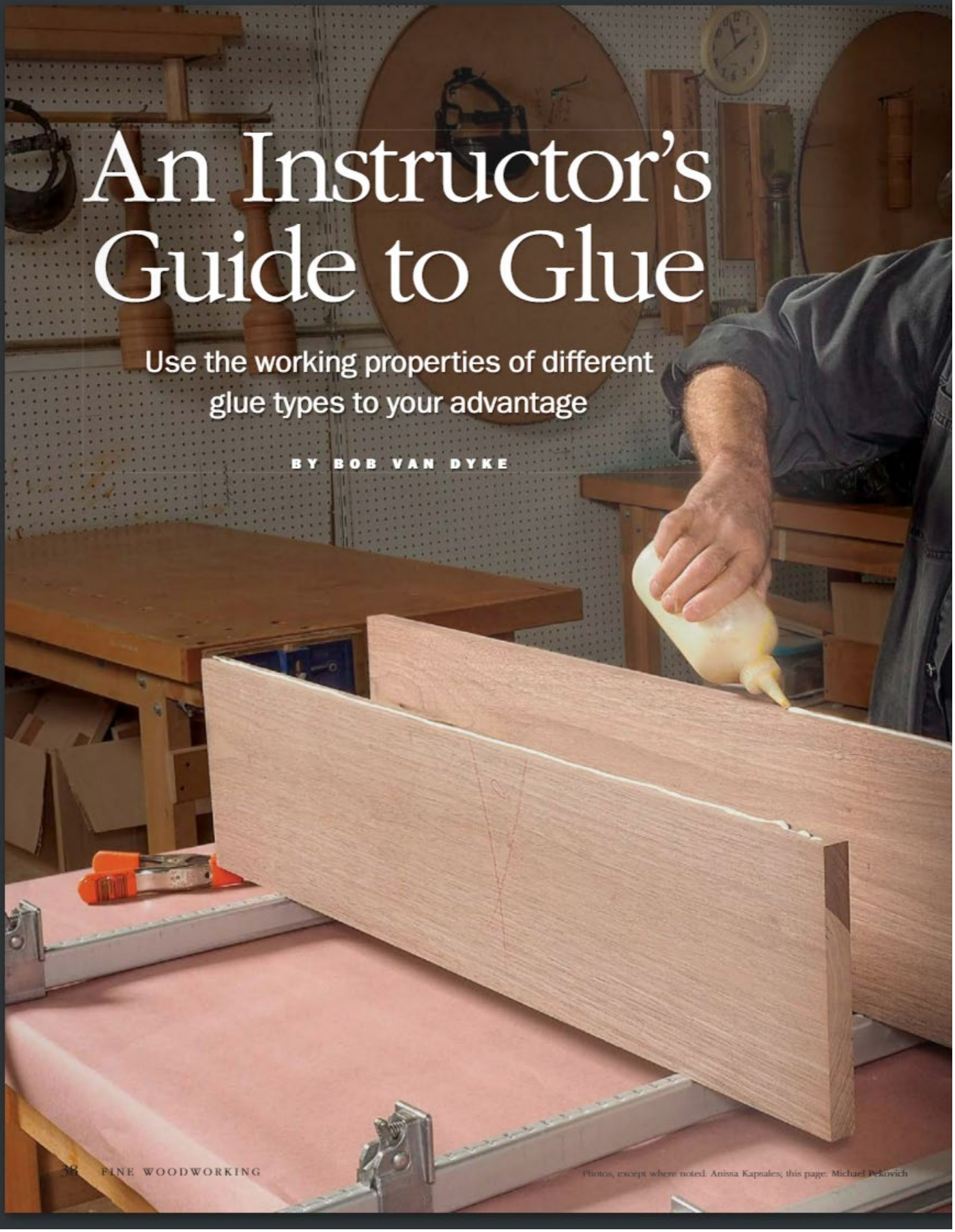
An Instructor's Guide to Glue

Use the working properties of different glue types to your advantage

BY BOB VAN DYKE



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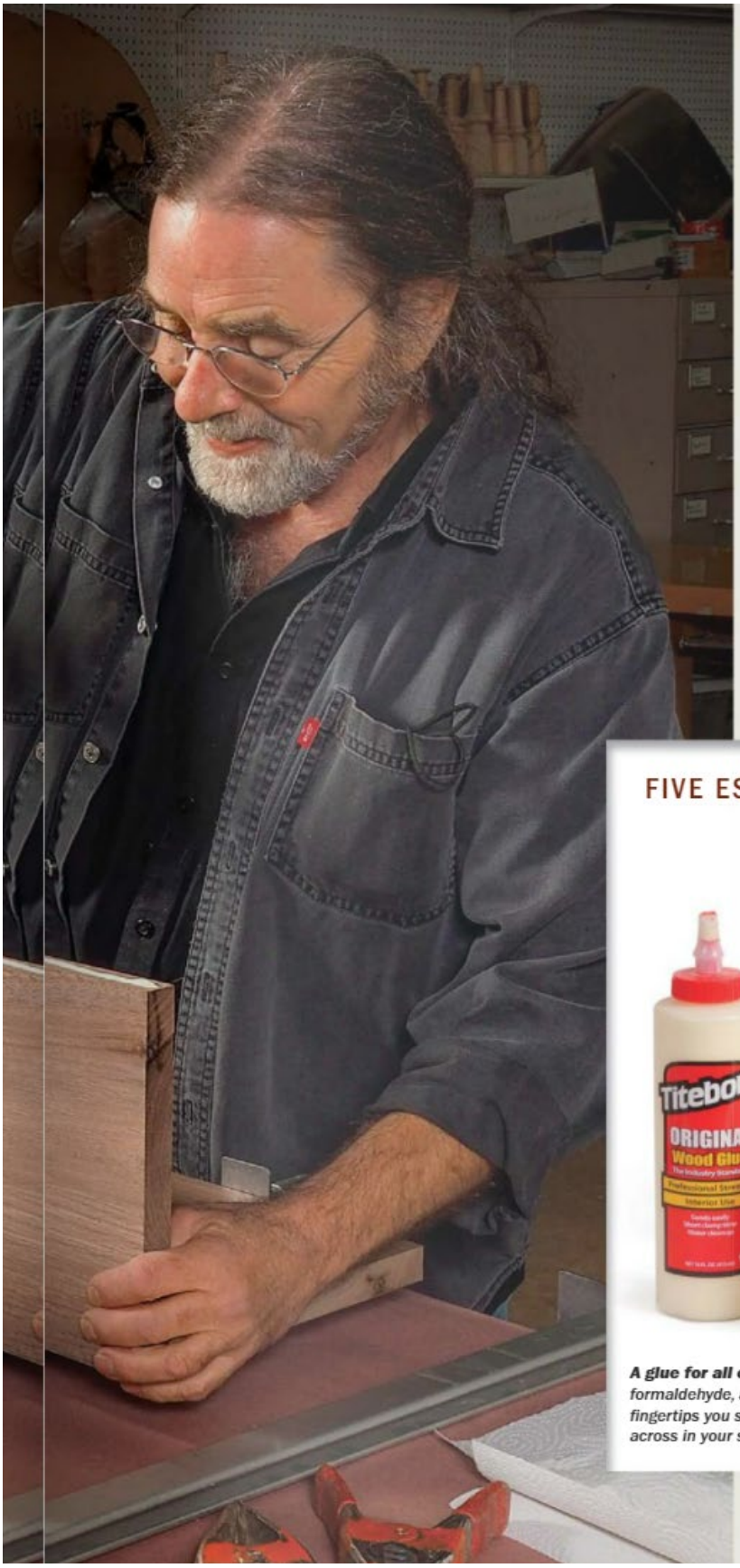

I can't think of a more mundane subject in woodworking than glue, but knowing the working properties of the various glues available and matching their specific traits to a particular glue-up is important. It can turn a stressful situation into a very methodical and precise task. I teach my students to learn the pros and cons of each glue type and then choose the one that best fits the task at hand.

Almost all woodworking glues, when used according to the manufacturer's instructions, yield a bond that is as strong, or stronger, than the wood itself, so strength is not the issue. While I definitely lean on yellow glue and Old Brown glue for the bulk of my glue tasks like panel glue-ups, joinery, and carcase glue-ups, I do turn to epoxy, cyanoacrylate, hot hide glue, and urea formaldehyde glues for certain other things like veneering, laminating, sizing templates, and filling voids. When choosing what glue to use for a specific task I think about what is going to get the job done most efficiently, with the lowest amount of stress possible, and with the best end results.

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FIVE ESSENTIAL GLUES FOR THE SHOP

A glue for all occasions. *From PVA and epoxy to cyanoacrylate, urea formaldehyde, and liquid hide glue, with this arsenal of glues at your fingertips you should be able to tackle any woodworking glue-up you come across in your shop.*

Yellow glue is a shop standard

Most woodworkers use yellow glue (aliphatic resin or PVA) for most, if not all gluing tasks, and it is always on hand in my shop. It is easy to use, readily available, dries quickly, and has a proven track record.

But it does come with a few drawbacks. Yellow glues have an extremely short working time. The label on Titebond Original states about 15 minutes and Titebond III adds another 5 to 10 minutes, but I have found in most cases that is just wishful thinking. Sliding a tenon up or down in its mortise is virtually impossible after just two or three minutes of assembly. This leads to a huge amount of stress and can result in misaligned joints after the glue has dried. I don't recommend PVA for tricky joints or glue-ups involving a lot of parts, unless you are able to break the glue-up into stages.

Yellow glues are also well known for their tendency to creep, making them a poor choice for veneer work that involves visible joints or inherently unbalanced woods like crotch and burl veneers. There is nothing worse than spending hours making a complex veneer pattern and seeing the joints open up after a week or two.

Yellow glue does excel in a lot of areas though, and that's why it's such a workhorse in the shop. There is no point in using any other glue for simple everyday glue-ups if the advantages the other glue offers are not important in a given situation. Take advantage of yellow glue's simplicity when it works for you. Since the clamp time on yellow glue is short, I regularly use it to glue up panels. In a porous wood like pine or walnut, I can remove the clamps after 20 minutes.

The stats on PVA—It's an all-around shop glue, with about 5 to 10 minutes of open time. You can usually unclamp between 30 and 60 minutes, and clean up with water.

MINIMIZING SQUEEZE-OUT ON JOINERY

A smart glue-up strategy. *Brush the glue into the mortise, and around the tenon, putting a thin coat on the end grain shoulders of the tenons. Before you seat the tenon all the way in the mortise, stop and brush out the roll of glue that forms as the tenon goes into the mortise. This will help eliminate squeeze-out.*

TIP

REMOVING SQUEEZE-OUT WHEN IT HAPPENS

If you can't prevent squeeze-out, use the straw trick. Cut an angle on a plastic straw and scrape the wet glue off the work into the straw.

Bottom photo, this page, and all photos, opposite: Michael Pekovich

Don't waste any time. *Because yellow glue skins over quickly, Van Dyke starts by running a bead of glue along both edges to be joined. It is then quickly spread with a finger. Rubbing both edges back and forth ensures a thin, even layer on both surfaces.*

A level glue-up makes flattening easier later. *Use spring clamps to hold the boards flush, testing flatness with a finger. Before adding clamps across the top, scrape off any squeeze-out. This allows the glue joint to dry faster. Add the top clamps, then flip the panel and remove the glue from the bottom as well.*

Liquid hide glue

I discovered Old Brown Glue (OBG) several years ago, and it is my go-to glue for anything other than a straightforward glue-up or a panel glue-up. It is basically traditional hide glue to which urea has been added, making it liquid at room temperature. Because of its extremely long working time and simple cleanup, it is ideal for any complex glue-up. Another trait of OBG is its slipperiness. It acts like a grease when you're assembling tight joinery. This, coupled with the fact that it does not swell the joints quickly, makes it my glue of choice for all dovetail joints, complex glue-ups, and any mortise-and-tenon assembly that involves more than four or five joints.

I don't use it for glue-ups where its unique working characteristics are unnecessary. Its long working time (30 to 45 minutes) means it has a correspondingly long clamp time (the time required for the glue to set sufficiently to allow the clamps to be removed without compromising the joint), which becomes an unnecessary disadvantage when that long working time is not needed. Removing the clamps on an unstressed glue joint in less than four hours is asking for trouble. Leaving the joint in clamps overnight is safer but can be inconvenient.

At room temperature, OBG is too thick to spread and should be heated to at least 110°—putting the bottle under hot running water or into a glue pot or crock pot for a few minutes is sufficient. Don't microwave it.

Reversibility is possible. I have heated misaligned joints that were put together with Old Brown Glue, taken them apart, and easily re-glued them correctly. Doing that with any other glue involves drastic repairs.

The insider's take—Liquid hide glue is reversible, perfect for complex glue-ups, invisible under a finish, and has a long open time. Clamp time is 6 to 12 hours, and it cleans up with water.

TIP

A LITTLE HEAT WILL DO

Though it's liquid, Old Brown Glue is too thick to use out of the bottle. But if you transfer what you need for a glue-up into a container and heat it until it thins, you are ready to go.

Plenty of time to work. *Not only does liquid hide glue provide a long open time making complex glue-ups less stressful, the slippery nature of the glue when it's heated helps the parts go together easily, so you won't have multiple parts seizing up quickly.*

Cleanup is easy. *Water is all it takes. Whether you are cleaning squeeze-out while it's still wet or after it has been dry for days, the answer is always the same. Use warm water on a rag or brush and you can work the glue away.*

NEED TO TAKE IT APART?

Disassemble a dried joint. *With liquid hide glue, it's easy to take a joint apart after the glue sets. In this case, the dovetailed box was glued up before it had a groove to hold the bottom. No problem. Just heat the corners until the glue softens and the joints come apart. Van Dyke uses opposing wedges to force the box open. He sets a pair of wedges on either side, and uses clamp pressure to move them toward each other, pushing the joint apart.*

Hot hide glue has its uses

Animal protein glue (hide glue) was the glue used in almost all furniture built before 1940, and it is still very popular among traditional furniture makers. It sets quickly, is not visible under finishes, and is easy to clean up with water. Hot hide glue has an even shorter working time than yellow glue. Because it starts to set as soon as the temperature gets below 120°, you have little time to spread glue, let alone assemble and adjust the parts. Many furniture makers use this working trait to their advantage when making a rub joint. Traditional hammer veneering with hot hide glue exploits this same characteristic and is a very efficient way of applying veneer.

Add water to granules. *Mix 6 parts granules to 11 parts water by weight. Let them sit for about half an hour at room temperature to bloom, and then put the mixture in the glue pot and heat until it is liquid. Keep a top on the glue pot so the heated glue does not thicken. Store unused glue in the refrigerator.*

Rub joints and veneer. *The quick-setting glue is good for attaching glue blocks and drawer stops. Rub it back and forth, and within a minute it will stay in place without clamps. For hammer veneering, quickly spread glue on the substrate and both faces of the veneer. Use a veneer hammer to rub and press over the surface, forcing out the excess glue as it cools and grabs. The surface glue lubricates the hammer while it fills the grain.*

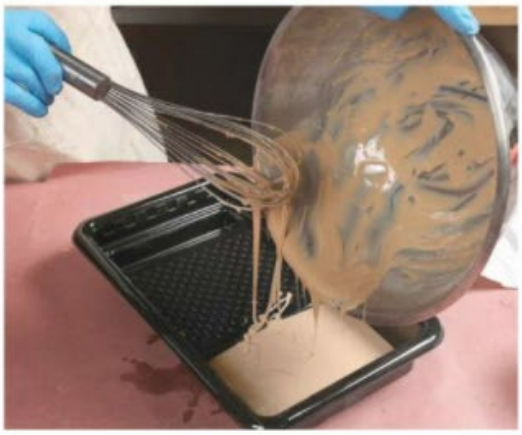
Urea formaldehyde

Rather than being all-around adhesives, urea formaldehyde glues are formulated for specific tasks. I use them primarily for veneer work and bent laminations, at which they excel. Both tasks require a long open time and a hard glueline. Hide glue and polyurethane glue fit this category, but urea formaldehyde glues such as Unibond 800 are the best. The open time and clamping time of Unibond 800, developed by veneering expert Darryl Keil, can be easily adjusted by altering the ratio of resin to hardener. And clamping time can be sped up by increasing the room temperature. I learned the hard way that it requires a minimum room temperature of 70°. Years ago, I ran a class in the winter and the veneered projects were left to cure overnight. When the heat was turned down at night it caused the glue to fail and the next day we had to peel up all the veneer. I now cover a urea formaldehyde glue-up with an electric blanket.

Unibond 800's long open time and rock-hard glueline make it the perfect choice for bent laminations. Once cured, there is no spring-back at all. Squeeze-out is nearly impossible to remove, short of cutting it off. Make parts oversize so you can trim them to size once the glue is fully cured, removing the squeeze-out.

While I do not normally consider expense or shelf life with glue, it should be noted that Unibond 800 does have a one-year shelf life and will fail if used beyond its expiration date. If the resin thickens up like honey, it is no longer usable. Always buy the smallest amount you think you will use in a year.

The lowdown on urea formaldehyde—Great for bent lamination and complex veneering. Open time up to an hour, clamp time between 5 and 13 hours depending on temperature and mix. Clean up with water.



Measure and mix. *Unibond, a urea formaldehyde glue, is available in a two-part system, like epoxy. Once you've measured out the powder and the liquid (1 part powder to 4 parts liquid or 1:6 for a slower dry time) mix them together. Van Dyke pours the mixture into a paint tray and rolls it onto the work. Unibond cures to a rigid, strong bond, making it a solid choice for bent laminations. Roll the glue on one side of each lamination as you stack them.*

Into the vacuum. *Use shrink wrap to keep the laminations together and positioned on the form. Once it's in the vacuum bag, the suction will pull the laminates tight to the form.*

Put it to bed. *Unibond requires a minimum air temperature of 70° while curing and extra heat speeds up the cure, so throw an electric blanket over it, turn it to high, and let it all set overnight.*

TIP

MINIMIZE BLEED-THROUGH

When you're working with certain veneers such as burl or crotch, this glue can seep through. If you add blocker to Unibond (1 part powder, 1 part blocker, 4 parts liquid) bleed-through will be radically reduced or eliminated.

Epoxy, the problem solver

Epoxy is the only gap-filling glue on the market, and this characteristic can be a life saver when it comes to filling knot holes and gouges, and when gluing parts that do not have good mating surfaces. I also use it to prevent fissuring in crotch veneers. When faced with an outdoor project, my glue of choice has always been epoxy.

The working and clamp time of epoxy is easily adjusted by using different hardeners, and adjusting the viscosity is a matter of adding various thickeners to the mix. Thickeners can even be added to transform the glue into a "fairing" putty, which is used extensively in boat building, and thin epoxy can be used to repair damaged or rotted wood.

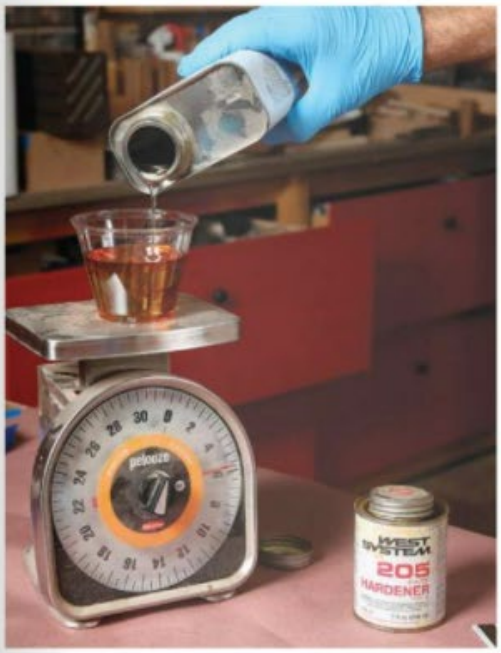
There are many epoxies on the market, and I recommend choosing one such as West System or System Three, learning the product, and staying with it.

The straight facts on epoxy—It is the standard for marine use and any outdoor project; also suited for gap-filling repairs, and it will stabilize crotch and burl veneer panels. Open time can vary from 5 to 60 minutes, and clamp time can vary as much as 45 minutes to overnight. Clean up with acetone.

FAST VOID FILLING

Mimic a natural defect. *Rather than trying to hide a void by camouflaging it, you can use tinted epoxy to fill a hole and imitate naturally occurring flaws like knots or pitch. Mix equal parts of 5-minute epoxy and add a dab of oil pigment to tint. Drop the colored epoxy mixture into the defect, and let it cure, then scrape it flush. Let it fully cure overnight before scraping and finishing.*

STABILIZE VENEERS



24-hour epoxy eliminates cracks. *Because crotch veneers typically develop fissures over time, Van Dyke coats them with standard epoxy after the veneer is glued to the substrate. The epoxy's thin viscosity allows it to completely saturate the unstable veneer. Because 5-minute epoxy is thicker, it will not saturate the veneer as well. He uses an old credit card to spread the glue and remove any excess before it sets. After it is fully cured all the epoxy is scraped off, leaving behind only the clear glue left in the pores of the wood. The surface is 100% grain filled, speeding up the finishing process drastically.*

Cyanoacrylate

When I need to bond something instantly, cyanoacrylate (CA) glue is an obvious choice. CA glue, with or without an accelerator, yields an instant bond. But I have heard of long-term failures, so I limit its use to workshop jigs or other non-furniture applications. I use it to harden the edges of MDF router templates and mat board tracing patterns. Once the CA glue soaks into the edges, it is rock hard.

The skinny on CA glue—Use it to make small, non-structural, fast repairs, and to harden edges of templates. Open time and clamp time are less than a minute. Clean it up with acetone.

Seal and harden. *Spreading medium thick CA glue and spraying an accelerator on MDF templates seals the edges and hardens them, allowing a single template to last through years of repeated use.*