotching; a coat of glue size or a washcoat of shellac eliminates blotching and most of the color but still leaves pigment in the grain; sanding to P400-grit and P220-grit makes little difference.

Now try an aged finish

Like many furniture projects, Dan Faia's porringer-top tea table in cherry won't be the first piece of furniture in its new home. There is a spot all picked out for it in the living room, between pieces of age-darkened cherry and stained pine.

So the first goal was to tone down the table's bright natural cherry a little to help the new piece blend in.

Cherry's tendency to blotch can make dyeing tricky, but this staining method helps to minimize the problem. For a topcoat afterward, use Waterlox Original Satin Finish because it builds a durable finish quickly with a minimum of fuss.

Surface preparation is important to all finishes, but especially when dyeing and staining. Coloring wood highlights and magnifies minor imperfections like overlooked glue squeeze-out or small areas of tearout. Glue will absorb less dye and appear lighter than the surrounding wood. Sanding scratches and tearout will do just the opposite.

Begin the process by handplaning to level the surfaces and to remove mill marks. A thorough scraping will refine the surfaces, helping to clean up any tearout. How the wood is scraped will determine the sanding grit to begin with—P180-grit is most likely. To preserve the feeling of hand-worked surfaces on this period reproduction, Faia sanded only by hand, without using a sanding block.

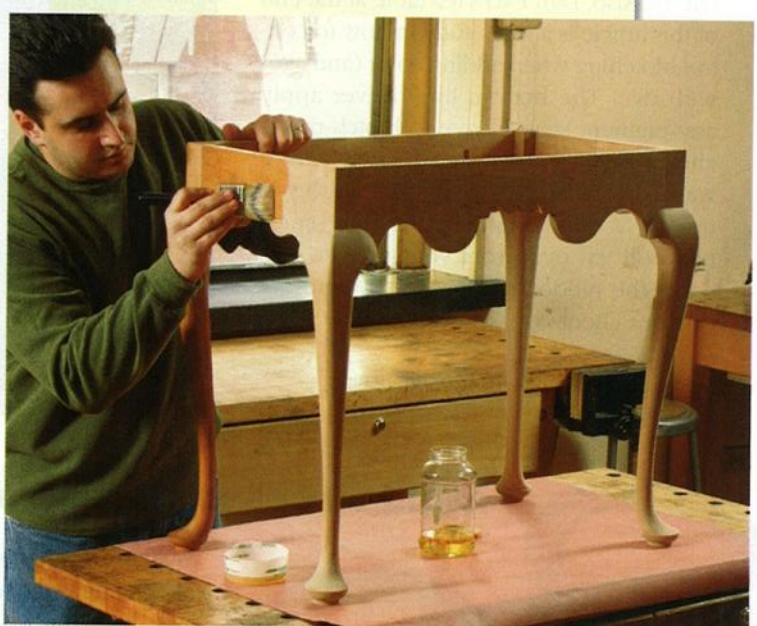
Even though you will seal the surface before applying the water-based dye, start by raising the grain. After sanding, slightly dampen the surface with distilled water. If you use tap water, be sure to test it on a piece of scrap first. Some tap water has a high iron content that can stain the wood, leaving black or yellow spots. Allow the wood to dry thoroughly and re-sand the wood lightly with P220-grit paper.

1 The first coat is shellac

Sealing the piece with a washcoat of shellac will even out the wood's absorption properties, resulting in a more uniform color throughout the piece.

Whether you're using premixed shellac or flakes, adjust the heavy cut with denatured alcohol until you have roughly a 1-lb. cut.

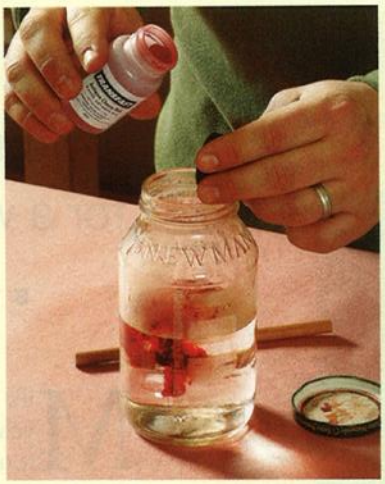
Apply the shellac with a brush. It will dry quickly, so don't do much reworking as you go. Sand lightly with some used P220-grit paper or 0000 steel wool to level any fuzzy fibers.



Washcoat. *Brush on a thin coat of blond shellac (above). Try to avoid drips and puddling. Level any raised fibers with sandpaper or steel wool (below).*

Photos, this spread: Steve Scott

2 The key to applying dye: Keep moving



Water-based aniline dye is easy to mix. Faia used Homestead Finishing's TransFast dye powder in antique cherry red. Start with a capful (about ½ oz.) of dye powder in a pint of warm water and add small amounts of dye or water to adjust the color. Always test the color on a scrap piece of project lumber that also has been sanded and sealed.

To achieve a uniform color when applying the dye, it's best to be methodical. Brush dye on one element of the project at a time, then mop away the excess with a rag. If the dye puddles or sits too long, it could darken the piece unevenly. You can make the overall color darker by applying further coats. The dye shouldn't raise the grain enough to require any additional sanding, but you can smooth the surface with 0000 steel wool.

Brush on the dye, then mop it off. *Keep a rag handy to wipe away any excess quickly after applying the dye. Any puddling will result in darker areas.*

3 Full-strength varnish builds quickly

Apply Waterlox Original without thinning. It is heavy and flows slowly, but the advantage is that it is self-leveling and leaves very few brush marks. Be sure to use a high-quality brush for fewer stray bristles. Brush on three or four coats (maybe more for porous woods), rubbing out between coats with 0000 steel wool.

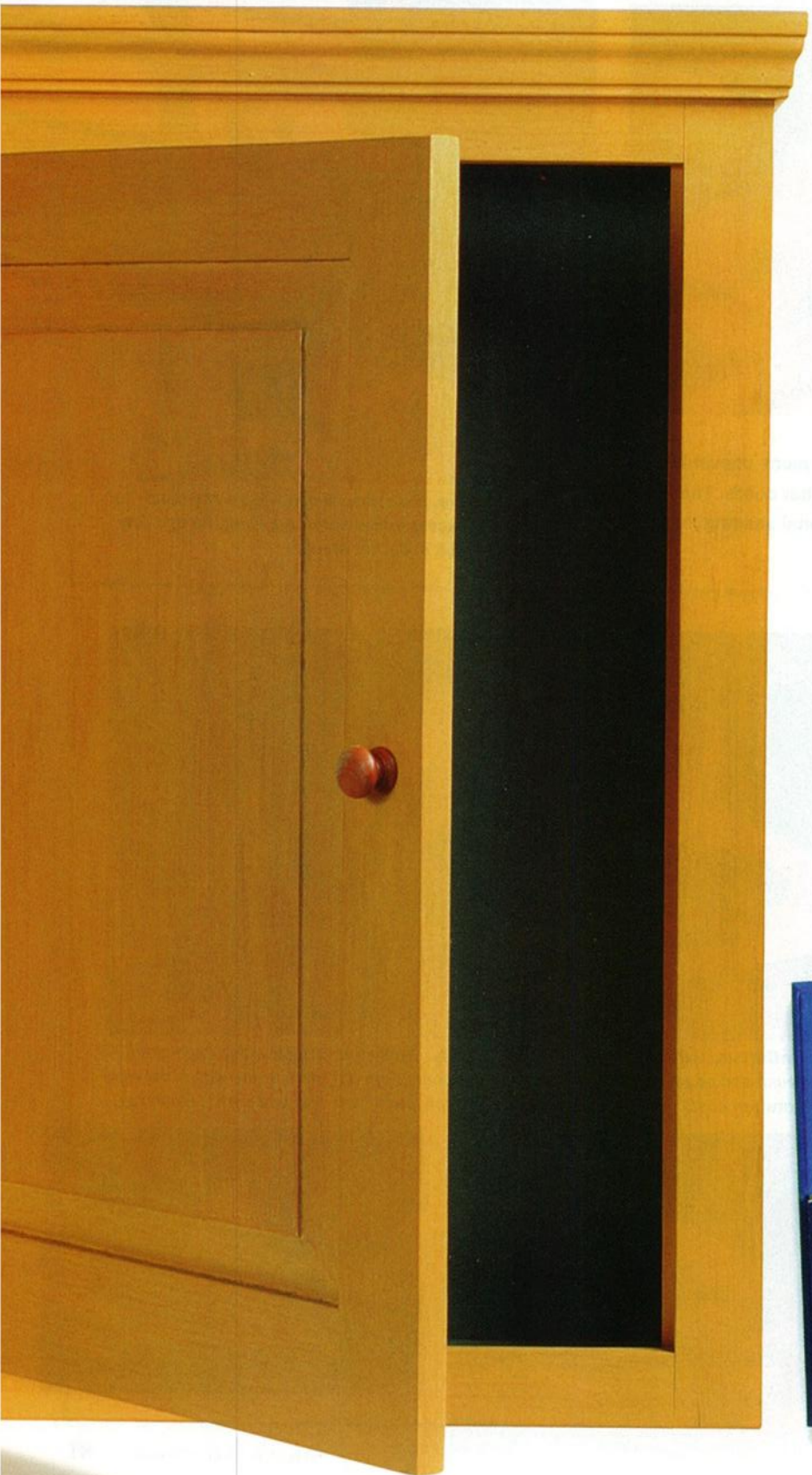
If you are nervous about brushing, you can apply the finish with a rag. Ragging requires the product to be thinned. The downside is that this means more coats—and more rubbing out—to achieve the same build of finish.

After the final rubout, apply a coat of paste wax for a uniform sheen and an extra layer of protection. Use a lint-free rag and work on a few sections at a time. If the wax hardens for a long period of time, it will become very labor-intensive to rub out.

Finally, use a clean rag to buff the piece to its final luster.

Unthinned varnish builds a finish quickly. *Apply the varnish with a high-quality brush and count on applying three or four coats. Rub out the surface with steel wool between coats. After a final rubbing out, apply paste wax and buff with a clean rag.*

Rediscover Milk Paint



Get a rich, traditional look or break out of the bag for a wide range of effects

BY NANCY HILLER

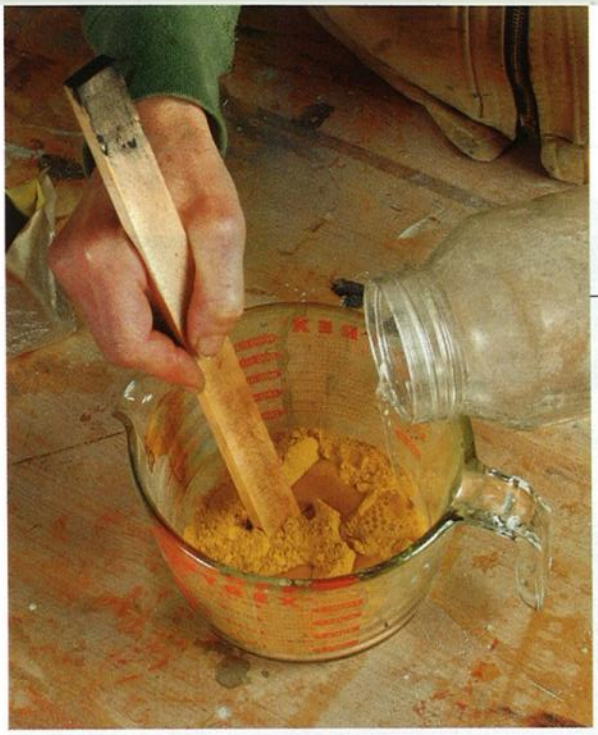
Milk paint has been around at least 20,000 years. The Egyptians used it, and it has been found decorating ancient cave dwellings. Woodworkers who build Colonial and Shaker furniture are familiar with it, but milk paint also offers interesting possibilities for those who prefer contemporary furniture and cabinetry. And it contains no toxic ingredients. This durable and versatile finish comes in a variety of colors and can be used with different topcoats to create unique effects. Opaque surfaces, color washes, layering, and decorative painting are just the beginning.

Many woodworkers are reluctant to try milk paint, concerned that it may be difficult to use. Nothing could be further from the truth. This finish is so easy to mix and apply that you can't mess it up, and slight imperfections will only enhance the finished look.

What is milk paint?

Milk paint's durability comes from its ingredients. Casein, a protein found in milk, is extremely hard when

Photos, this page and across bottom: Michael Pekovich

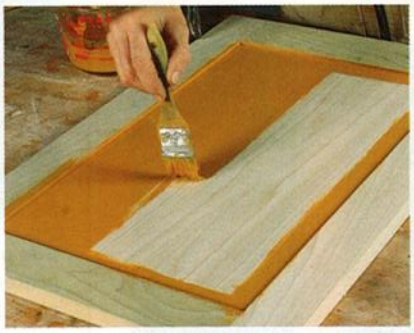


Milk paint 101

Powder first. *To reduce clumping, add some water to the powder, and then stir to a paste before adding the rest. Alternatively, you can add all of the water, cover the mixing container tightly, and shake vigorously for several minutes.*

dry and adheres to a variety of substrates, including solid woods, plywood, and medium-density fiberboard (MDF). Manufacturers mix casein with lime. When combined with water, the lime and casein react to form a natural coating that cures over time, somewhat like concrete. If you want to apply milk paint over some other type of finish, be sure to follow the manufacturer's instructions. You'll usually have to scuff up the existing finish with sandpaper, and then clean the surface with water or vinegar and water. Finally, use a bonding agent (supplied by milk-paint manufacturers) mixed in with the water and powder of the first coat when refinishing.

Supplied as a dry powder, milk paint has a limited shelf life once it is mixed with water, so you should make up only as much as you can use in a day. Unused powder, however, can be stored indefinitely in an airtight, sealed container. Moisture makes the powder unusable, so the trick is to keep out humidity. You



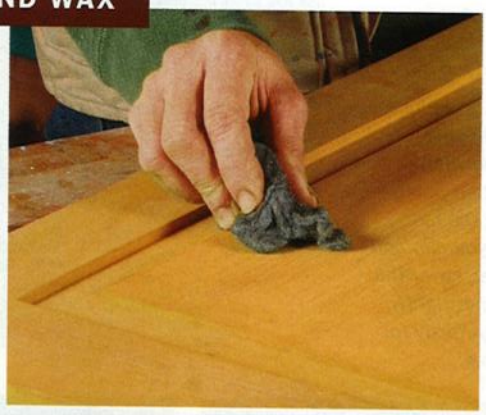
Work in the first coat. *Milk paint soaks into the wood as it is applied. Reapply paint to the brush often, and push the paint into the wood (above left). The second coat glides on more smoothly, like regular paint (above). After two coats, scuff-sand lightly with P220-grit paper (left) and decide if you need more.*

Endless color palette. *You can buy dozens of milk paint colors, and those colors can be mixed to achieve unlimited variations. Mix colors in small batches, keeping track of the ratios so you can duplicate the color in a larger portion.*

Photos, except where noted: Anissa Kapsales

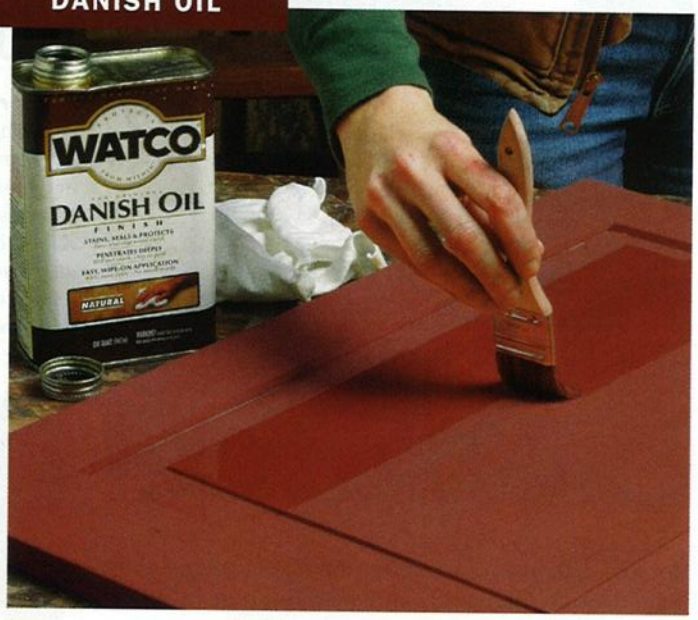
Topcoats make a big difference

STEEL WOOL AND WAX



Wax is simple and easy. *After scuff-sanding with P220-grit, Hiller burnishes the milk paint with 0000 steel wool (right) and uses the steel wool to work in a fairly heavy coat of paste wax (below) for a natural look.*

DANISH OIL



Oils offer more protection. *Apply a generous amount of an oil finish (above) and allow it to penetrate for about 30 minutes. Wipe off the excess with a clean, lint-free cloth (right) to give the surface more protection than wax as well as a subtle sheen.*

can purchase many different colors. The paint dries lighter than it looks when it's wet, so test colors on scraps.

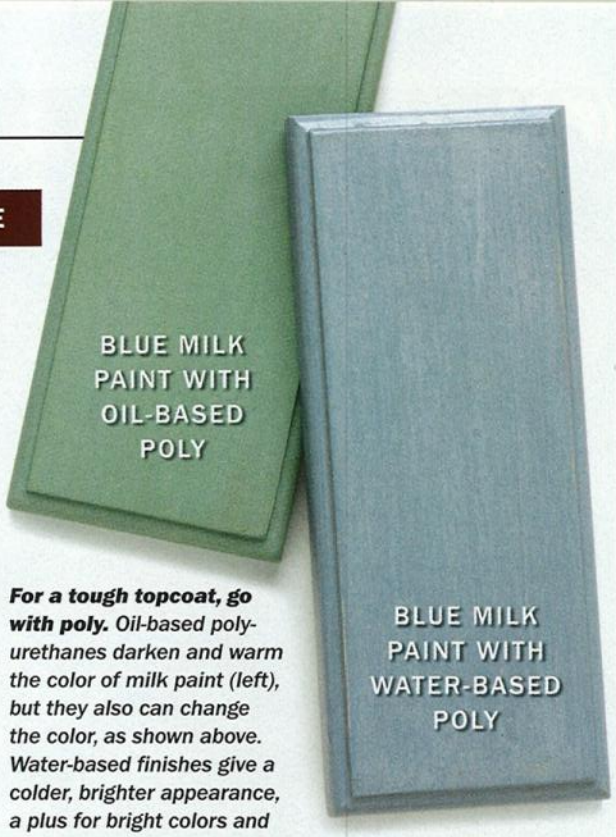
Close-grained species such as pine, poplar, and maple will give the smoothest finish under milk paint. While you can use it on open-pored species such as oak or ash, the grain structure will be pronounced and must be considered part of the design.

Applying milk paint is easy but different from other paints

To prepare the surface, sand to P180-grit and remove dust using a vacuum or tack cloth. Milk paint is not like premixed latex and oil-based paints that form a layer on top of the wood's surface. It's thinner and, when used on clean, unfinished surfaces, is self-priming: The first coat is partially absorbed by the wood and, when cured, forms its own bond coat. This makes applying the first coat very different from applying the first coat of a premixed paint. The wood will absorb the milk paint as you apply it, so don't expect it to glide on. Compensate for this by reapplying paint to the brush more often and dabbing the paint into the wood.

The most common approach is an opaque finish, which obscures the figure of the wood and covers your piece with the intense, velvety color that is milk paint's hallmark. Mix equal parts warm water and powder in a nonmetallic container and stir briskly. Let the paint slake for about 10 minutes. An opaque application is between two and four coats. Although some people recommend raising the grain with a light spray of water before applying the paint, I don't. I find this step to be redundant. Since I am applying multiple coats of milk paint, I'm not worried about sanding through the first coat.

Photos, this page (top and bottom right): Michael Pekovich, facing page (bottom): Dirk Bakker



For a tough topcoat, go with poly. *Oil-based polyurethanes darken and warm the color of milk paint (left), but they also can change the color, as shown above. Water-based finishes give a colder, brighter appearance, a plus for bright colors and contemporary designs.*

With an inexpensive natural-bristle brush, apply a generous first coat with the grain. Stray bristles or small chunks of undissolved paint can be picked off the surface as you go. Applying a second coat of base color before the first has fully dried seems to help even out the coverage. When the first two coats have dried, scuff-sand with P220-grit paper to a smooth surface and decide whether you need subsequent coats. You can tell a coat is dry by the characteristic papery appearance. Drying time is quick—you can usually recoat in one to two hours—depending on humidity.

Apply as many coats as needed to produce the opacity you want. There is no rule about how many coats to apply. If you want a very smooth finished surface, sand each time between coats. I don't always do this (sometimes I want to achieve a more imperfect-looking surface), but I always sand before applying the topcoat in order to create optimal conditions for adhesion. Let the milk paint dry completely—at least overnight—before protecting it with clear topcoats.

Topcoats: different looks and levels of protection

The bare finish has a distinctive shaded look with subtle imperfections that can be left natural or burnished to a soft sheen using 0000 steel wool. Topcoats add protection but alter the color of the paint. Milk paint is compatible with almost any topcoat, but topcoating is not required; the paint itself is hard and stands up to normal wear on furniture. However, if left unfinished it will quickly pick up and show oils from fingers. A high-traffic area such as a kitchen or a bathroom will need more protection than a keepsake box, picture frame, or wall shelf. Waxes, shellac, and oils provide less protection than polyurethanes.

Whether water-, alcohol-, or oil-based, topcoats will alter the final look, making it darker. Whichever topcoat you plan to use, prepare the painted surface by sanding with P220-grit paper along the grain, then remove the colored dust.

Wax, alcohol, and oil-based topcoats—These topcoats all tend to leave the paint color warmer and darker. Because visually the end result is almost the same, you should consider the level of protection when choosing between them.

Wax, like oil, will darken milk paint. While it is one of the traditional coatings used over milk paint, it won't afford substantial protection from common household substances. Shellac will create a clear, glossy look but give only limited protection against damage by water and oils. Boiled linseed oil and Danish oil are two traditional protective coatings. Apply as many coats as necessary

Polished and modern. *On the clean lines of his contemporary designs, José Regueiro brings milk paint out of its traditional role. This dining table has four coats of milk paint followed by two coats of satin polyurethane.*

Weathered from the start. *Milk paint is the logical finish for this traditional cupboard. To achieve the distressed look, D. Andrew Kates layered different colors of milk paint (scraping through layers) over dark brown aniline dye and completed the finish with a dark brown glaze and wax.*

to build up the luster you desire. These oils will darken the paint's color as well as give the piece a subtle sheen and moderate protection. For a more durable finish—necessary in the case of kitchen or bathroom cabinets, for example—use oil-based polyurethane. Like oils, it will darken the paint's tone and give colors a warmer look. It is important to take this ambering effect into account if you are working with blues, which will shift toward green under oil-based polyurethane. If you are concerned about yellowing, you can always use a water-based polyurethane instead.

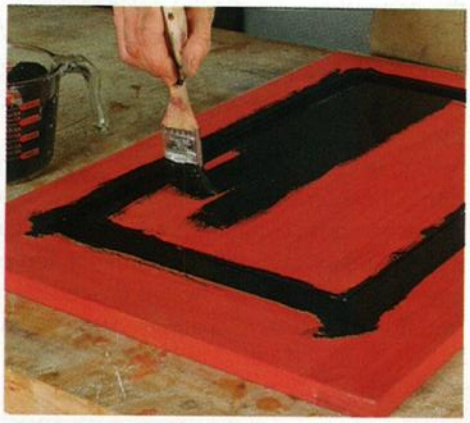
The availability of matte and glossy finishes adds yet another dimension to consider.

Water-based topcoats—Unlike oil-based topcoats, water-based topcoats can make a finish look colder and give it an artificial appearance. This can be a problem over warm colors such as reds and browns. However, this effect can be a positive if the design of the piece calls for a starker look.

Once dry, milk paint forms a coating that is nonsoluble, so it won't dissolve when water-based topcoats are applied. In days past, water-based finishes were not resistant to damage from oil, so you couldn't rely on them to protect a milk-painted surface from such common hazards as a pastry baker's buttery fingers opening cabinet latches in the kitchen. But these days, many

Layer for an aged effect

Simulate centuries. *Hiller applies a coat of black as a second color over two coats of red and finishes with a coat of green. When the final coat dries, she sands through the layers to simulate years of wear and tear (far right). When figuring out where to sand through the layers, try to find a similar piece of old furniture and imitate wear in the same areas.*



Photos, this page (top left): D. Andrew Kates; facing page (bottom right): Phil Harris

Go halfway with a washcoat

Keep grain but add color. *Thinning the paint mixture at a ratio of about 1:4 allows you to see the wood's figure through the milk paint.*

water-based finishes are as good as, if not better than, their oil-based counterparts and offer full protection from oils, water, and alcohol. Some even mimic the warm yellow cast of the oils.

Breaking the mold: special effects

In addition to the opaque finish, you can get a variety of looks with milk paint, depending on how the film is applied.

Layering—Layering different colors and then sanding through in spots so that the base hues appear is a good way to age a piece instantly. When you layer different colors, you should use two coats of the base to ensure that the buildup will be adequate. And whenever you switch colors in layering, be sure to let the paint dry well to prevent the wet colors from mixing together.

Washcoat—A wash made from a dilute solution of paint adds color while allowing the figure to show. Because the finish becomes more opaque with each coat, I use one washcoat only.

My wood of choice for washcoating is cypress because it's close-grained yet has pronounced figure that shows through under the color. It isn't always accessible at local lumberyards, but I have found a great mail-order source, paxtonwood.com. Other woods that could work well with a washcoat are yellow pine, furniture-grade Douglas fir, and maple.

Decorative painting—To paint intricate pictures and graphics, mix milk paint as you would any other artist's paint. To cover a large surface, mix larger quantities of dry powder, adding more of particular colors to obtain the look you want. For small designs, you can blend small batches of color on a ceramic plate just as you would on a painter's palette, adjusting hues as you go.

Because the first coat of milk paint soaks into the wood, it's best to decorate on a background that has already been coated at least twice. The consistency should be thicker when you are decorating than when you are covering an entire surface with one color. Test it on a sample piece that matches the piece you'll be painting. Experiment and have fun. □

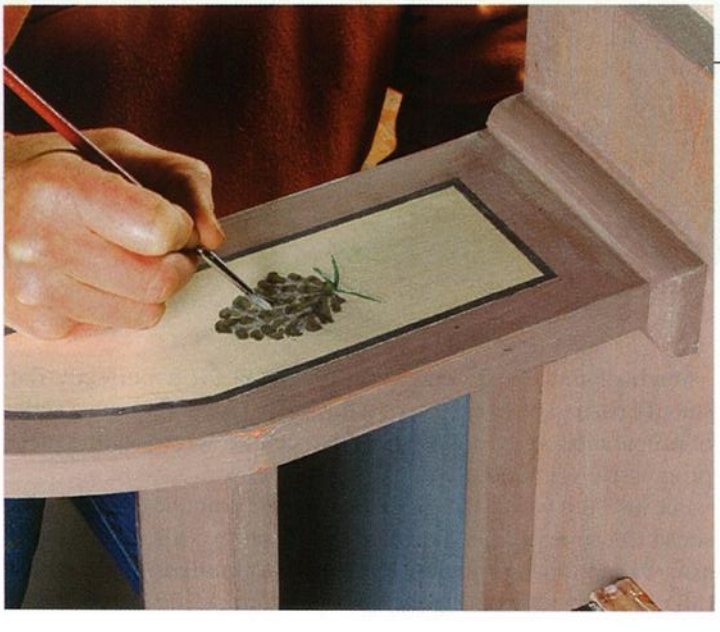
Nancy Hiller owns and operates NR Hiller Design Inc. (nrhillerdesign.com) in Bloomington, Ind.

SOURCES OF SUPPLY

THE OLD FASHIONED MILK PAINT CO. INC.
milkpaint.com

THE REAL MILK PAINT CO.
realmilkpaint.com

Decorative painting



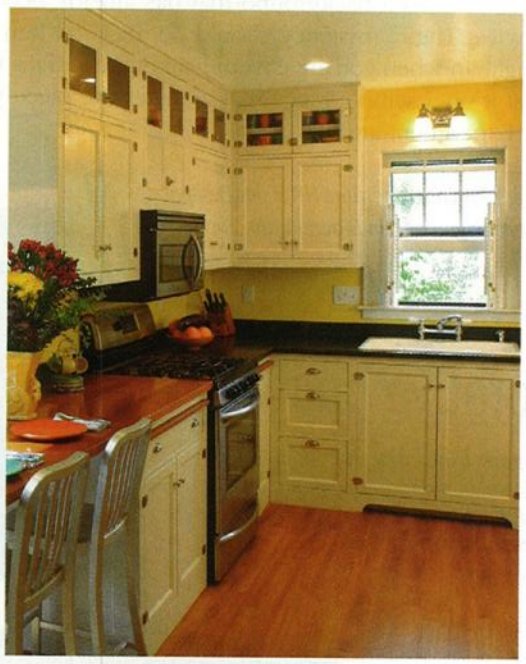
Release your inner artist. *Milk paint is simple to use as a decorative paint. Mix colors to a thicker consistency and apply them with small artists' brushes.*

Deep textures. *Using his furniture as a canvas, Michael deForest paints in layers, sanding through to reveal the colors underneath when necessary. The topcoat is sprayed lacquer.*

Three Steps to a Perfect Painted Finish

Prep and prime before you paint

BY PAUL SNYDER



If you think of paint as something that comes out of a pail and goes on the wall with a roller, you may have trouble picturing it on fine furniture or cabinetry. However, painted built-in cabinets, bookcases, wall units, and furniture are as popular today as they have ever been, and a great paint job stands comparison with the best clear finish. That's true for the beauty of the results and for the care required to achieve them; there is more to a quality painted finish than meets the eye.

Much of the effort centers on the need for a perfectly flat, smooth base for the paint. To get this base, I work through a series of preparation and priming steps that get the surface of the piece progressively smoother.

Because the wood will be hidden under paint, it doesn't make sense to use expensive furniture-grade hardwoods, such as oak, ash, walnut, and mahogany. Poplar, medium-density fiberboard (MDF), birch plywood, pine, and paint-grade alder and maple

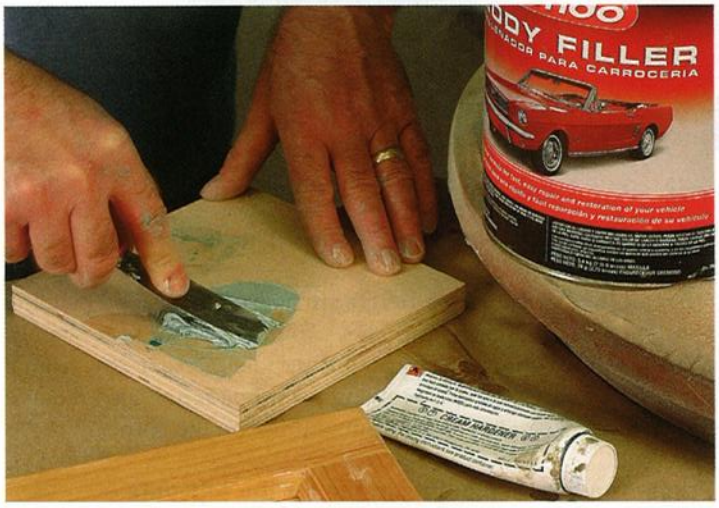
Photos: Mark Schofield

Preparation A filler for every blemish

Fillers under a painted finish don't need to blend into the wood, but they shouldn't shrink as they dry, leaving a low spot that must be refilled. Use fillers that are easy to sand. I also prefer fillers that dry fast.

Some of the best painted finishes are on cars, and auto-supply shops sell fillers that will help you achieve such quality. For fine cracks, flat end grain, and flat MDF edges, automotive spot and glazing putty works well.

Spackle is a good choice on flat or routed end grain and MDF profiles. However, spackle shouldn't be used to fill a deep hole; sanding it can leave a depression in the surface of the piece. Spackle also dries a lot more slowly than other fillers, so use it sparingly.



A smooth surface. *Large holes are best filled with an auto-body filler that must be mixed with a hardener (far left). Fast-drying wood filler is ideal for medium-size holes (near left).*

are more suitable for painting. Paint grade just means the wood has grain or color variations that make it unsuitable for a clear or stained finish.

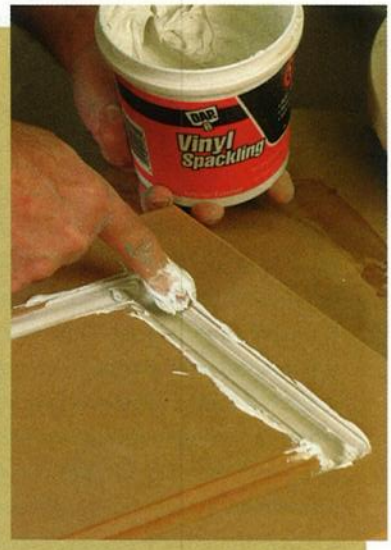
Surface preparation is critical

Getting the wood ready for painting is even more important than preparing it for a clear finish, despite the fact that any repairs will be hidden under the paint. The first step is to inspect all of the surfaces and fill any holes, cracks, and gaps, and remove any glue runs or drips.

Once the filler is dry (for more on the different types of fillers, see "A filler for every blemish," above), sand the wood with P150-grit paper. This grade of paper levels the surface and makes it uniform, but leaves it relatively rough so that the primer still has some "tooth" to latch onto. As you sand each surface, start with any areas that were filled; excess filler will create a high spot that will show up later in the finish. However, filler used in large holes might shrink, leaving a recess that will need to be filled and sanded again.

Pay attention to end grain, edges, and profiles—End grain will soak up a lot of primer if you don't pretreat it. Either seal end grain with glue size, shellac, glazing putty, or spackle and then sand

Tips for MDF



When MDF is cut or routed, a rough, porous surface is exposed. The best way to fill and smooth it is to cover the area with spackle, and then use a small, dampened brush with the bristles cut short to work the excess spackle out of the corners and curves before it has a chance to harden. Once the spackle dries, smooth it with a sanding sponge that can be shaped to fit into the profile.

Avoid using a water-based primer on MDF; it can cause the fibers to swell and leave the surface bumpy. Instead, choose an oil-based primer or alcohol-based shellac.

Priming Select a compatible primer

Primer should be compatible with the topcoats and adhere well to both the wood and the topcoats. The primer also should fill the grain, leaving the surface flat, as well as dry quickly and sand easily. If you'll be using a water-based topcoat, choose a 100% acrylic primer.

There are situations when another type of primer is preferred. On areas prone to staining—wood knots, sap streaks, tannins, and pitch—shellac is the best choice. To simply seal the wood, use clear shellac, but to seal and prime the wood, use pigmented shellac such as Zinnser's BIN.

If the paint you're using contrasts a lot with white primer, tint the primer to a color close to the paint. The paint will obscure the tinted primer with fewer coats, and if the finish is scratched or otherwise damaged, the primer will be less visible.

it smooth; or sand the edges with P220- or higher-grit sandpaper to burnish the surface, which will prevent the primer from soaking in too deeply.

On routed profiles, the aim is to achieve a smooth surface but still retain the crispness of the profile. Automotive glazing putty dries too fast, and glue size is relatively difficult to sand; like shellac, glue size doesn't fill the many small voids that cause a rough texture. I've found that the best filler for profiles is spackle (for more on using spackle, see "Tips for MDF" on p. 89) because it is easy to use and easy to shape when dry. Spackle is especially well suited for filling mitered corners in crown molding, where the detail and location call for a filler that can be spread easily and then sanded.

Break the corners for a better surface—The final preparation is to lightly sand the sharp corners, rounding them over slightly. Known as breaking the corners, this step helps paint flow from a flat surface onto a corner, avoiding paint buildup. It also reduces the chances of sanding through the primer on the corners.

Primer readies a smooth surface for the topcoats

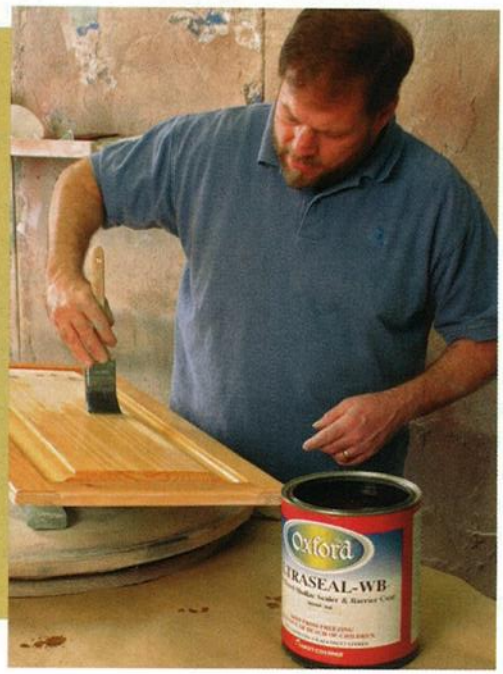
With the obvious defects filled, everything sanded, and the corners broken, it's time to prime. Don't think of primer as being optional; it's indispensable for the flat, smooth base necessary for a painted finish. Primer performs a variety of functions that either the paint itself doesn't do or the primer does better.

The first coat of primer may be absorbed unevenly—Apply an even coat of primer, brushing with the grain when possible. With MDF and maple, one coat of primer often is all that's needed because the substrate is dense and free of pores. Other woods usually take two coats and sometimes three.

Despite the extra preparation on end grain and profiles, these areas still may absorb an excess of primer. The natural instinct is to apply it more heavily to get continuous, even coverage. But applying primer thickly leads to sags and runs and also slows the drying time. A better option is to apply primer in several thin coats until you get uniform coverage.

Seal before priming

I use a clear sealer when I'm painting a piece that's made of wood suitable for a stained or clear-coat finish (such as pine). Applying the sealer makes it easier to strip paint from the piece if someone ever wants to change the look; it's hard to remove every last trace of the pigments when primer or paint is applied to bare wood. An alternative to alcohol-based shellac is a water-based shellac such as Ultra-Seal from Target Coatings. It can be sprayed safely and cleans up with warm, soapy water.



Apply the first coat of primer. *Brush on an even coat. On areas that will absorb the primer, let this coat dry and then apply a second coat.*

Fill small blemishes. *The first coat of primer reveals surface imperfections that may have been missed during the initial preparation.*

Once the primer dries, it's time to find and fix all of the surface flaws that this first coat has revealed. Each little hole, crack, and other imperfection that you didn't see during the surface preparation stands out clearly after the first coat of primer.

Filling, sanding, and applying the next coat of primer—If you need to make minor repairs, and you are working with MDF or a tight-grained wood such as maple, sand the whole surface carefully after the filler dries; use P220 grit on a sanding block or a random-orbit sander. If the primer has soaked in a lot, or if there's a strong grain pattern, the entire surface will need a vigorous sanding, which means you may end up removing most of the primer. If the grain is visible, use P150 grit, sanding until either the wood begins to show through the primer or all the shiny dimples (low spots) on the surface disappear. Use a random-orbit sander on large, flat areas, but on narrow boards, molding, or inside corners, use a sanding sponge. To avoid cutting through the edges and corners on narrow pieces, fold the sponge to fit the width.

With everything sanded, remove the dust and feel the surface with your fingers. Sand any rough areas again as needed. If there are bare spots, prime and sand them again. Then apply a second coat of primer over the entire surface. Sand this additional coat with P220-grit paper and a fine sanding sponge, working carefully to avoid cutting through the primer. When you're finished, remove the dust and inspect the surface to make sure all of the problem

Sand the primer. *Depending on how rough the surface is, sand the first coat of primer using P150- or P220-grit paper on a random-orbit sander. A sanding sponge is a good choice for smoothing moldings.*

Painting Pay top dollar for the topcoat

Paint for interior cabinetry and furniture should be formulated to resist sags and runs, and it should dry fast to avoid excessive dust collection. It also should provide a completely opaque finish after two coats and be durable enough for the intended use of the piece. Don't be tempted to economize with a $15 can of paint from a home center; quality is indicated by price, so be prepared to pay upwards of $30 per gallon for paint used by the pros.

There are a number of quality 100% acrylic and acrylic-enamel house paints. Generally speaking, manufacturers use the term enamel to describe any paint that has a smooth, hard surface. Add a few ounces of Floetrol, a latex paint additive that improves flow-out and leveling, to each gallon you use.

A good paint deserves a good brush. Pay extra for a quality nylon brush with flagged ends (the bristle ends are split). Nylon is softer than polyester or polyester/nylon blends and will help the paint lay down more smoothly with fewer brush-stroke ridges. The flagged ends will leave a finer, smoother pattern.

Try to paint horizontally. *It is easier to get a good finish with no sags or runs if you paint surfaces when they are horizontal.*

areas have been addressed. The surface should look as defect-free as you want the final painted finish to look. If you sanded through to bare wood, prime and sand only those areas again.

Two tinted topcoats are protected by a clear coat

Now that all of the hard work is done, it's time to paint. If more than a day has passed since you last sanded the primed surfaces, go over them quickly and lightly with P220-grit sandpaper. Like other finishes, primer continues to cure for a number of days, so the sanding scratches tend to shrink and close, reducing the bond between primer and paint.

If the paint is tinted and you have more than one can, mix them all together in an empty paint bucket to ensure that you'll have the same color throughout the job. Then pour the paint into a smaller container with a large opening until it's half full. Dip the brush into the paint no more than halfway up the bristles, and gently tap them on the inside wall of the container to remove excess paint.

Brush with the grain in long strokes, holding the paintbrush at about a 45° angle to the surface. Overlap strokes slightly to maintain a wet edge and apply light pressure to keep all of the bristles in contact with the surface. Pull up as you reach the end of a stroke to avoid leaving a ridge. On long surfaces where you need to apply the paint in sections, start a new section just beyond the last strip and brush back into the wet section. Starting in the wet section causes pooling.

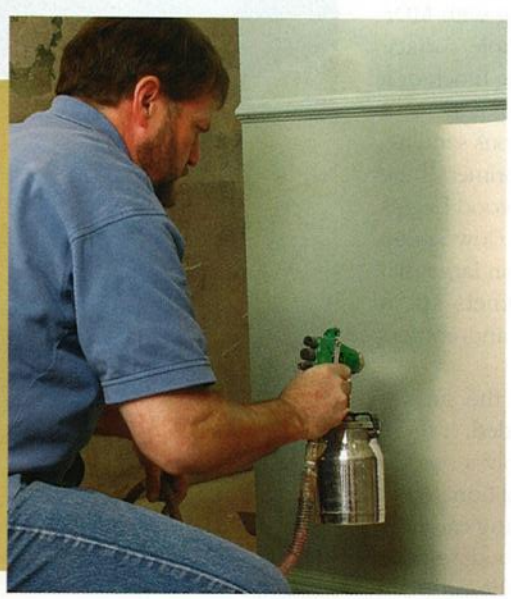
Plan to use two coats of paint. Trying to obtain 100% coverage with one coat encourages applying the paint too thickly. Scuff-sand between coats to promote good adhesion, and allow the paint to dry for at least two weeks to reach optimal durability before putting the piece to use.

Clear-coat the paint—After letting the second coat of paint dry for 24 hours, you can apply a coat of clear finish for improved durability, added depth, and optional sheen adjustment.

The texture of the painted surface and the final sheen determine how much sanding is needed before the clear coat. If the surface is flat and you're planning on a satin or semigloss clear coat, then a

Paints designed for spraying

Spraying is the quickest and easiest way to get a smooth, high-quality finish. I use high-volume, low-pressure (HVLP) spray equipment and select a paint designed for spray application. A couple of good brands are Target Coatings and M.L. Campbell.



FOR PERFECT RESULTS

Choose the right brush. *Use a 2-in. or 2½-in. angled brush to get into small or confined areas (above). Switch to a 3-in. brush for large panels (left), and apply the paint in long, flowing strokes.*

Sand between coats. *Use a fine sanding sponge to smooth the first topcoat. Don't worry about sanding through to the primer in some spots; it is more important to get a smooth surface.*

light scuff-sanding is fine. If there are substantial brush ridges, or if you want a high gloss, the paint should be sanded until it is level.

For hand-sanding, use sanding sponges. Their padding helps to avoid cutting through the paint. For larger flat surfaces, Mirka's Abralon abrasive pads can be attached to a random-orbit sander to make the job faster.

To minimize changes in color, the clear coat should be completely clear, nonyellowing, and compatible with the paint. A water-based polyurethane is a good choice. You will be rewarded with a painted finish that is every bit as attractive as the finest clear finish. □

Paul Snyder is a professional finisher near Fredericksburg, Va.

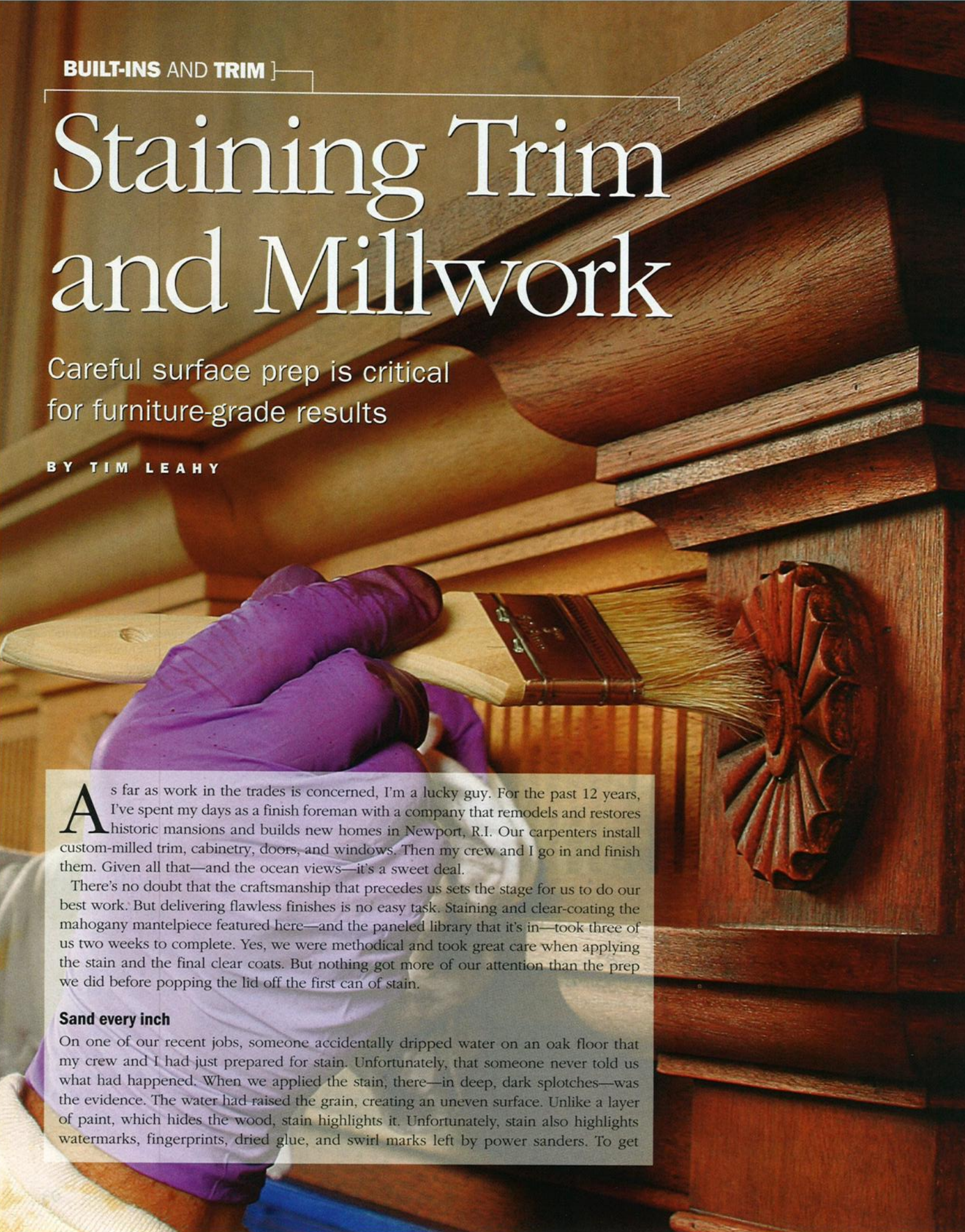
A clear coat is optional

Applying a clear coat protects the paint and gives a look of greater depth. To minimize changes in color, the clear coat should be completely clear, nonyellowing, and compatible with the paint.

Staining Trim and Millwork

Careful surface prep is critical for furniture-grade results

BY TIM LEAHY



As far as work in the trades is concerned, I'm a lucky guy. For the past 12 years, I've spent my days as a finish foreman with a company that remodels and restores historic mansions and builds new homes in Newport, R.I. Our carpenters install custom-milled trim, cabinetry, doors, and windows. Then my crew and I go in and finish them. Given all that—and the ocean views—it's a sweet deal.

There's no doubt that the craftsmanship that precedes us sets the stage for us to do our best work. But delivering flawless finishes is no easy task. Staining and clear-coating the mahogany mantelpiece featured here—and the paneled library that it's in—took three of us two weeks to complete. Yes, we were methodical and took great care when applying the stain and the final clear coats. But nothing got more of our attention than the prep we did before popping the lid off the first can of stain.

Sand every inch

On one of our recent jobs, someone accidentally dripped water on an oak floor that my crew and I had just prepared for stain. Unfortunately, that someone never told us what had happened. When we applied the stain, there—in deep, dark splotches—was the evidence. The water had raised the grain, creating an uneven surface. Unlike a layer of paint, which hides the wood, stain highlights it. Unfortunately, stain also highlights watermarks, fingerprints, dried glue, and swirl marks left by power sanders. To get

consistent results with stain, you can't just sand the blemishes; you need to sand the entire project evenly.

Sanding everything evens the porosity of the wood. Let me explain: When wood is run through a planer or shaper, its outer fibers are compressed, which leaves it with a glazed or glossy appearance. If stain is applied directly over those compressed fibers, it doesn't penetrate the wood the way it's meant to. Sanding opens the fibers evenly, allowing stain to soak into the wood.

The amount of sanding you should do depends on the quality of the wood. If you are staining molding or cabinetry made at a high-quality woodshop or in your own shop, chances are you'll need to sand the surface only lightly. Wood from big-box stores and moldings or cabinetry that has been exposed to temperature and humidity changes will likely need more work. In either case, using the proper grit sequence is important.

Because of the high quality of wood we work with, we typically use a two- or three-step sanding sequence. We thoroughly inspect all the wood first for the problem areas mentioned above, as well as for planer snipe. We do this by holding a light at a 45° angle close to the wood so that the light rakes across the surface. Don't use halogen work lights; they create too much glare. An aluminum clip-on work light with a 150-watt bulb works best.

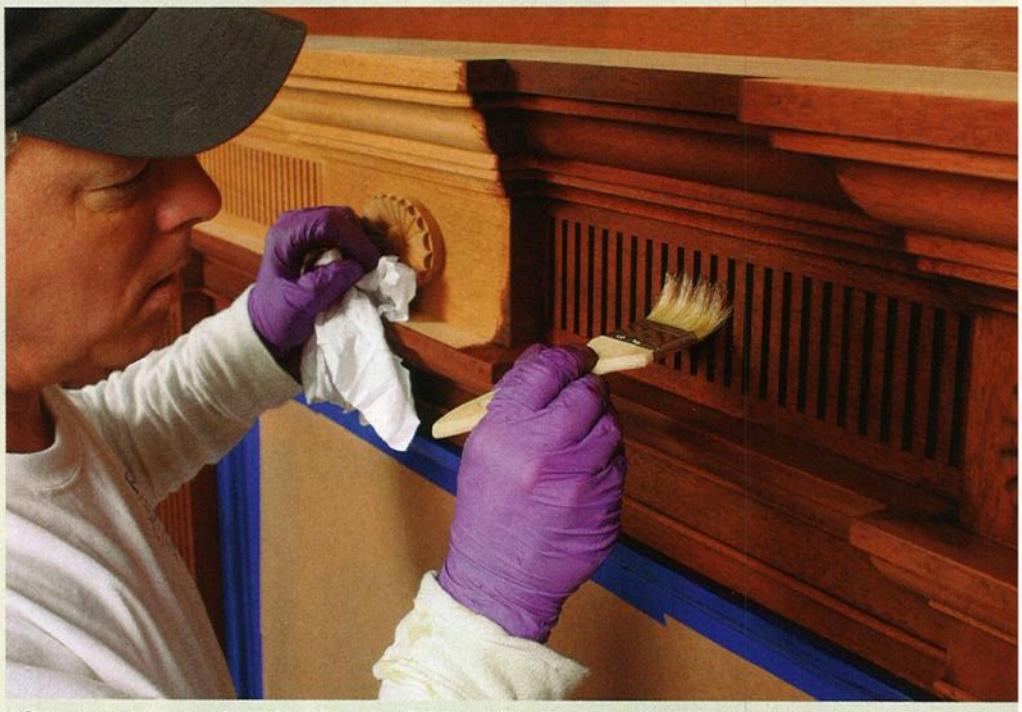
We remove the illuminated trouble spots by sanding along the grain with 120-grit sandpaper. We also lightly sand sharp corners and edges at this point because they splinter easily and don't take finish well.

Once the imperfections are removed, we sand the entire surface with 120-grit paper. Then we sand with 150-grit paper, still working with the grain. We maintain even pressure as we sand, making sure that we don't bear down with our

STEP 1 STAIN **Staining wood is a two-step process. First, brush on the stain. Let it sit for several minutes to achieve its full color potential, then wipe it down with a clean rag. Additional coats yield a darker color but can muddy the grain. Let the stain dry fully before proceeding to Step 2.**

Cut in with a brush. *Working in small sections, apply the stain liberally, and let it sit for several minutes before wiping it off. Apply stain in a neat, orderly process. Excess stain can drip, run, and puddle, which can leak or leach out from behind moldings afterward.*

Wipe with a clean rag. *As you're working across the surface, keep the soaking time consistent for all sections, and pay attention to the edges, profiles, and corners. Replace the cloth when it gets loaded with stain.*



After wiping, use a clean brush to get into crevices. *Inexpensive brushes are great for removing excess stain from tight spots. Have a dry cloth handy to keep bristles dry.*

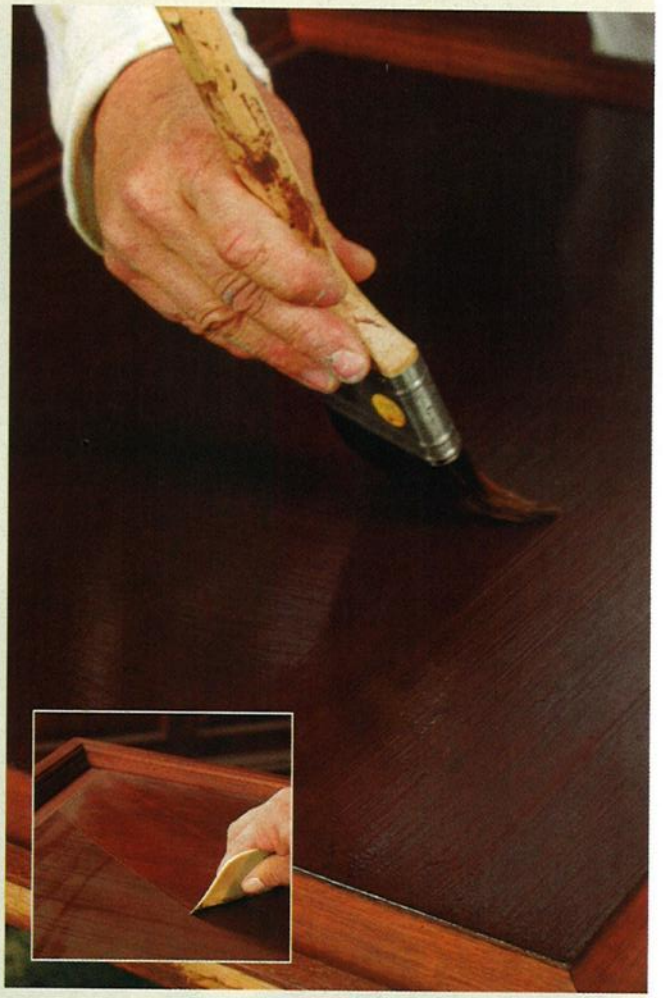
THE SECRET TO DEALING WITH BLEMISHES: WET-SANDING WITH STAIN

When water or glue stains appear after stain is applied, sand the spot with 180- or 220-grit wet/dry sandpaper and stain. Apply stain to the wood and also to the paper; then sand the area in the direction of the grain. Wipe and repeat to remove the spot. Use longer strokes to feather out the area if needed. After the wet sanding, the glue spots are erased. This process also works wonders on scratches.

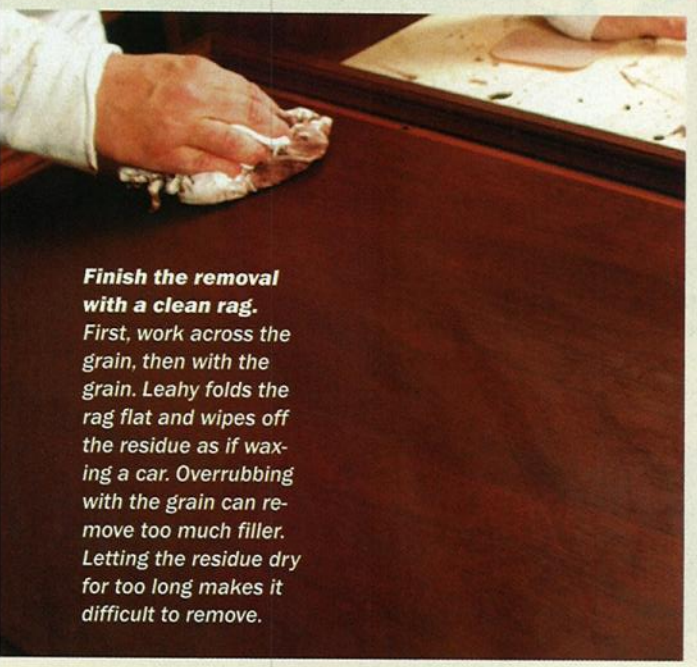
STEP 2 FILL THE GRAIN

Add a grain filler to accent the grain and to smooth the surface of open-grain woods such as mahogany. Filler also can be used on bare wood if no stain is to be applied. If you don't want to use grain filler, skip this step and proceed to Step 3.

Mix the grain filler with the stain to add color to the grain. *Follow the label directions for the proper filler-to-stain ratio and consistency. Here, Leahy accented the grain by using a darker stain. It's also possible to use a lighter stain for a different effect.*



Apply along the grain, then perpendicular to it. *Use a brush, and work in both directions to force the material into the wood pores. Wait for the sheen to dull; then use a rubber squeegee or plastic spreader to remove the excess. Work across the wood at a 45° angle to the grain.*



Finish the removal with a clean rag. *First, work across the grain, then with the grain. Leahy folds the rag flat and wipes off the residue as if waxing a car. Overrubbing with the grain can remove too much filler. Letting the residue dry for too long makes it difficult to remove.*

Don't forget profile transitions. *Filler left on edges or in grooves results in a sloppy look when the piece is finished. A dull putty knife or pointed stick works well to clean these areas.*

fingertips. Doing so could leave sanding marks and stripes.

You can use a random-orbit sander on flat stock and cabinets, and sanding sponges are great for molding profiles. Just make sure to use high-quality sponges from 3M or Norton; their sanding surface is consistent, the granules don't flake off, and they have a stiff sponge material, which gives them crisp edges. Cheap sponges fall apart easily and often lack crisp edges.

Once everything has been sanded, we vacuum and clear sawdust from nooks and crannies with an air hose. We check the surface one more time with our bare hands to make sure it's smooth. Then we lay tarps around the area and bring out the staining supplies.

Premixed stain isn't for every wood

I've seen plenty of beautiful woodwork virtually destroyed by stain because it was applied to wood that's difficult to finish. Pine, cherry, maple, and birch can absorb stain unevenly, often resulting in a blotchy look. To prevent blotching, use a wood conditioner prior to staining these woods. Woods like oak, mahogany, walnut, chestnut, ash, and hickory are easier to stain. Their porosity is more consistent, so they take stain more evenly.

Off-the-shelf oil-based wiping stains such as Minwax are easy to use. They are premixed, so they are ready to use straight from the can. They also dry slowly, so they can be pushed around the surface easily to avoid lap marks. Dye stains, on the other hand, require mixing and dry much more quickly, so they are more difficult to use. Dye stain can be the best option for blotch-prone woods, however. (To learn more, see "Cherry Without Blotches," pp. 76-81.)

Using premixed stain, as we did on this project, is a two-step process: applying the stain, then wiping it off. We apply stain from the bottom up so that an errant drip doesn't hit bare wood. It's possible to apply it with a rag, but a tapered top-quality paintbrush with natural bristles is the best choice. These brushes offer better control over the stain, which is crucial when working around molding profiles. To prevent lap marks, we cut in every surface as if we were painting trim. To remove any excess stain, a rag is the tool of choice, though brushes are helpful in tight spots.

To heighten the level of finish on open-grain woods like oak, hickory, and ma-

Photos: Chris Ermides

hogany, we often apply a grain filler like Behlen's Pore-O-Pac (www.behlen.co.uk) once we're done staining. Grain filler produces a smooth surface and is often used on fine furniture and musical instruments. Whether we end the coloring process with stain or grain filler, we wait at least 18 to 24 hours before applying the finish coats.

Topcoats serve many purposes

Topcoats protect. They also affect the overall feel and final look of the wood. Products like teak oil, furniture oil, or Danish oil create a natural look. They highlight the grain, but because they soak into the wood, natural finishes don't leave a durable film that protects the surface. Use them for projects that won't be exposed to much sunlight or wear and tear. Oil finishes are typically brushed on, then wiped off with a rag, so they're easy to work with.

Film-forming finishes create a hard, durable surface and a lens that allows light to accent color and grain. The most commonly used film-forming finishes include varnish, shellac, polyurethane, and lacquer, which I'm applying here.

Each of the film finishes I mentioned is available in waterborne and solvent-based formulations. To protect wood from alcohol, water, and ultraviolet (UV) light, we typically use varnish or a conversion finish with UV-blockers. For a durable finish that comes close to an antiqued look, choose lacquer or shellac. And, as you guessed, the most commonly used hand-applied finish is polyurethane. It doesn't spray well, so we don't use it often. We like to use lacquer because it is easy to spray and dries quickly.

We prefer to spray clear coats because spraying produces the smoothest finish. Spraying also allows us to apply thin layers so that it's easy to fix problems that present themselves after the first coat. We can sand down the initial thin layer to fix a stain blemish that we missed, and we can blend the clear finish around that area when we're done. Despite the great working conditions and projects, there always seems to be something that needs a little extra attention. □

Tim Leahy is a finish foreman for restoration contractor and builder Kirby Perkins Construction in Newport, R.I.

STEP 3 TOPCOAT

Apply three to four coats of clear finish to protect the wood and to enhance its tones. Fill the nail holes after the first coat. If you fill them before the wood is sealed, the filler will penetrate the pores around the holes, creating a smudged look. Sand between each coat with fine sandpaper, and rub down the surface with a tack cloth between coats.

A properly applied spray finish gives a furniture-like quality to this library. *The first coat of precatalyzed lacquer makes the wood come to life. When spraying lacquer or any other finish, maintain a wet edge at all times. Safe working conditions require good ventilation, a respirator, and a Tyvek suit.*

OR

Brushed-on polyurethane is a great choice, too. *Always use a high-quality brush. Also, thin the first coat with mineral spirits or naphtha for a base layer void of brush marks. Then follow with two coats straight from the can. Make sure the area and the air are clean so that dust doesn't settle on the surface as the polyurethane dries.*

Scuff each coat for the smoothest result. *Use 400- or 600-grit sandpaper, 0000 steel wool, or fine Scotch-Brite pads to remove dust nibs and to prepare the surface for subsequent topcoats. Be careful not to sand through the clear coat and remove stain around profile edges.*

Last-minute touch-up. *Leahy fills imperfections and nail holes after the first topcoat so that the putty matches the wood tone exactly. Force the material into the hole; then wipe it clean. You might need to mix two or three colors to match various tones in the piece.*

Custom Finishes for

Layers of dye and glaze add instant character to inexpensive doors

BY PETER GEDRYS

More often than not, wood interior and exterior doors are finished using a premixed pigment stain. The results are typically less than stellar. The stain ends up too dark, the grain becomes muddy and obscured, or the finish is blotchy.

Besides, there is more to finishing than just changing the color of wood. By understanding the finishing products available to you and by learning how to combine them in creative ways, you can dramatically improve the final product. Even a brand-new pine slab door like the one featured here can be finished with a warm, antique glow.

Get a feel for sanding

If the door is already installed, pop it off its hinges and bring it to your shop, your garage, or another well-ventilated area of your house, then lay it flat on sawhorses.

Don't assume that a store-bought door will be ready for finish. Every square inch of wood needs to be sanded, wet down, then sanded again.

On a softwood like pine, I start sanding with P150-grit paper; harder woods should begin with P120 grit. I occasionally use an orbital sander for the initial sanding, but not when I switch to higher grits. If you use an orbital sander for the first pass, make sure to remove any swirl marks. Keep in mind that nothing can get into the details on a door as well as a piece of handheld sandpaper.

After the first sanding, I dampen the door with a wet cloth to raise the grain; then I do a second round of sanding. I sometimes use a finer grit to ease any sharp edges, but otherwise, there's rarely a reason to go higher than P180 grit. Finally, I clean the door with a vacuum or blow it clear with an air compressor; then I wipe it down with a lint-free cloth.

Use a dye for background color

Now that the door is sanded, it's ready for the first layer of color: a dye stain. I prefer to work with powdered dyes because I find that powder gives me much better control over color strength. I like to mix batches of dye at double strength (2 oz. of dye to 1 qt. of warm distilled water), then add water as needed to get the look I'm after.

To help control the penetration of the dye so that the entire surface of the door absorbs the same, I first apply a thin washcoat. For this project, I used shellac—3 parts of denatured alcohol to 1 part 2-lb. cut shellac. Distilled water also can be used; your choice depends on the look you are trying to achieve. A washcoat of shellac partially seals the surface of the door and controls the penetration of the color. Water, though, soaks into the pores of the wood, helping to control the absorption of the dye and creating more variation between light and dark areas.

Seal the dye, and apply the glaze

After applying the dye, use shellac to create a thin film finish over the dye in preparation for the glaze coat that comes next. Remember, shellac dries faster than oil-based products, so it becomes tacky quickly. Coat the surface with as few brush strokes as necessary to cover the wood, then leave it alone. On the plus side, quick drying time means that I can apply three coats in

Photos, except where noted: Justin Fink

Interior Doors

UNFINISHED PINE DOOR

STEP 1
Sand and wash

Sand, raise the grain, then sand again. *After a light sanding with P150-grit sandpaper, wipe the surface of the door with a wet cloth to raise the grain. Then begin a second round of sanding with P150-grit sandpaper, working your way up to 180 grit. It can be hard to gauge sanding progress by eye, so run your free hand over the surface of the door to feel which areas need more attention. For best results, sand with the grain. Use a wooden block as a backer for sanding the flat areas, and crease the sandpaper as needed to work into the door's details.*

Prep the wood with a washcoat. *To help control the penetration of the dye, first use a pad to apply a washcoat of shellac or water. For an even-colored look, use shellac (shown here), which seals the wood surface. If you want to create more definition between light and dark areas, use distilled water instead of shellac. The water simply soaks the pores of the wood so that the dye can be absorbed more predictably.*

under an hour. There's no need for sanding between coats, but you do need to sand the final coat lightly with 220-grit sandpaper and wipe the door surface with a clean cloth in preparation for the glaze coat.

A water-based stain can be used for the glaze, but oil stains dry more slowly, which makes blending easier. Either way, don't use a conventional liquid penetrating stain; it's too thin and doesn't have as much depth of color. That said, gel stains used out of the can are a bit too thick. I like to thin the gel to a creamy consistency and extend its working time by mixing in a bit of clear glaze base. A basic recipe is 1 part glaze base, 1 part mineral spirits, and 2 parts gel stain.

The glaze mixture can be applied using a brush, a paper towel, or a pad. You also can manipulate the glaze to achieve different looks. The glaze can be feathered with a dry brush to create a soft, even color, removed in the center of a panel and pulled into the corners, or pounced with a brush to create light and dark areas where desired. Have fun with it. If you don't like what you see, simply wipe the surface before it dries, and start again. If the surface has started to become tacky, wet a paper towel or a rag with mineral spirits to remove the glaze easily from the sealed surface. Once you have the surface glazed, let it sit for at least a day prior to finishing.

Lock in the glaze with a clear coat

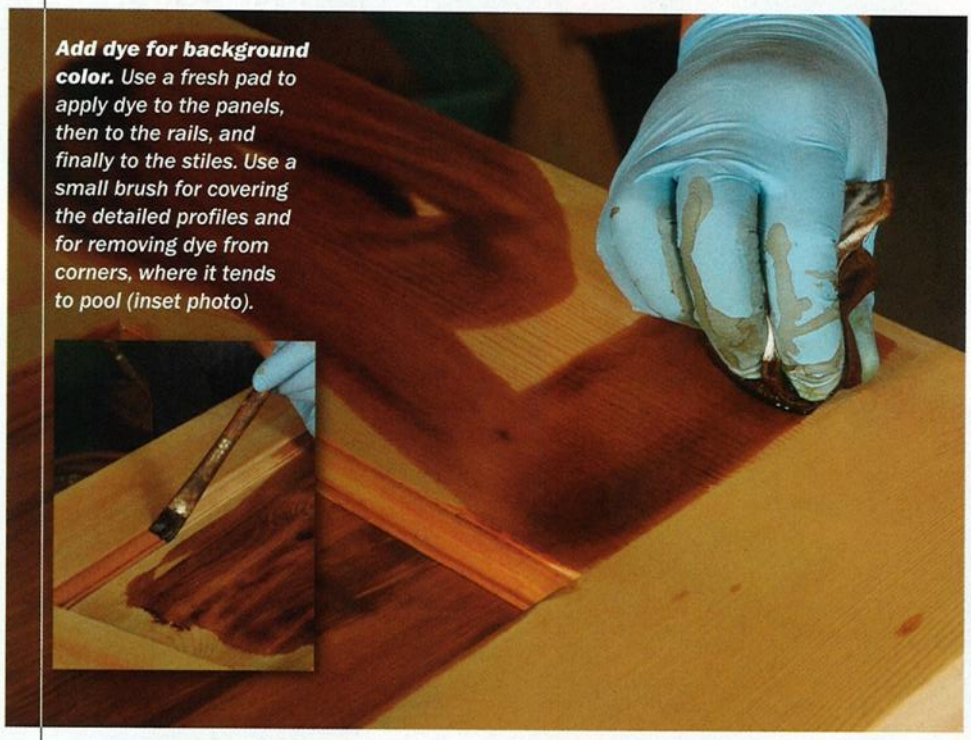
Before applying the final protective clear coat, it's a good idea to seal or lock in the glaze with another application of shellac. The shellac can be sprayed, brushed, or padded on, but take care with brushing and padding because these application techniques can lift the glaze in areas if you are too aggressive.

The topcoat can be polyurethane, varnish, lacquer, or additional coats of shellac followed by a coat of paste wax, which is what I did for the project shown here. Avoid using penetrating finishes such as boiled linseed oil for the final clear coat. This type of finish needs to soak into the surface of the wood to cure properly, and the layers of shellac prevent this penetration, leaving you with a sticky mess.

Peter Gedrys is a professional finisher in East Haddam, Conn.

STEP 2
Dye and seal

Don't be intimidated; dye is simple. *Add 2 oz. of dye to 1 qt. of clean water, and stir the mixture until the powder dissolves. Then smear a sample onto a white paper plate to check the strength of the color. If the mixture is too weak, add more dye. Too strong, add more water.*



Add dye for background color. *Use a fresh pad to apply dye to the panels, then to the rails, and finally to the stiles. Use a small brush for covering the detailed profiles and for removing dye from corners, where it tends to pool (inset photo).*

Dry dye looks dull. *Once dry, the dye will leave the door with a flat, dull appearance. This will change after the seal coat is applied next. Regardless of whether water or shellac is used for the washcoat, the seal coat should be shellac. Apply it with a brush or pad, taking care not to lift the dye. Apply three coats, lightly sanding only after the last coat.*

STEP 3
Apply glaze

When it comes to glaze, less is more. *A glaze coat doesn't need to be thick. A few ounces goes a long way, so don't mix a big batch unless you need it. A basic recipe is 1 part glaze base, 1 part mineral spirits, and 2 parts gel stain. A pad is best for applying this coat, but a brush or cloth is fine, too. Again, work sequentially, starting with the panels, then the rails, and finally the stiles.*

Few things are as forgiving as a glaze. *As the glaze is applied, use a clean, soft brush to feather out any application marks and to even the color. If any light-colored areas need a bit of extra darkening, dab them with a pad or brush, then remove the excess. If at any point you're not happy with the look of the glaze, you can wipe it off with a clean cloth before it dries. Once you're OK with the look, let the glaze dry, and add a clear topcoat.*

STEP 4
Topcoat

Seal the deal with shellac and wax. *For a nice tactile surface, use a topcoat of shellac followed by a coat of paste wax applied with 0000 steel wool to create a softer sheen. Finally, buff out the wax with a soft, lint-free cloth. The finished door will have a wonderful surface that is a pleasure to touch.*

SHOPPING LIST

Finishing materials vary based on the look you want to achieve. Here are the supplies you need to finish the door shown here.

POWDER DYE
Early American Maple, medium yellow, about $7 per oz. wdlockwood.com

SHELLAC
Zinsser's SealCoat, $13 per qt. zinsser.com

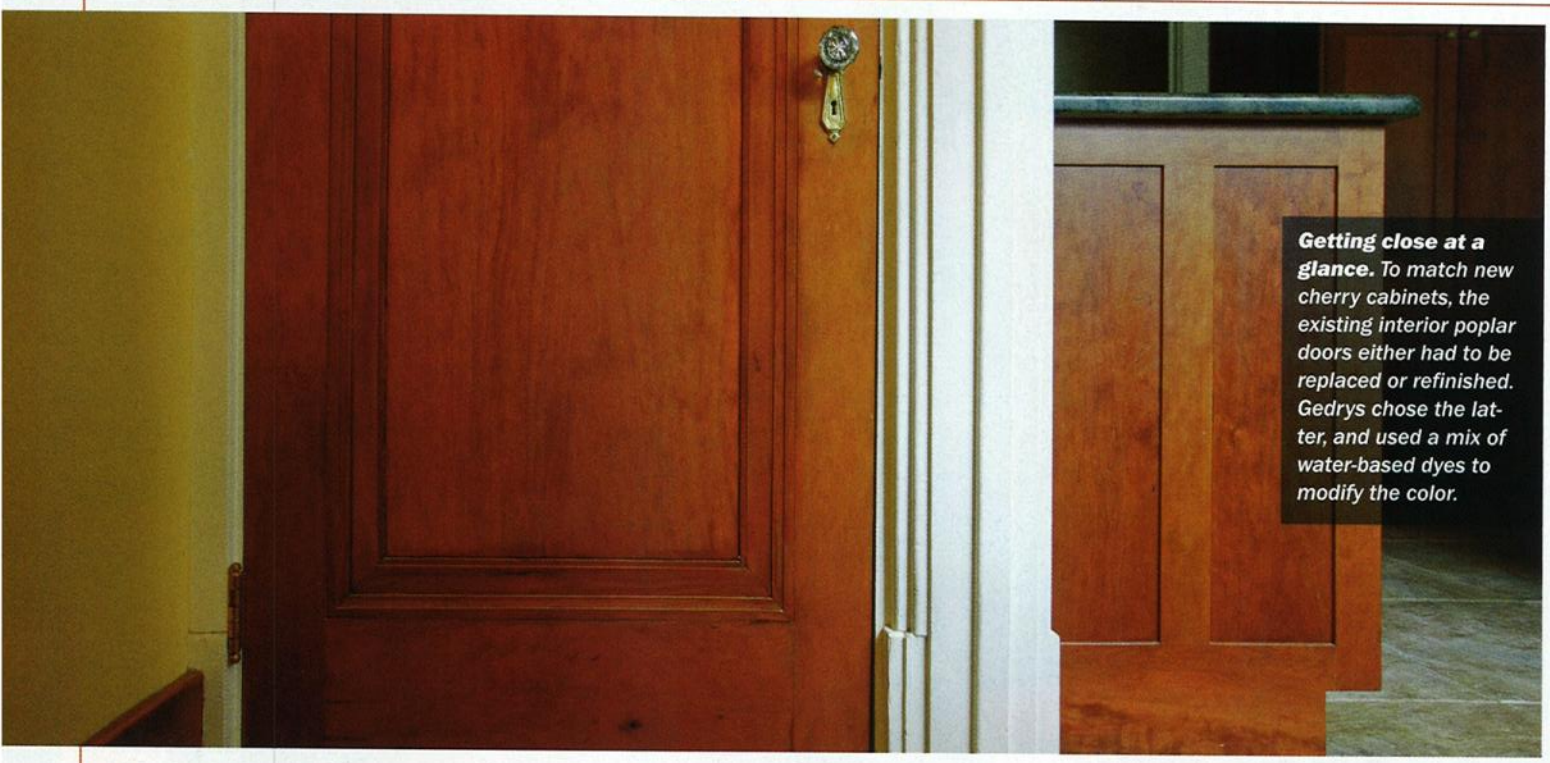
OIL-BASED GEL STAIN
Brown Mahogany, $11 per pt. generalfinishes.com

ALKYD GLAZE BASE
Benjamin Moore #409, $15 per qt. benjaminmoore.com

CLEAR PASTE WAX
Liberon Black Bison fine paste wax, $20 liberon.com.au

0000 STEEL WOOL
Four-pack of pads, $7 liberon.com.au

Use dyes to transform poplar into cherry



Getting close at a glance. *To match new cherry cabinets, the existing interior poplar doors either had to be replaced or refinished. Gedrys chose the latter, and used a mix of water-based dyes to modify the color.*

When we updated the kitchen in our 1920s home, we decided the cabinets should be made of cherry. However, I wanted everything else to be visually in tune with the new cabinets, and an adjacent door happened to be made of clear-finished poplar (a common choice back then). My solution was to turn the poplar into cherry. Historically, furniture makers also used stained or dyed poplar as an inexpensive alternative to the more desirable cherry. Using a sample cabinet door, I'll show how I transformed the color. You can use the same techniques to change the color of almost any species of wood.

The easiest way to begin the finish is with a dye; unlike pigmented stains, dyes are transparent and won't muddy the surface of the wood. I prefer to make dyes from water-soluble powders because they offer greater color control. Water-based dyes are also extremely economical. You can make a gallon of color for as little as $20, and it goes a long way.

The only problem with a water-based dye is that it will raise the wood's grain, so before applying the dye, I sand, lightly dampen the surface, let it dry for 10 minutes, and then give it a final sanding.

APPLY A BASE LAYER OF COLOR

Mix dye powder into hot distilled water, and let it cool. Check the strength of the dye on white paper, and adjust accordingly. Just to be safe, strain any undissolved dye particles with a fine paint filter. Flood the surface with dye, starting with the panel and progressing to the frame. Allow it to sit, and wipe off any excess.

Catch drips before they start. *When finishing paneled doors, it's a good idea to blow a little compressed air around the hips of the panel to force out the dye that has migrated behind the rails and stiles. Otherwise, pooled dye will dry and create a halo along the hip.*

Photos, this spread: Charles Bickford

Another option is to dye the wood, wait until it's dry, then seal the surface with a thin wash of shellac. The raised fibers will be locked in the sealer and can be easily sanded smooth without affecting the color.

MAKE COLOR SAMPLES FIRST

I make a color sample in four steps. First, I pick the general color range (yellow brown, red brown, deep brown, etc.), and then dye a sample piece of the same species. I put the sample next to the color I want to match. If my sample looks light or washed out, I add more powder to the dye mix and adjust the warmth or coolness as required. Next, I adjust the color depth by making sure the value (light or dark) matches. Finally, I apply a coat of the clear finish I plan to use, which enlivens the color.

For these samples, I used two colors, both from W.D. Lockwood (wdlockwood.com): golden amber maple and antique cherry. A small scale is handy for weighing exact amounts of powder, but for this project, I measured by volume. I mixed about 2 oz. of powder into 16 oz. of water.

—P.G.

ADD MORE DYE UNTIL THE COLOR IS RIGHT

After the first layer of color is dry, a second dye can be applied to modify the color further. When that's dry, brush the surface with a thin washcoat of shellac. The color can be tweaked further with a layer of stain before the final topcoat is applied.

Move the process along. *Because the dye doesn't have a flammable base, you can use a heat gun or hair dryer to speed up the drying time between coats.*

Topcoat ready. *When the color closely resembles cherry, the clear finish can be applied, which adds the final depth to the color.*

TRICK OF THE TRADE

Use scrap pieces to dial in color

Start the matching process with a sample of wood and a dye color close to the wood to be matched. Adjust the finish with second or third colors as necessary. Colors dominated by reds and yellows are considered warm, and those with greens and blues are cool. For example, maple dyes are generally warm yellows. Some, like honey amber and golden amber, lean more toward orange-yellow. If you need to neutralize the orange, add a small amount of its complementary color, which is blue. (Complementary colors sit opposite each other on the color wheel.) Other colors, such as mahoganies, tend to run the gamut from orange-red to purple-red and can be used to warm a color as well as change its value (the light or dark aspect). Walnuts lean toward the cooler green-brown side of the spectrum and are useful in balancing a dye that is too red.

The faux cherry used on the sample door above is a mix of golden amber maple and antique cherry.

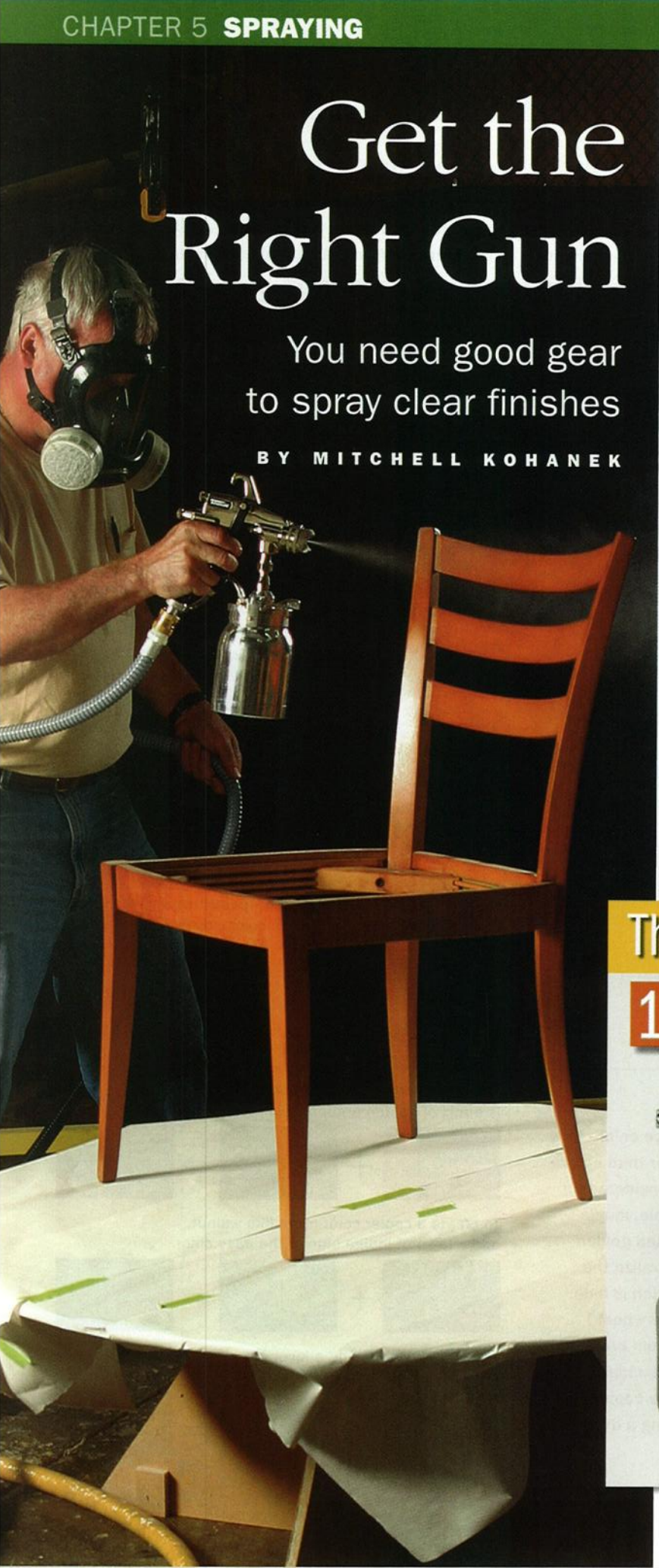
To create a cooler color more like walnut, add a layer of indigo blue to the base color.

To warm the color, add a layer of medium yellow maple instead.

Get the Right Gun

You need good gear to spray clear finishes

BY MITCHELL KOHANEK



When professional finishers talk about an "off-the-gun finish," they are describing a finish so smooth that it doesn't require sanding. Achieving this finishing perfection requires practice and knowledge of finishes, but above all, the right equipment.

I looked at top-quality guns capable of spraying clear furniture finishes. The two main types are those powered by a turbine and those that run off an air compressor. I focused this review further by considering only guns that can spray water-based finishes, as most people don't own explosion-proof spray booths and shouldn't spray solvent-based finishes. Also, water-based finishes are among the most difficult to atomize, so if your gun can spray them well, it should be able to handle most solvent finishes and paints. These requirements ruled out the $100 hardware-store spray guns, but I discovered that you can get a beautiful finish for around $500—and spend far more for inferior results.

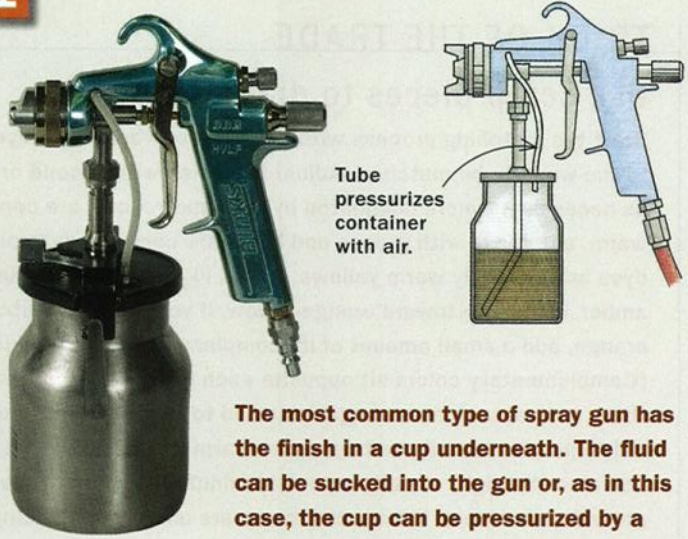
What happens when you mix air and finish

To understand spraying, you need to grasp two conflicting concepts: atomization and transfer efficiency. Atomization is forcing a liquid to become small, round particles; the smaller the particle, the better the look of the coating. Large particles can produce an effect known as "orange peel." There are many reasons for this pebbly look, but poor atomization is one of the most common.

Early spray guns used air at high pressure (45 to 90 lb. per square inch, or psi) at the tip of the gun to blast the liquid finish into a fine mist of tiny particles. This produced a beautiful, smooth finish, but only about 25% of the liquid ended up on the object being sprayed. The rest

Three containers for finish

1 SUCTION-CUP GUN



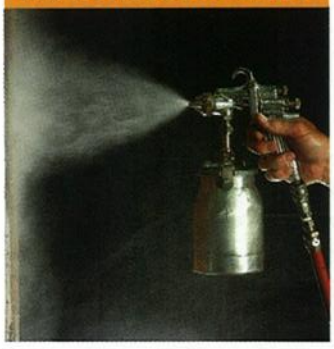
The most common type of spray gun has the finish in a cup underneath. The fluid can be sucked into the gun or, as in this case, the cup can be pressurized by a plastic tube from the gun.

Photos: Mark Schofield; drawings: Vince Babak

Choose a low-pressure gun

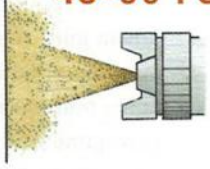
High-volume, low-pressure (HVLP) spray guns use enough air to atomize the fluid into small, even-sized particles, but at lower pressure, so less spray bounces off the target.

HIGH-PRESSURE GUNS

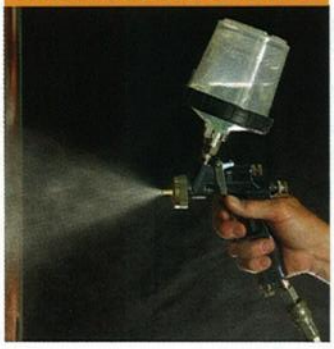


Old-fashioned high-pressure spray guns atomized the finish into a fine mist. This gave a good finish, but only about 25% of the liquid ended up on the workpiece.

45–90 PSI

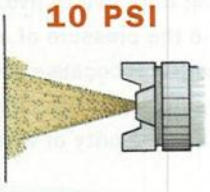


LOW-PRESSURE GUNS



Sophisticated HVLP guns also give good atomization, but their lower pressure means that far more of the finish ends up on the workpiece.

10 PSI



missed the target or bounced off because of the high pressure. To improve on this 25% transfer efficiency, high-volume, low-pressure (HVLP) guns were developed. HVLP technology reduces to a maximum of 10 psi the amount of air needed to atomize liquid. This increases the transfer efficiency to between 65% and 90%, but at a price: You spray more slowly and the quality of atomization varies among systems.

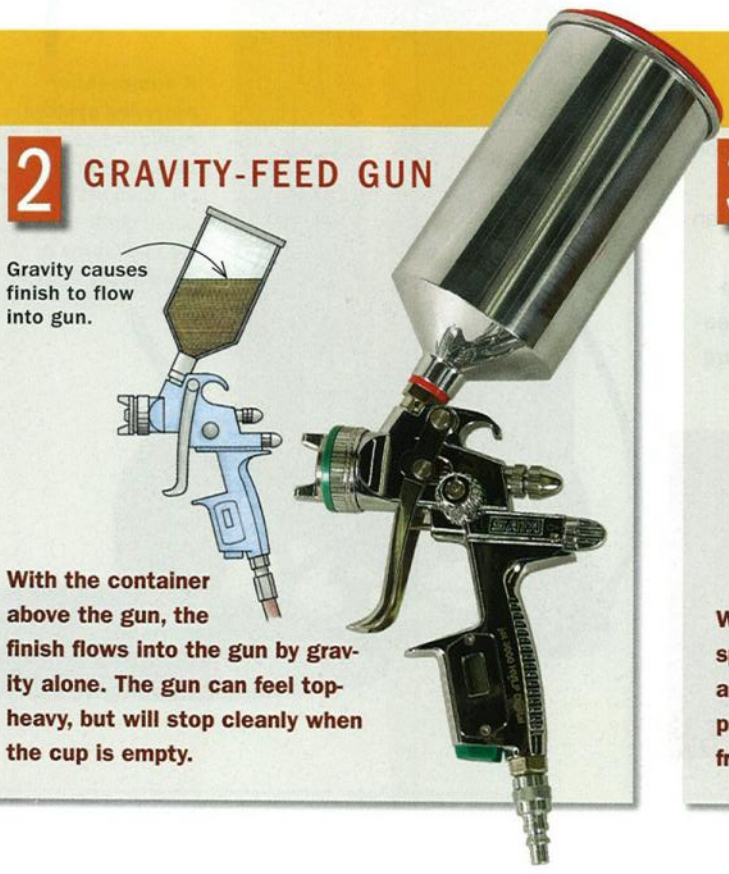
Making sense of this information

The first step is to decide if turbines or compressed-air guns are right for you. You may decide it's worth paying for a turbine system to get the simplicity of a whole system designed to work together. If so, I recommend you save money and go for a three-stage turbine. In my testing, I didn't see better results with a four-stager. If you have a compressor, check its capacity and then have a retailer match it to a suitable gun. If you intend to spray only small projects, or a large piece in sections, you can team a small compressor with a low-air-consumption HVLP or LVLP gun such as the Sata Minijet IV (around $350). If large tabletops are on your list of things to spray, use at least a midsize compressor and invest in a pressure pot.

Whatever gun you choose, practice spraying on ¼-in.-thick plywood to dial in the adjustments. Sooner than you think, you, too, will achieve an off-the-gun finish.

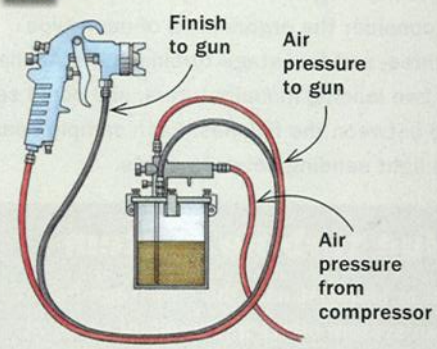
Mitchell Kohanek contributed to this article.

2 GRAVITY-FEED GUN



With the container above the gun, the finish flows into the gun by gravity alone. The gun can feel top-heavy, but will stop cleanly when the cup is empty.

3 PRESSURE POT



Without a cup of fluid attached to it, a spray gun is much more maneuverable and can access tight spaces. Small pressure pots can be carried or hung from a belt.

Two ways to propel the finish

Your next decision is whether to buy a turbine system or a spray gun that uses a compressor.

TURBINE: ONE-STOP SHOPPING BUT BULKIER EQUIPMENT

Turbines are matched with guns and hoses and sold as a complete package. They are rated by their number of fans (or stages), ranging from two to five. The higher the number, the greater the volume and the pressure of air they can pump out. All turbines are considered HVLP because they don't shoot more than 10 psi at the tip of the gun. A good-quality three-stage turbine with around 6 psi will spray the majority of water-based finishes and set you back around $880; a four-stage model with 8 psi gives you the flexibility to spray thicker water-based finishes and paints, and to spray faster, but costs about $200 more.

The turbine package. *The advantage of buying a turbine is that you get everything you need to start spraying, with good instructions.*

Turbine technology demands larger, heavier guns and hoses than compressed-air guns, so consider the ergonomics of each type before you buy. I tested three- and four-stage turbines from Apollo and Turbinaire, two leading manufacturers, and could see little difference between the finishes. Each sample board required only a light sanding between coats.

Best-value turbine system

For occasional or hobbyist use, the two-stage Earlex turbine and gun system offers an excellent value at $300. Slower operation and lighter components separate this unit from pricier models, but the Earlex had no trouble atomizing a water-based lacquer, with a final surface that required just a bit more sanding.

GOT A COMPRESSOR? USE IT TO POWER YOUR SPRAY GUN

If you already have compressed air in your shop, you probably will opt for a compressor-driven gun. The capacity of the compressor, in terms of how much air it can deliver in cubic feet per minute (cfm) at what psi, will determine which gun is compatible. A 2- to 5-hp, 20- to 25-gal. midsize model ($350 to $600) is adequate for many guns, and I even used a Sata Minijet successfully with a portable

A compressor-powered system. *A midsize compressor is enough for many HVLP spray guns, but you also will need a hose and a filter.*

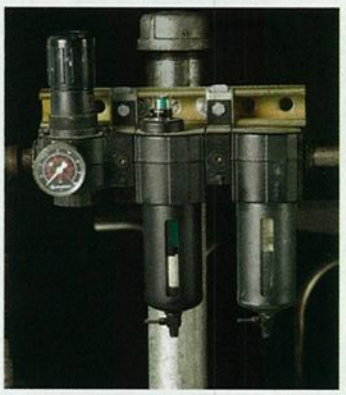
1.6-hp, 4.5-gal. compressor (similar models cost $100 to $250). The compressor ran continuously but it never starved the gun of air. An advantage of compressor-driven guns is that they generally have a greater maximum pressure at the tip than a turbine gun. This means you can increase the psi to achieve better atomization of thicker finishes, but at the cost of lower transfer efficiency. Using a midsize compressor, I've had good results from HVLP guns made by Binks, Kremlin, and Sata, among others.

Compressed-air guns also come in an LVLP (low-volume, low-pressure) category. Because they use less air, you can get by with a smaller compressor, but you generally pay the price in slower spraying. Better guns are constantly being developed, however. In a spray test, all the compressed-air guns received an A grade for producing excellent off-the-gun finishes.

You'll need the right supply hose ($10 to $50) to connect the compressor to the gun. The smaller the internal diameter (ID) of the hose and the greater its length, the more the pressure will drop between the compressor and the gun. It is recommended that an air hose with a 5/16-in. ID be limited to no more than 20 ft., a 3/8-in. ID hose to 50 ft., and a 1/2-in. ID hose to 100 ft. On many occasions the wrong hose size is to blame for a poor finish, not the gun or the coating. A good way to make sure that you have sufficient pressure is to attach a pressure gauge ($15 to $40) at the base of the gun. Alternatively, some guns come with a built-in digital readout in the handle.

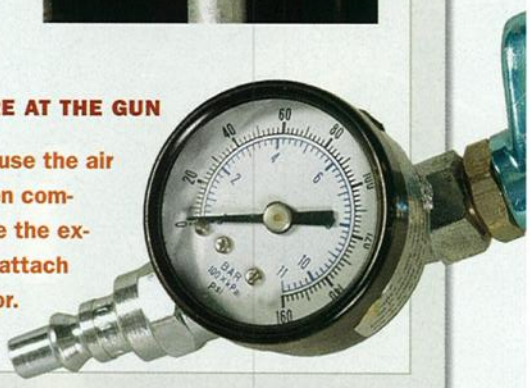
YOU'LL NEED A FILTER

Compressed air leaving the tank contains small amounts of water, oil, and other contaminants. If allowed to pass through your gun, they create unpleasant finishing defects. You need to invest in some kind of filter. Disposable filters for around $30, attached between the gun and the air hose, are worthwhile if you only spray occasionally. The crystals inside turn from blue to mauve as they become saturated (above). If you intend to spray regularly, invest in a coalescing filter (right) made up of a series of filters you change every six to 12 months depending on the amount of use. These run $75 to $175 depending on the specifications.



CHECK THE PRESSURE AT THE GUN

Long or small hoses cause the air pressure to drop between compressor and gun. To measure the exact air pressure at the gun, attach a pressure gauge or regulator.



Small investment for good results

If you don't mind spraying slowly, you can achieve a great finish for under $500 with a portable compressor and a small spray gun.

How to Troubleshoot

Learn to handle the typical problems and

BY JEFF JEWITT

As the technical troubleshooter for my business, I've been asked to solve just about every spray-gun problem imaginable, from a new gun that just hisses air to an old gun that used to spray perfectly and now leaves a horrible finish. The good news is that in most cases, you can diagnose the cause of the problem by analyzing the spray pattern. In a few other situations, a slight change in your spraying technique can help. Even if you're just considering taking the leap into spray finishing, knowing how to achieve and maintain a good spray pattern will give you the confidence you need.

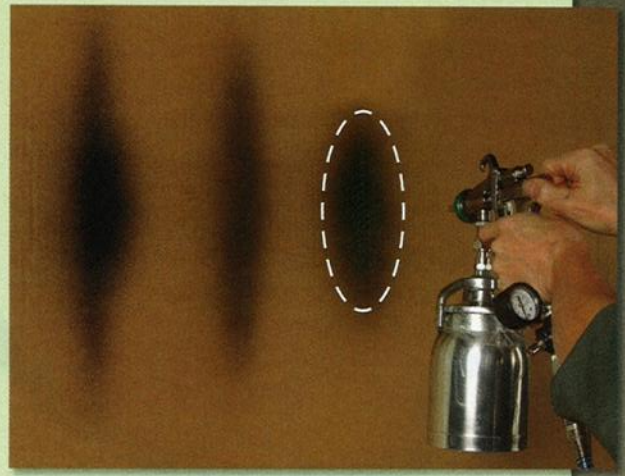
Since all spray guns operate on the same basic principle, it doesn't matter whether you have a high-volume, low-pressure (HVLP) gun or a non-HVLP gun, a turbine-driven system or a compressor-driven system. When differences exist, I'll call them out.

Most of the time some finish comes out of the gun, just not in a manner to give that thin, even coating that makes spraying so worthwhile. One of the most common problems is uneven coverage, which leaves a repeating light/dark effect when the finish dries. You can study the spray pattern with a light shining through it. If you find this difficult, spray some dark finish or stain onto cardboard. If you substitute a dark finish for a clear one just to test the pattern, be sure that it has a comparable viscosity.

Jeff Jewitt, who runs a finishing-supply company (homesteadfinishingproducts.com), writes frequently about finishing.

Test your gun

You want the gun to spray an elliptical pattern consisting of fine, even-sized droplets (far right). Most of the time, spraying clear finish onto cardboard will give you a legible spray pattern while the finish is wet. For an even clearer pattern, spray black stain or paint onto the cardboard as shown in this article's test panels.

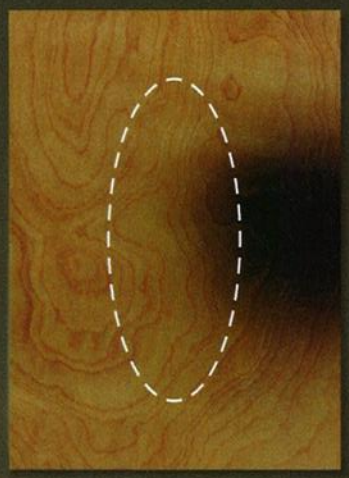


Photos: Mark Schofield; drawings: Vince Babak

a Spray Gun

enjoy carefree spray-finishing

Pattern heavy on one side



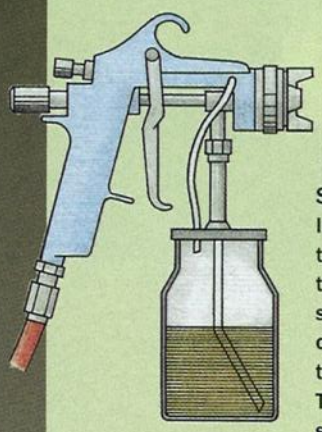
The typical culprit for this is a plugged or partially clogged air-cap port. It's easy to diagnose: Just rotate the air cap 180° and if the problem side reverses, then it's the air cap. Remove the air cap and soak it in lacquer thinner. Use micro-brushes to clean the air-cap ports as best you can. The ports meet inside the air cap at a 90° angle, so come in from both sides. A blow gun that has a protective rubber tip can be used to blow out the ports, but wear eye protection in case some thinner splashes out (I speak from painful experience).

If the pattern does not reverse when you rotate the air cap, then it is the fluid nozzle that is clogged, causing the spray to veer to one side as it exits the gun. If you have a gravity gun, you can easily diagnose a partially obstructed nozzle by unhooking the air line and pulling the trigger completely back with solvent or finish in the gun. The liquid should come out in a steady stream if the nozzle is clear. If you have a compressor-driven pressure cup and the gun has a cheater valve (an internal air shutoff), simply close the cheater valve and pull the trigger. Again, the finish/solvent should come straight out the front. On suction and turbine-driven pressure cups you can't do this, so you'll just have to see if cleaning the nozzle helps.

One side clogged. *To find out if a clogged port on one side of an air cap is causing the spray pattern to be heavy on one side, rotate the air cap 180° and see if the heavy pattern also changes.*

Blow out the problem. *Air ports have a 90° turn in the air cap, so the easiest way to clean them is to blow out any obstruction with compressed air.*

Which type of gun do you have?



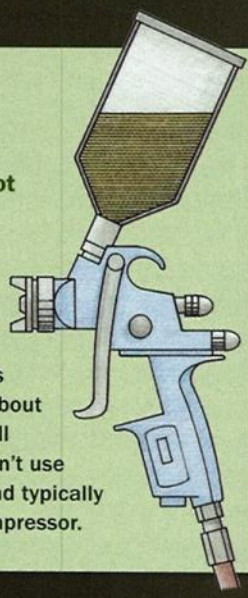
Spray guns come in two basic designs. Siphon cups (also called suction cups) have the storage cup under the spray gun, while gravity guns put it on top. To troubleshoot correctly, you need to know which type you have.

SIPHON CUPS

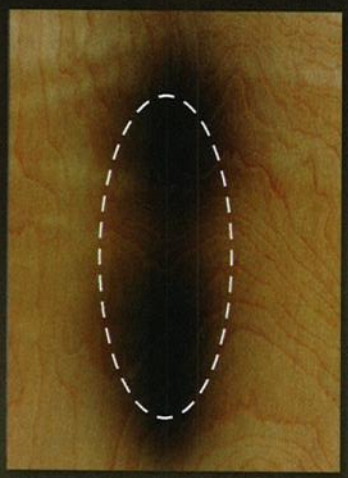
In a standard siphon cup, air exiting the front of the gun creates suction, pulling the finish up into the gun through a metal tube. With a pressurized siphon cup (usually called a pressure cup), the cup is pressurized by an external or internal tube that diverts a small amount of air from the gun. This pushes the finish up into the gun. All turbine systems use pressurized siphon cups.

GRAVITY CUPS

With the cup on top, gravity alone pushes the finish down into the gun. Gravity guns range from full-size cups (about 20 to 25 oz.) to detail guns (about 4 to 5 oz.) used for touchup and small projects. These small gravity guns don't use much air (4 cubic feet per minute) and typically can be run with a small portable compressor.

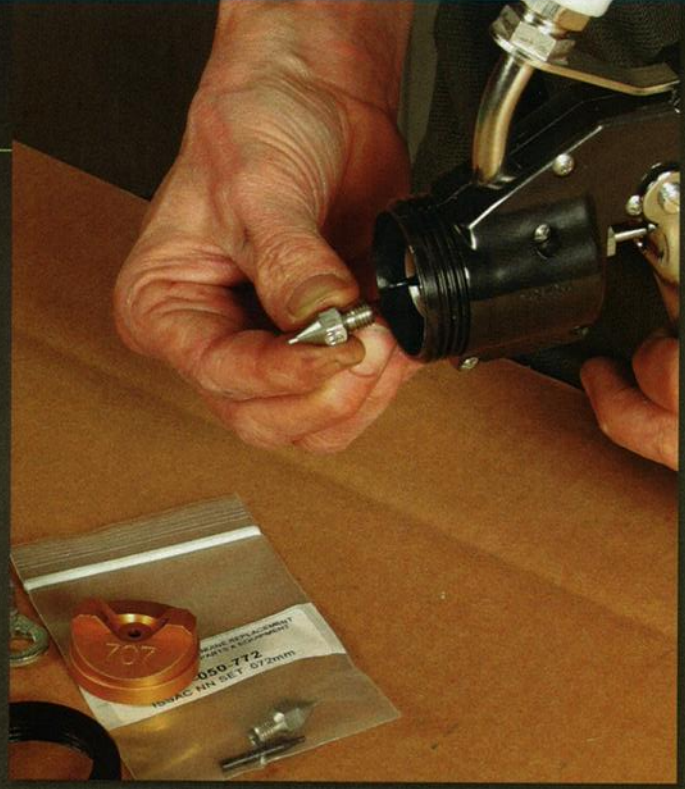


Pattern split in the center



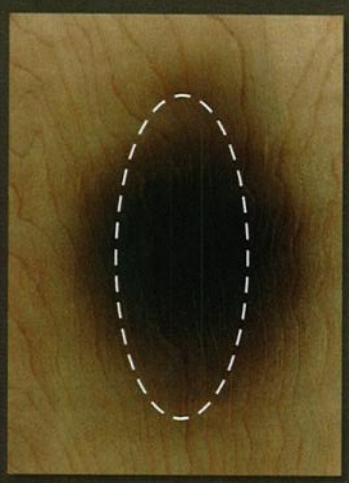
Less pressure. *If there is no finish in the center of the spray pattern, try turning down the air pressure on the compressor or turbine.*

If there is no finish in the center of the spray pattern, more than likely the air pressure is too high. Lower it and see if the problem gets better. On the few turbine models that lack air regulation, switch to a smaller fluid nozzle.



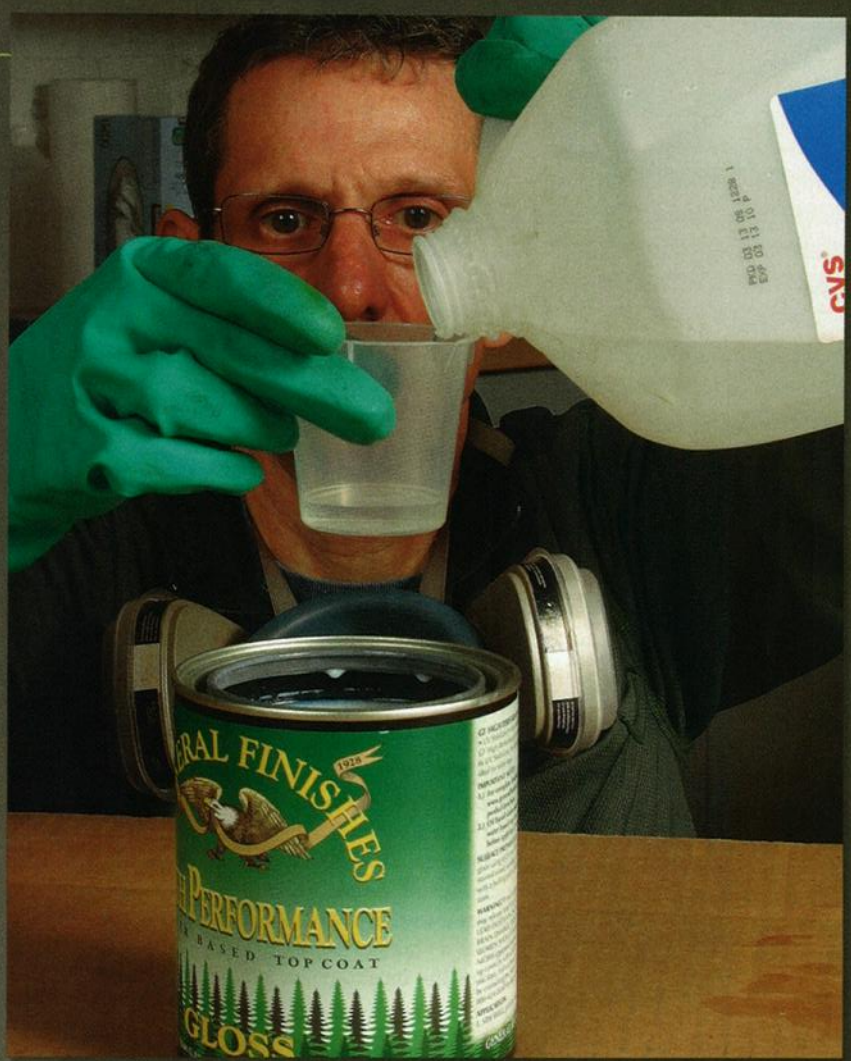
Adjust the nozzle. *If adjusting the air pressure doesn't solve the problem, switching to a smaller fluid nozzle may help.*

Pattern heavy in the center



Thin the finish. *If you can't turn up the pressure, try thinning the finish in 10% increments.*

If most of the finish is in the center, the air pressure is too low. If you can adjust the pressure, turn it up. On a compressor-driven system, turn down the atomizing air using either the compressor output regulator or a secondary supply regulator. This regulator can be wall-mounted if you have a metal air pipe, or a mini-regulator attached to the base of the gun. With turbines, all you can do is to turn down the atomizing air with an air-control valve mounted on or near the base of the gun. If your turbine has a speed control, you can adjust it for a slower speed, which reduces the air. If you can't adjust the pressure, try thinning the product or switching to a larger fluid nozzle.

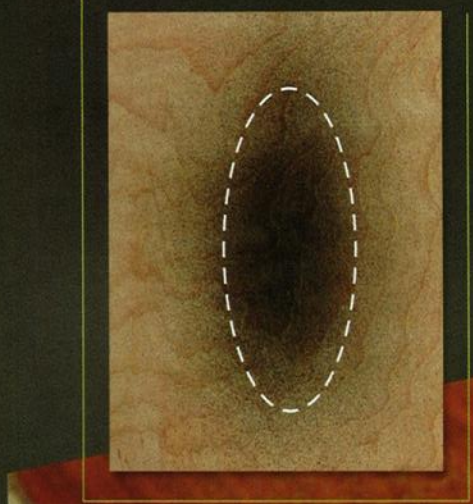


You can't get a wide fan pattern

On a suction-feed gun, try thinning the finish, or even just spraying some solvent to see if you can get a wide pattern. If that doesn't help, try increasing the atomizing pressure. If both these steps fail, then install a larger nozzle.

Though unlikely, both air ports on the aircap may be clogged, so remove and clean them as explained earlier. As a final cause, the fan-width adjustment valve assembly may be damaged or faulty, in which case you should return the gun if it is under warranty or seek out a repair shop. On gravity and pressure-cup guns, follow the same sequence of steps, but don't increase the atomizing pressure.

Coarse spray pattern



If your dried finish has little dimples all over it resembling the skin of an orange, you have "orange peel." Poor atomization (large droplets) is the main culprit, and this is often easiest to see if the spray pattern is backlit.

On all compressor-driven guns, try increasing the air pressure and see if the coarse pattern improves. If it doesn't, you can try thinning the product in 10% increments until it improves. If neither works, try a smaller nozzle.

With a turbine gun, make sure the air control (if you have one) or the speed control for the turbine is opened all the way. If this doesn't work, try thinning the material and then switching to a smaller nozzle.

Too much overspray

HVLP systems should limit overspray to 20% to 30% of the finish. If you think you're getting more, you can reduce it by turning down the air pressure. Just keep in mind that when you do this, the finish quality will start to suffer, at some point resulting in the orange-peel effect described above.

Bounce back. *Old-fashioned spray guns created large amounts of overspray (right). Modern HVLP guns are designed to avoid this.*

Throttle back the air. *To reduce overspray, simply reduce the air pressure. If you build a dedicated spray booth, consider installing a combination regulator and air cleaner attached to the wall (above). The cleaner ensures that no contaminants reach the finish.*

Dry or rough spray, or no spray at all

If the finish feels rough when it dries, there are some possible causes common to all guns. You may not be depositing enough finish: Try slowing down your motion as you spray to leave more finish on the surface. Likewise, the gun may be too far from the surface. The correct distance is 4 in. to 6 in. for HVLP and 6 in. to 8 in. for non-HVLP.

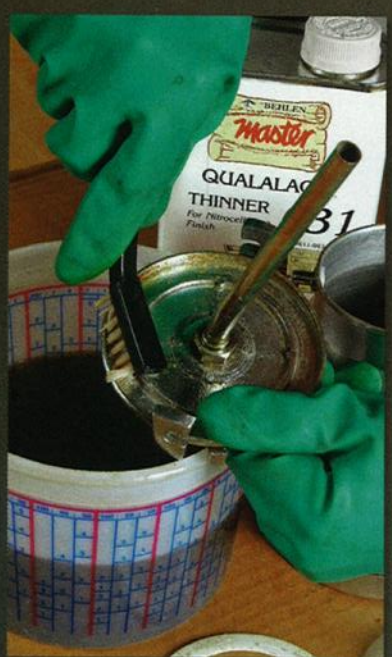
It could be that the overspray is landing on your work after you spray. Use a fan to remove the overspray. Last, the finish may be drying too fast because it's hot and dry. Use a retarder specified by the manufacturer to give the finish a longer time to flow out into a smooth film.

In extreme circumstances, you may get no finish coming out of the gun. You pull the trigger and hear air coming through the front but no finish comes out, or it sprays a little and then stops. All standard siphon and gravity cups have a small vent hole that allows air to enter the cup to displace the finish volume as it's pulled out through the fluid nozzle. Use a toothpick or micro-brush (see opposite page) to clear the vent hole. If there's a fair amount of hardened finish in the hole, soak the top in lacquer thinner, but be sure to remove any gaskets first.

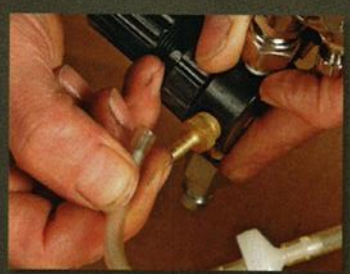
If that doesn't work, remove the fluid nozzle and see if it's clogged. Soak it in lacquer thinner to soften any dried finish and ream it clean with a micro-brush. Finally check the fluid pickup tube and see if it is clogged.

Get closer. *If you use an HVLP gun more than about 6 in. from the surface, you run the risk of creating a rough surface.*

Slow things down. *A finish that dries before it can flow out will leave a rough surface. Adding a suitable retarder slows the evaporation and lets the finish dry smooth.*



Remove dried-on finish. *Soaking gun parts in lacquer thinner is the best way to remove hardened finish, but first remove non-metal parts.*



Trouble in the tube. *If the tube that pressurizes a pot is clogged, finish will not fully flow to the gun. Remove the tube from the base of the gun and the top of the pot (above), and then blow through the tube to see if the check valve or tube is blocked (below).*

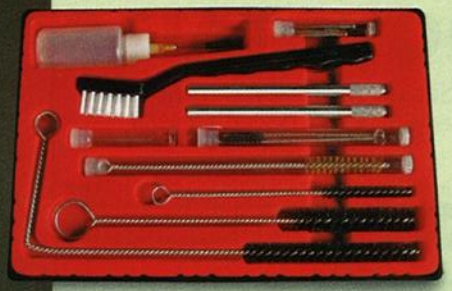
Clean the splash guard. *The small pressure vent can get plugged with dried finish, interrupting the flow. Use micro-brushes in a spray-gun cleaning kit to clean the hole.*

Regular cleaning prevents most problems

If you are spraying a fast-drying finish such as shellac, solvent-based lacquer, or a water-based finish, each coat is likely to be 1 to 2 hours apart, so leaving finish in the gun between coats doesn't cause problems. However, if the finish needs to dry overnight, or if you change to a different finish, you should clean the gun.

When you use solvent-based lacquer and shellac, any new finish in the gun will re-melt any dried finish, so you typically don't have to clean the gun thoroughly. Just run some lacquer thinner or denatured alcohol through it, depending on the finish.

Finishes that require more diligence in cleaning are water-based and oil-based products (including latex and oil paint) because the cleanup solvent won't remove the dried finish. Therefore you should clean the gun soon after use. When cleaning guns that sprayed paints, remove the air cap, fluid nozzle, and needle so you can clean more thoroughly. The chart below tells you which solvent works best to clean the different finish types, or you can check the finish container for the proper solvent. Note that some products require a different cleaner once they have dried.



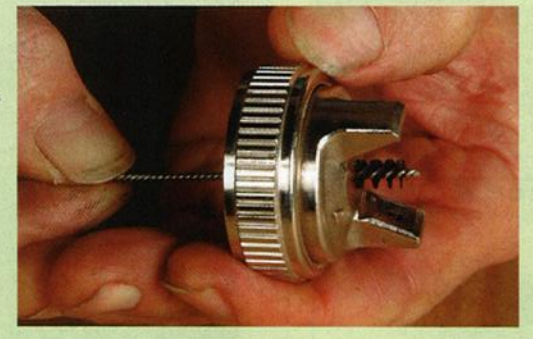
Buy a full cleaning kit. *To keep spray guns working properly, a cleaning kit should contain special brushes and needles to access the different parts of the gun.*

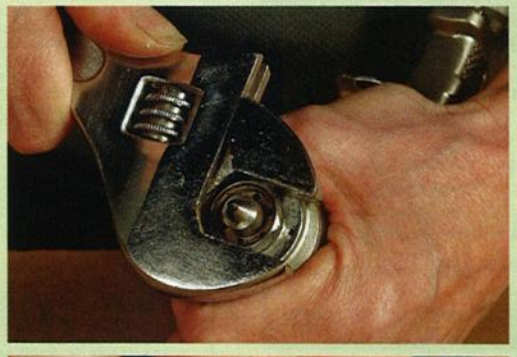
A thorough going-over. *After spraying waterborne or oil-based finishes, guns need to be stripped down and thoroughly cleaned right after use.*

FOR CLEANUP, MATCH SOLVENT TO FINISH

Finish	To rinse/clean	To remove dried finish
Shellac	Denatured alcohol	Denatured alcohol
Solvent lacquer	Lacquer thinner	Lacquer thinner
Waterborne finishes and latex paint	Water followed by denatured alcohol	Acetone/lacquer thinner
Oil-based finishes and oil paint	Mineral spirits/paint thinner/naphtha	Lacquer thinner

Let fluid flow. *Use a large brush to clean the main nozzle in the center of the air cap where finish exits the gun.*





Air supply. *The small holes on either side of the fluid nozzle supply air that atomizes the finish. Clean them using thin needles.*

Don't forget the needle and nozzle. *After removing the air cap, unscrew the nozzle (top), and then use a micro-brush to clean inside it.*

WOODWORKERS MART

when all else fails

10 Best Fixes for Finishing Mistakes

CURES FOR COMMON PROBLEMS, AND HOW TO PREVENT THEM IN THE FIRST PLACE

BY TERI MASASCHI

Hobbyists and professionals alike make mistakes in the shop. When you're building a piece, fixing an error is fairly straightforward: Back up and start again by milling a new piece, recutting a joint, or fitting in a patch. But finishing mistakes can be harder to overcome—hence the dread many woodworkers feel.

Problems can pop up at any one of three points in the finishing process—surface preparation (and assembly), staining and coloring, and applying the topcoat. I'll show you some of the methods I use as a professional to keep mistakes from happening in the first place, and to repair them when they do.

The best way to avoid mistakes altogether is to practice on a sample board. Testing the colors and materials you want to use will alert you to problems before you risk ruining an expensive project. Also, resist the urge to rush through the finishing process. You can nearly always tell when someone has taken a shortcut.

And finally, even if you make mistakes you can't fix, after suffering through them you probably won't repeat the same ones again.

Teri Masaschi is a professional finisher who lives near Albuquerque, N.M.

Surface flaws

The most common pitfalls are sanding swirls and tearout, sanding through the veneer of hardwood plywood, and glue squeeze-out. Many of these maladies can occur even if you're trying to be meticulous. And you might not see the problem until it glares at you through a freshly applied coat of oil or stain.

1 SCRATCHES AND TEAROUT

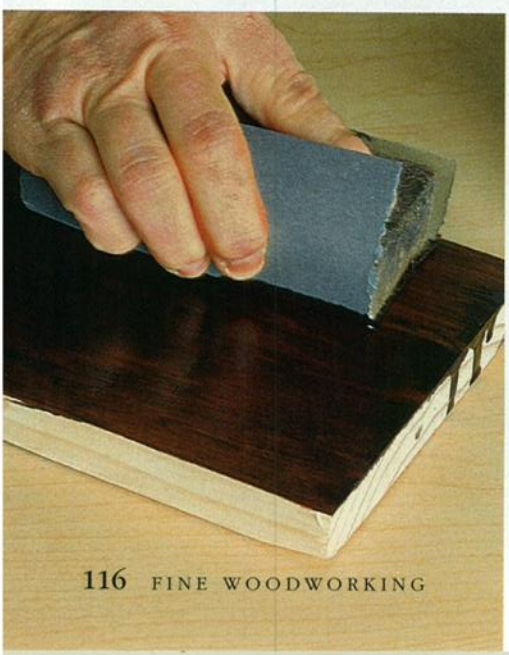
Not smooth enough. *Swirl marks tell you that you haven't done enough sanding to eliminate scratches.*

Problem: A random-orbit sander left its signature pigtail marks, or you didn't use the right paper to eliminate scratches left by coarser grits. Or, cutting or planing tore out some wood fibers, leaving a divot in the surface. If the first swipe of stain shows vivid swirls or scratches all over the work, stop.

Solution: Sand the piece again, this time changing paper frequently and working your way systematically through the grits. If you've oiled or stained the piece and find that swirls show up in only one or two spots, sand those areas by hand with P220-grit wet-or-dry paper, wetting it with some of the same finish you used. This method works well with most oil finishes or oil-based pigment stains. If you used stain, reapply it carefully to match the surrounding stained areas. If you used a dye, resand a stand-alone area, such as an entire stile. If it is a large surface, sand the damaged area, feathering the edge between sanded and unsanded parts. Then apply more dye.

To eliminate tearout, sand, plane, or scrape the surface. Wipe the surface with mineral spirits to check the smoothness. If the imperfections are small enough (generally no larger than a pinhead), you can fill them after you've stained and sealed the piece, using fill sticks, the wax crayons sold for touching up scratches.

If you aren't coloring the wood, small amounts of tearout can be OK in some places (legs, frames, etc.). But stain makes them pop.



Smoothing slurry. *Wet-sanding with the oil or stain you used helps eliminate swirls more rapidly without ruining the color.*

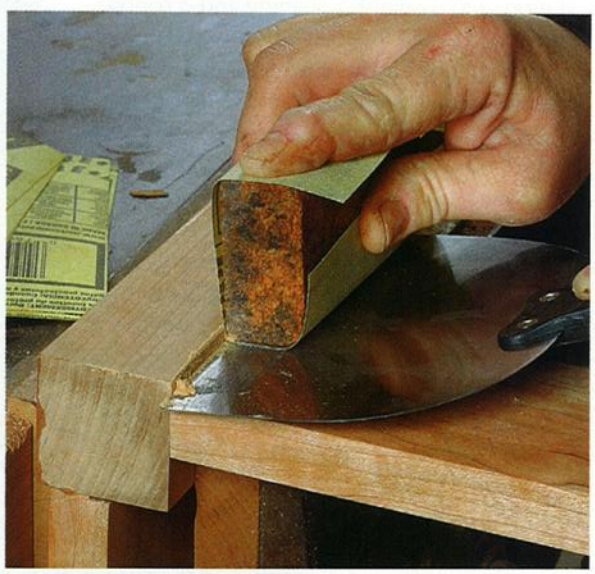
2 GLUE RESIDUE

Problem: You used too much glue, leaving squeeze-out around the joint. Or you got sloppy and left a gluey fingerprint on the workpiece. Oil or stain won't penetrate the glue residue, leaving an unsightly light spot.

Uneven oiling. *Glue residue on this mortise-and-tenon joint prevents the wood from absorbing oil evenly.*

Solution: You can get rid of some fingerprints by wet-sanding with the stain you used, or by lightly sanding and reapplying the stain.

Use a sharp chisel to eliminate dried glue from around a joint. Use sandpaper to clear up areas where you didn't completely wipe away squeeze-out. Wrap P220-grit paper around a hard block and sand with the grain, using firm pressure. To avoid scratching adjacent surfaces, use a 6-in. flexible drywall knife as a shield.



Touch-up. *When removing glue squeeze-out, sand with the grain using P220-grit sandpaper. Keep the block flat against the work to avoid rounding over an edge. Shield adjacent surfaces with a wide drywall knife.*

Photos, except where noted: David Heim; individual boards: Kelly J. Dunton

3 SAND-THROUGH

Overdone. *It doesn't take much to sand through the face veneer on hardwood plywood.*

Problem: You sanded away some face veneer on a large, expensive piece of plywood after you had glued up everything.

Solution: Use a scrap of the same plywood to duplicate the mistake and serve as a sample board for the remedy. Apply the same finish you plan to use on the piece, then sand through a portion of the face veneer to give yourself a place to experiment with a repair.

Mix thin shellac with a touch-up powder such as Behlen Master Furniture Powder (woodworker.com) or Mohawk Blendal Powder Stain (mohawk-finishing.com). Put a piece of glass next to the sand-through on the practice board and begin developing your color. Quickly dip the brush into the shellac, then into one of the touch-up powders. Swirl the brush around on the glass to incorporate the powder and shellac. Dab on more shellac and a different powder to blend the color you need. Work in thin layers, sneaking up on the color rather than painting it in. If you aren't happy with the results, wipe away the color and start over.

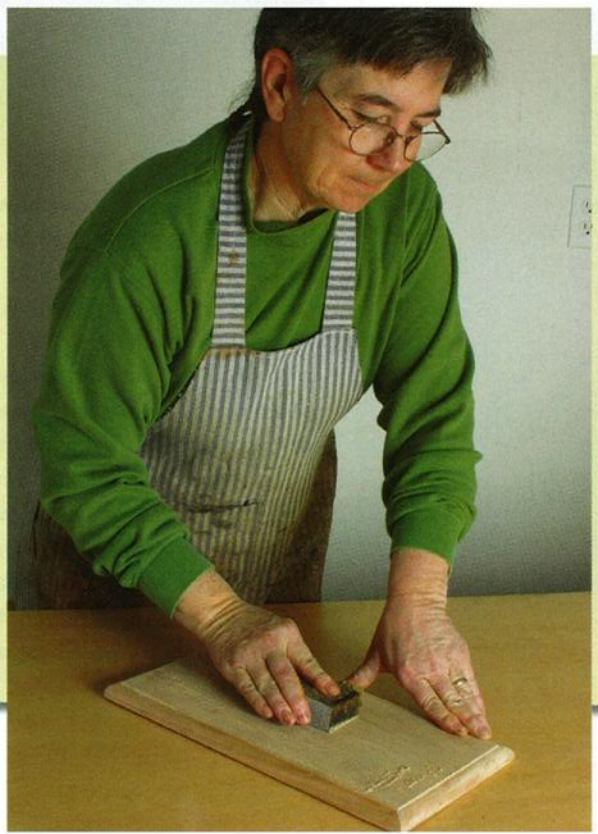
When you've done a reasonable job of covering the sand-through on the scrap, take a deep breath and do the same thing on the real project. A glaze—a type of stain used on a semisealed surface—brushed on and then lightly wiped off will help blend in the patch.

Practice patch. *Make a similar burn-through on a scrap of the same plywood. Mix touch-up powders with thinned shellac to match the color of the face veneer and hide the sanded-through spot.*

Faux finish. *Carefully paint the tinted shellac over the sand-through. Apply a glaze to help blend the patch into the surrounding wood.*

How to prevent surface flaws

Sand with progressively finer grits, ending with P220. Finish by hand-sanding with the grain with P180- or P220-grit paper. Vacuum or blow off the dust. Wet the surface with mineral spirits or shine a bright light across it to reveal flaws. If you're working with hardwood-veneer plywood, sand with a very light touch and check your progress often. Use glue sparingly and remove squeeze-out carefully.



Sand by hand. *To eliminate cross-grain scratches, finish sanding by hand, always moving with the grain.*

Check your work. *Wipe on mineral spirits before applying the finish. This will reveal any lingering scratches or patches of tearout.*

Color mistakes

By far the biggest finishing problems can occur when you apply dye or stain. A color you thought would look great comes up garish. Or the first coat of color takes unevenly, leaving blotches or streaks. Here's how to get around drawbacks like these.

4 UNEVEN DYE STAIN

Problem: A dye-based stain looks stronger or more intense in some areas than in others. Consequently, you have an unevenly colored surface or lap marks where you wanted uniformity.

Solution: Pull a damp rag over the surface. That will lift the dye, so you can "move" or remove it to make the color even. Work the rag around to blend the color evenly. Then apply a washcoat of shellac and the stain you want to use.

Easy fix. *This maple door didn't take dye well, leaving lap marks on the frame. A wet rag rubbed over the dye will even out the color, minimizing blotchiness.*

5 WRONG STAIN COLOR

Problem: The stain you applied threw the wood color way off. Generally, a stain will appear either too red or not red enough. Either way, it spoils the appearance of the piece.

Tone it down. *A contrasting glaze usually will correct a color that's wrong. Here, black glaze will tame a too-red stain on this oak door. Wipe off the excess glaze almost immediately, revealing a better color.*

Solution: Correct the color with a glaze. I've had good results with Behlen or Mohawk glazing stains. Apply a washcoat of shellac over the stain, then gently scuff-sand with P320-grit paper when it's dry. Use a glaze that contrasts with the stain to bring the color back into line.

For example, if the stain looks too red, tone it down with a raw umber glaze, which is greenish in tone. Alternatively, you can use a black glaze to change the color's tone.

If the stain doesn't have enough red, warm up the color with burnt umber or burnt sienna, which is predominantly reddish.

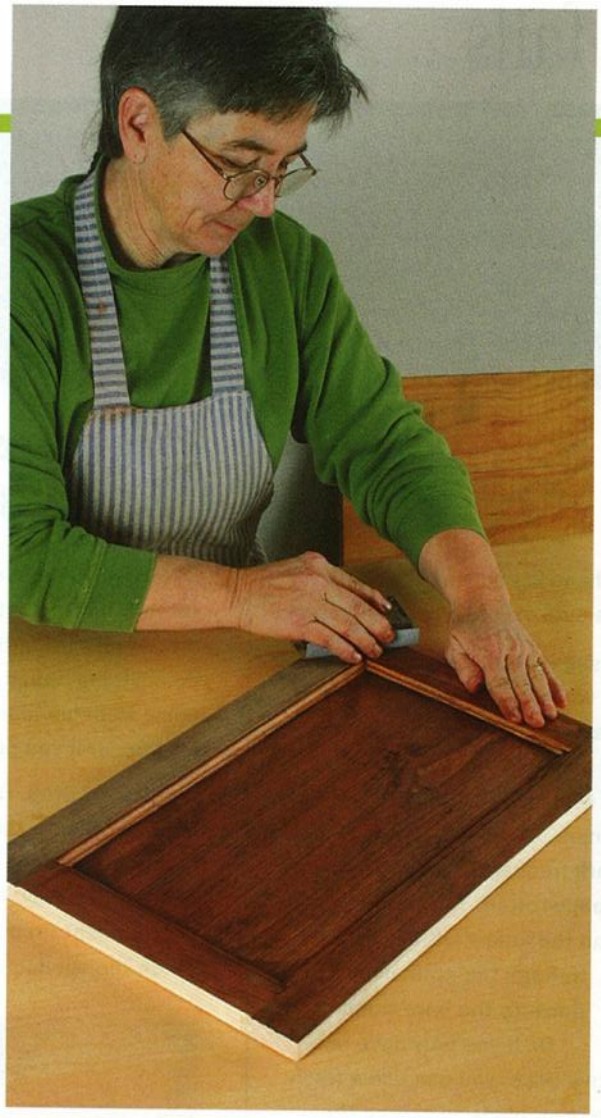
Brush on the glaze liberally, let it sit for a minute or so, then lightly remove most of it with a clean rag, leaving a thin film of color. Once you've corrected the color to your liking, protect the glaze with another washcoat of shellac before you apply the topcoat.

6 BLOTCHY STAIN

Problem: You chose a pigmented stain that didn't take evenly on the wood. Pine, cherry, maple, birch, and alder are the most likely to blotch.

Solution: If the surface is very blotchy, you'll have to remove the stain by stripping, sanding, or both, and start over. This time, apply a washcoat of shellac (see below) and then the stain.

If the blotching isn't too severe, try using a glaze to soften the contrast between the deeply colored and lighter areas. Once the initial stain is dry, apply a washcoat of shellac. Let it dry, then gently scuff with P320-grit paper. Brush on a burnt umber or other brownish glaze; wipe gently to remove most of the excess.



Sand lightly. *Pine is one of several woods that blotch easily. To even things out, begin by scuff-sanding.*

Apply a glaze and wipe it off. *Brush on a glaze to help cover up the blotches. Once the excess glaze has been wiped away, the door's color is much more uniform.*

How to prevent color mistakes

To avoid problems with stain or water-based dye in the first place, use a sample board to test the finish you want to use. You'll greatly increase the odds of having the color go on evenly if you apply a washcoat of thinned shellac beforehand. That will help ensure that subsequent coats of color take uniformly. A good washcoat is a 1-lb. cut: Combine premixed shellac (which is a 3-lb. cut) and denatured alcohol in a 3:2 ratio.

Control penetration. *A light coat of shellac thinned to a 1-lb. cut creates a good foundation before coloring the wood.*

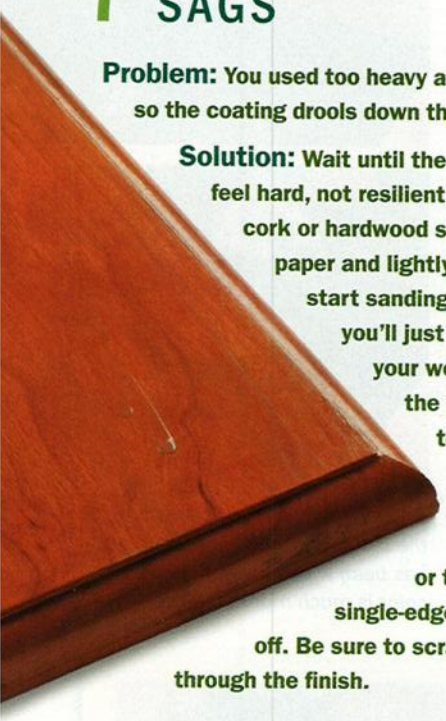
No blotching. *Stain over a shellac washcoat has much less tendency to blotch.*

Sample board. *Test the finish you want to use on a scrap of the same wood used in the piece you are building.*

Topcoat trouble

Problems can occur in laying down the final coats, whether you brush, wipe, or spray. Apply multiple light layers of the topcoat rather than one or two thick ones. Sand carefully, wiping away the sanding dust to check surfaces frequently. Rubbing out, the last step, is incredibly important because it "finishes" the finish. However, the idea of abrading a carefully applied topcoat scares many people, and rightly so. You don't want to have problems so close to the finale. Use a light touch.

7 DRIPS AND SAGS



Problem: You used too heavy a hand in applying the topcoat, so the coating drools down the side of your beautiful project.

Solution: Wait until the sag is totally dried. It should feel hard, not resilient, when you push on it. Wrap a cork or hardwood sanding block with P320-grit paper and lightly sand to level the mess. If you start sanding while the sag is still gummy, you'll just make the mess worse. Check your work frequently and change the paper often. You want to flatten the lumps without going through the stain color or down to the bare wood.

Or, if you only have one or two drips, you can use a fresh single-edge razor blade to scrape them off. Be sure to scrape carefully to avoid cutting through the finish.

Scrape or sand. *Once a drip has dried completely, scrape it off with a razor blade (above) or sand it flush (right).*

8 CONTAMINATED FINISH

Problem: Flat surfaces are pockmarked with small craters. Often from the first brushful, the coating literally "crawls" into an odd formation that resembles a crater or fisheye. You can't do anything ahead of time to prevent this contamination. It may come from lubricants used on a tablesaw or jointer bed. It can also occur if you put a water-based finish over an oil-based stain.

Solution: Stop. Don't even begin to think you can keep brushing to eliminate the problem. Wipe off all the coating, then brush or spray on a light coat of shellac. If spraying, use a very fine, almost dry spray. The shellac forms a barrier to keep the contaminant from coming up through subsequent layers of finish. When the shellac dries, continue applying the topcoat you want.

Attack immediately. *Wipe off all the contaminated topcoat as soon as you see it crawl. A light spray of shellac will isolate the contamination, so you can reapply the topcoat.*

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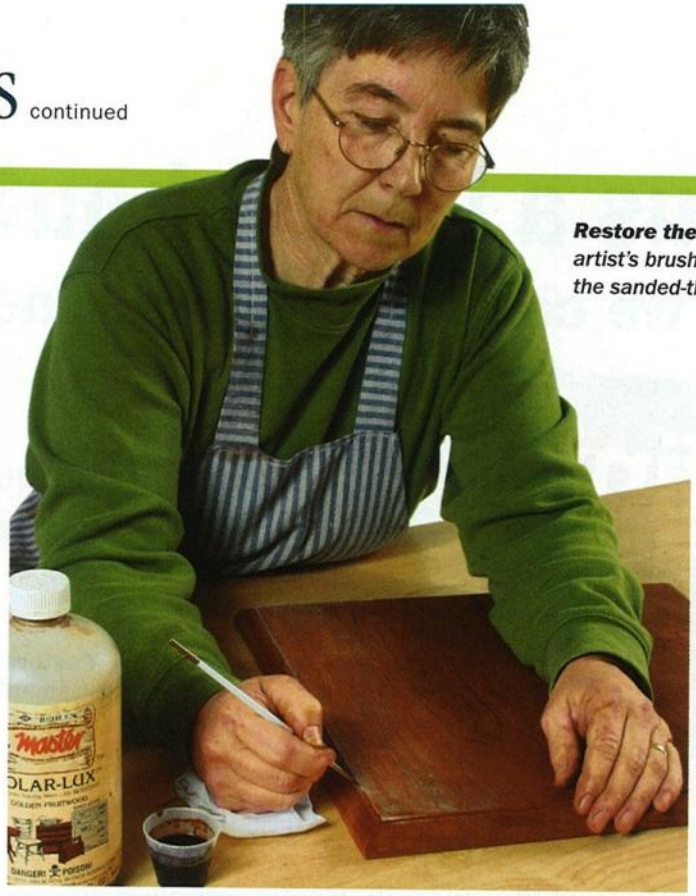
9 BURN-THROUGH

Burned up. *If you sand the topcoat too aggressively or don't keep the sanding block level, you risk removing some of the finish.*



Restore the color. *Use a small artist's brush to reapply stain to the sanded-through area (left).*

Seal the color. *Brush a light coat of shellac over the stain touch-up.*

Problem: You have either sanded through the finish (a frequent occurrence on edges, moldings, and carvings) or burned through the color (removing both the topcoats and the stain).

Solution: If you've burned through the color, carefully apply more stain, protect it with a light coat of shellac, and then replace the topcoats. If you've only burned through the finish, delicately reapply it. When the repairs are thoroughly dry, rub out those areas to blend them in with the rest of the surface.

10 WITNESS LINES

Problem: When rubbing out a film finish like varnish, you cut through the layers of finish. Witness lines are shadowy craters of this cut-through. Witness lines seldom occur with shellac or lacquer because new coats of those finishes dissolve into the old ones.

Solution: Keep leveling the finish, then apply at least two more fresh coats of finish.

Witnesses. *Sanding too much can produce witness lines, whitish areas exposing earlier coats of finish.*

Keep sanding. *Using fine sandpaper and a light touch, sand the surface to level it as much as possible before applying more topcoat.*

Add another topcoat. *Apply more of the topcoat to the entire surface, not just where the witness lines had been.*

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Wood River® Bench Mortiser

The WoodRiver® Bench Mortiser comes standard with "Best in Class" options such as a powerful ½ HP motor, a six-position reversible handle, rack and pinion fence, two roller bearing work supports, and pull-out table extensions that provide 35" of work surface. For unsurpassed accuracy, the head travels on adjustable rack and pinion dovetail ways. Includes: Bench Mortiser, 1/4", 5/16", 3/8", and 1/2" mortising bits and chisels, tool and chisel holder and user's manual with parts breakdown. One-Year Warranty.

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- High Carbon Tool Blade, 25° Blade Angle 1 5/8"W x 0.125"T
- 2"W x 7"L

Low Angle

151125

- Knuckle Style Lever Cap
- 12° Bed Angle
- High Carbon Tool Blade, 25° Blade Angle 1 5/8"W x 0.125"T
- 2"W x 7"L

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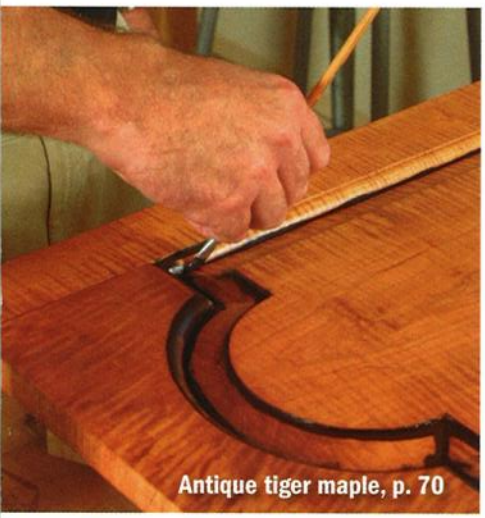
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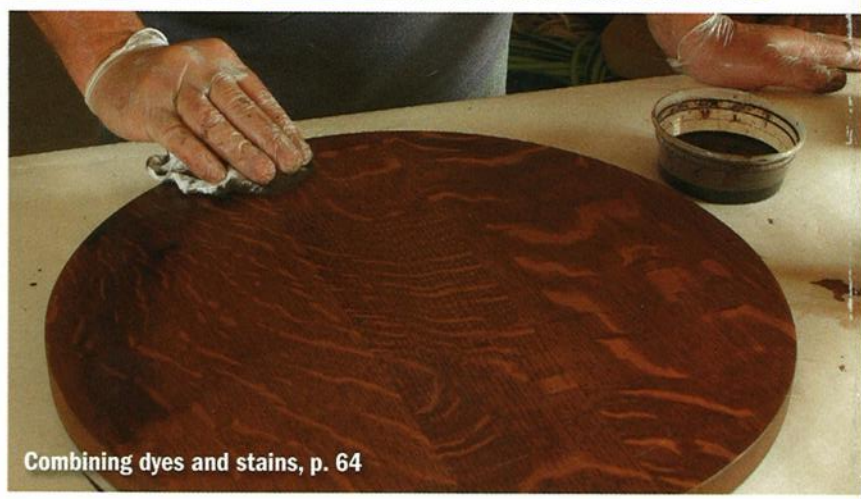
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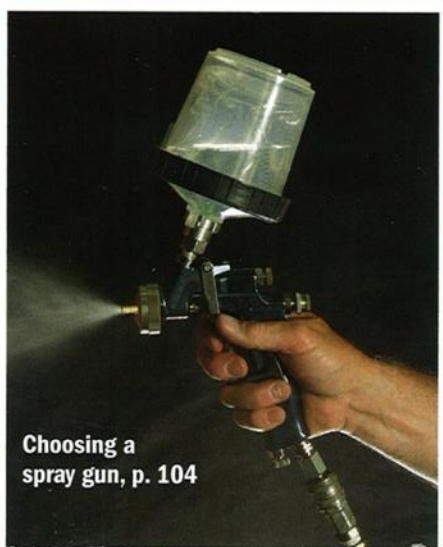
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