Gluing up Tabletops

Strategies for milling, matching, gluing, and clamping large panels

BY GARY ROGOWSKI

For many woodworkers, the thought of making a large tabletop can be intimidating. After all, a tabletop is big and heavy—two good reasons for an elevated fear factor. Plus, it's nearly impossible to find individual boards wide enough to make such a big part. To create a wide surface, several narrow boards must be butted edge to edge and glued together. And that big, heavy surface needs to be flat, straight, smooth, and strong. So it's easy to understand why many shy away from making big tabletops.

But, as I have discovered during my 29 years as a woodworker, the procedure isn't that scary. A well-made top is mostly the result of following tried-and-true steps. These techniques can be used to make any surface, large or small, whether solid-wood desktops, carcase sides and backs, or panels in frame-and-panel construction.

Mill the lumber, then let it stabilize before glue-up

Before reaching for the glue and clamps, it's worth spending time getting the boards ready. For starters, you want boards that are a little thicker, wider, and longer than needed. To minimize any tendency toward warping, they should be given time to acclimate to shop temperature and humidity. As soon as the boards are brought inside, they should be stored flat with stickers in between each one so that air can circulate. Letting the boards rest in the shop for a few weeks is ideal, but as little as a day or two can prove helpful.

Once the boards have acclimated to the shop environment, flatten one face of each one on the jointer before using the thickness planer to flatten the opposite faces. Continue planing the boards until they're within 1/32 in. to 1/16 in. of the final thickness. Later you'll either handplane or sand the faces to final thickness. Then, after jointing one long edge on each board, use the tablesaw to rip the opposite edge parallel to the first.

Arrange the boards for a pleasing pattern

Once the boards are flat and straight, you're ready to lay them out. Generally, though, to create a tabletop that looks good, you

Photos, except where noted: Tom Begnal

ARRANGE THE BOARDS AND JOINT THE EDGES

When arranging boards for glue-up, hitting the trifecta—achieving the best orientation of the heartwood sides of the boards, an ideal grain direction for handplaning, and a beautiful grain pattern—is pretty rare. You may need to make compromises based on how the panel is going to be used.

1. ORIENT THE HEARTWOOD

The heartwood side of a board is the one that faces toward the center of the tree. Boards tend to cup away from the heartwood side when they dry. And because a tabletop is made up of several boards, such cupping can affect the flatness of a panel.

ALL BOARDS WITH HEARTWOOD-SIDE UP (curves exaggerated)

If all of the boards have been edge-glued with the heartwood side facing in the same direction, the panel typically ends up looking like one big cupped board. For a tabletop that's screwed to heavy, flat cleats, I find it's often a good way to ensure that the top stays flat.

ALTERNATING HEARTWOOD SIDES (curves exaggerated)

Sometime it's best to alternate the boards in the panel—heartwood-side down followed by heartwood-side up. That way, the panel stays relatively flat across the entire width. However, it can result in a washboard effect.

2. DETERMINE THE GRAIN DIRECTION

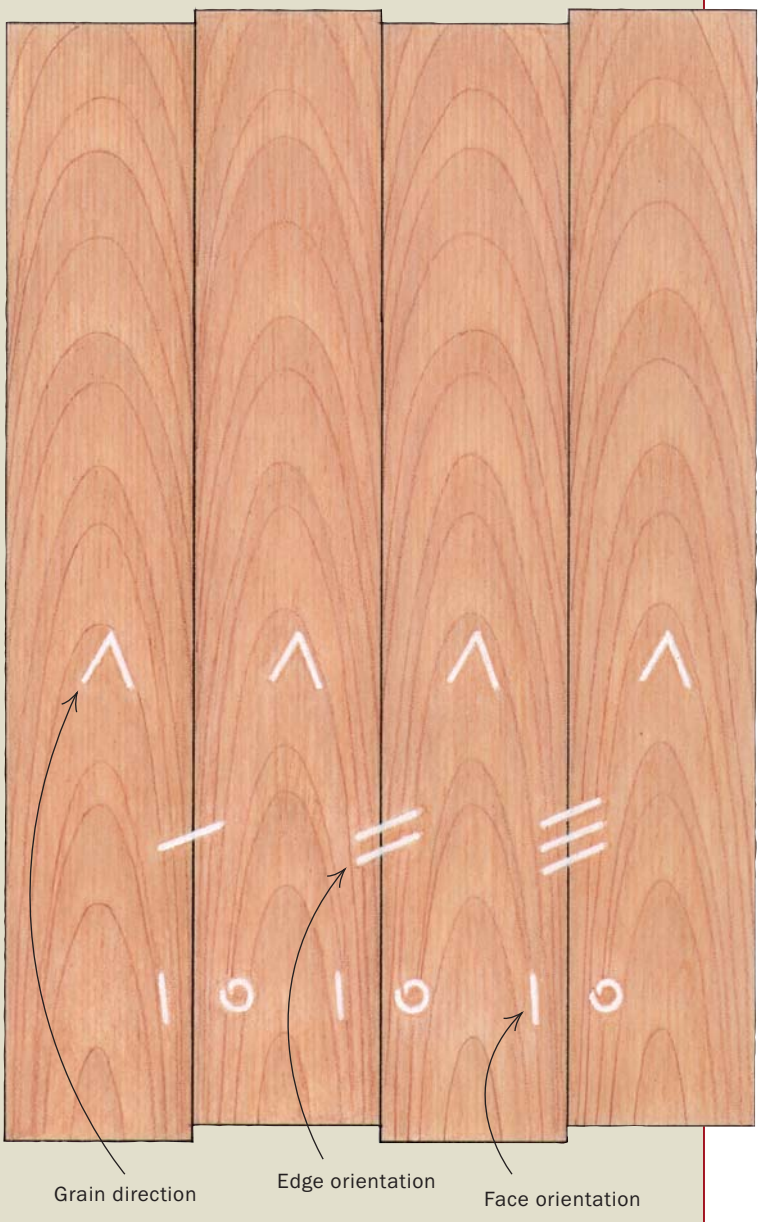
To make handplaning easier later, examine each board to determine the general direction of the grain at the face surfaces, then use chalk to mark the direction with an arrow.

3. MARK THE MATING EDGE JOINTS

Mark the first edge joint with a single line across the mating boards. Continue by marking the second joint with two lines, the third joint with three lines, and so on.

4. MARK THE IN AND OUT FACES

When using a jointer, it helps to alternate the faces that run against the fence (see p. 49). Mark one side of the joint line with an I (for "inside"), and the other side with an O (for "outside").



5. JOIN THE EDGES BY HAND OR MACHINE

No jointer? No problem when you plane in pairs. *The joints can be handplaned with the mating edges of the boards held flush in a vise.*

Jointing the edges. *When using the jointer, pay attention to the face-orientation marks.*

Drawing: Vince Babak

GLUE AND CLAMP THE BOARDS

A flat worksurface is important. *A twisted worksurface can result in a twisted panel. Before starting the gluing process, check the surface of your worktable with a pair of winding sticks. Slipping a shim under one or more worktable legs generally provides a quick cure for twist.*

Add the glue. *A generous bead of glue is applied to the full length of each mating edge. To help keep your fingers glue-free, use a thin wood stick to spread the glue evenly along the edges of the boards.*

Deadblow hammer encourages flatness. *A deadblow hammer helps any boards that resist lying fully against the pipes.*

need to consider a few things before finally deciding on the layout (see the story on p. 47).

Two ways to edge-joint the boards

Before any of the boards can be glued, both edges need to be planed true and flat, either on the jointer or with a handplane. The jointer usually is the best way to go. But for those of you who don't have a jointer, a handplane gets the job done just as effectively with a little more effort.

Handplaned edges—When handplaning long boards, use the longest handplane you can find. I use a No. 7 jointer plane that is 22 in. long.

One key to obtaining a quality handplaned edge joint is to fold the adjacent boards, much like a book gets folded closed. Then mount the boards in a vise with the folded edges flush and ready for planing. When the edges are folded, it is not critical for them to be planed perfectly square to the face surfaces of the boards because both edges get planed at the same angle. So when the boards are unfolded and the edges are again butted together, the two angles supplement each other to create a perfectly flush and flat joint.

When handplaning, you need a sharp blade. Also, as much as possible, plane in the direction of the grain. When you can't avoid

planing against the grain, take extralight cuts to minimize tearout, and angle the plane for more of a shearing cut.

Jointer-cut edges—Before using your jointer, give it a quick check to make sure it's cutting properly. Any signs of snipe or taper should prompt an adjustment of the outfeed table. Also, you want sharp jointer blades; dull ones can burnish the wood, preventing glue absorption and compromising the strength of the joint.

Ideally, the fence should be set perfectly square to the outfeed table, but don't worry if it's not. The geometric principle that applies to handplaning also works here, although the technique is different. Once again, you're working with adjacent boards, and to get the geometry to work, simply alternate the faces that meet the jointer fence. Chalk helps keep track of the face directions. First, butt two adjacent boards together. On one side of the joint line, mark the board surface with an I, which means the face of that board must run inside, against the fence. Mark the opposite side of the joint line with an O, meaning it has to face outside, away from the fence.

Once all of the adjacent boards have been marked with Is and Os, it's just a matter of running the boards through the jointer, all the while making sure the correct faces of the boards meet the fence. After jointing, when all of the adjacent boards are butted, the supplementary angle principle ensures that the surfaces are flush and flat. I find this approach more reliable than running a pair of boards folded together through the jointer.

Clamp the tabletop

With all of the boards flat, straight, marked, and arranged for the best possible appearance, you are ready to start thinking about the gluing process. But a little more prep work remains.

The first step to a flat tabletop is to make sure the clamps have a flat and true work surface to rest on during glue-up. An uneven or twisted worksurface means that the pipes (or bars) of the clamps won't be in the same plane, and that ultimately can lead to an uneven tabletop.

By placing a straightedge across both the length and width of the worksurface, you quickly can tell if it's flat in both directions. Then use a pair of winding sticks to check the surface for twist. Most benches can be trued simply by adding shims under one or two legs.

Now you can begin laying out the clamps. You can use either pipe or bar clamps, but just be sure they're straight. It's also a good idea to span across all of the clamps with a straightedge. If the straightedge rocks or if a big gap appears between the straightedge and the pipe, replace the offending clamps.

Do a practice run—Glue waits for no man. Aliphatic resin (yellow) glue usually sets in about five minutes at 70°, less time if it's warmer. So, before any glue meets wood, it's important to practice the gluing sequence while the glue is still in the bottle.

All of the clamps you are going to need should be at the ready and properly adjusted. To provide adequate pressure along the full length of the joint, each clamp should be spaced no more than about 18 in. apart. Also, have a deadblow hammer nearby, or a block of wood and a hammer. When a board needs some encouragement to sit flat on the pipe, these persuaders prove very handy.

Keep in mind you need to alternate the clamps—one on top of the tabletop followed by one on the bottom—to balance the forces applied by them. At this point, have within reach a thin wood stick to use as a glue spreader. Place the bottom clamps on the worksurface where you want them, then lay out your boards on top. Add the top clamps and tighten them lightly.

Check both sides of the tabletop for gaps in the joints. A gap often shows up as a dark line in a joint. But a dark line isn't necessarily a gap; it also can indicate that the edges of the joint aren't perfectly flush and the misaligned surfaces are producing a thin

C-clamps keep joints flush. *With the pads of a C-clamp temporarily spanning the joint lines at each end of the boards, the faces of the boards won't slide out of alignment.*

Add the top clamps. *Placing clamps on top helps balance the clamping forces applied by the bottom clamps. If all of the clamps were mounted on only one side, the panel likely would buckle when the clamps were tightened.*

CLEAN UP AND FLATTEN THE PANEL

Clean up the glue before it dries completely. *Once the squeezed-out glue turns rubbery, usually after about 15 minutes, it's relatively easy to lift off most of it with a putty knife.*

Knock off the high spots. *A straightedge placed across the panel at several points makes it easy to see high spots. Mark the high ground with chalk, then use a handplane to get everything flat.*

shadow. So, if you see a dark line, put your hand in front of it to eliminate any shadow and confusion it can cause.

If you find a gap, don't try to close it up simply by adding more clamp pressure. That puts the entire tabletop under added stress, making it less likely to be flat when the clamps get removed. Instead, remove the board and rejoint the edge.

Glue the boards—When you're finally ready to start gluing, shut off the phone, put out the Do Not Disturb sign, and practice a few moments of deep breathing. If it's the end of a long, tiring day, I'd suggest postponing the glue-up until morning when you're fresh.

Generally, I use only glue to hold the boards together. Adding biscuits, dowels, or splines makes the entire procedure longer and fussier. An exception would be a chair seat, where the edge joints are subjected regularly to high stress. Some woodworkers use biscuits to align the faces of the edge-glued boards. Although biscuits consistently produce faces that nearly align, they rarely align as close to perfect as I like. Therefore, I use biscuits only when the tabletop is especially wide, say 48 in. or more, which means I'm faced with putting together a lot of boards in a hurry.

Apply a bead of yellow glue along the entire edge. Then use the stick to spread the glue. Next, put the two glued edges together and slide the boards side to side a little to make sure the glue is fully spread. Keep moving efficiently from one board to the next, making sure with each joint that the boards are going together as planned.

When all of the edges have been as-

Finish with the scraper. *After planing, Rogowski uses a scraper to remove any areas of tearout and clean up any glue that might remain.*

Machine option

If you have a drum sander wide enough to accept the tabletop, or if you have a commercial shop in your neighborhood that will sand the top for a fee, it's an option you might want to consider. Overall, it's likely to save you time. Handplanes and scrapers still are needed to flatten one side of the top before the machine can be used effectively.

Photo, this page (bottom): Michael Pekovich

sembled, snug up the lower clamps and tighten them only enough to apply light but firm pressure. Check the underside of the tabletop to make sure it's sitting flat on the clamps. If it isn't, a few judicious raps from the deadblow hammer should solve the problem.

Starting at the middle of the tabletop and working toward the ends, begin applying additional pressure to the lower clamps. If the ends of any boards are misaligned, I temporarily mount C-clamps at both ends of the tabletop, with the pads of the clamps spanning each joint. Because the stay is short, the steel pads won't stain the wood. Once all the faces of the boards align, apply additional pressure to the end pipe clamps, then remove the C-clamps.

The top clamps are next. Once all of the top clamps are in position, it's just a matter of snugging them up tight. Check again to make sure the tabletop is flat on the pipes and that all of the clamps are tightened—but don't overtighten.

Invariably, the pressure from the clamps is going to squeeze some glue from the joints. Once that glue hardens, it's a chore to remove. To make life easier, I allow enough time, usually about 15 minutes, for the glue to turn rubbery. Then, using a putty knife, the glue will scrape off with relative ease.

Let the glue cure before cleanup

To make sure the glue has fully bonded, I generally allow the tabletop to sit overnight before removing the clamps. But there's still work to do even after the clamps are removed.

Scraping and flattening by hand—Secure the tabletop to your workbench, then check the tabletop for flatness with a straightedge. Mark any high spots with a pencil or chalk. Then use a jack plane to level the high spots. Start by working diagonally across the tabletop from both corners, cutting with the grain to minimize tearout. Once you've removed the marks, check the tabletop again with a straightedge and mark again as needed. Finish by planing in the same direction as the grain. Then use a scraper to remove any tearout or errant spots of glue you may have missed.

Techniques for trimming large panels

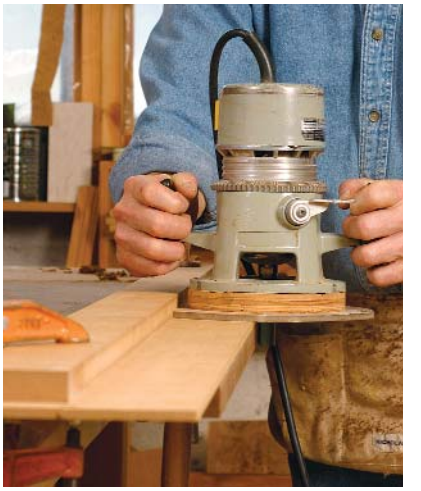
With both faces of the tabletop now flat and true, you can go ahead and joint all four of the edges, starting with one of the long edges. You can true these edges by hand if you prefer, but a long, straight board works nicely as a fence for the router. With a straight bit in the router, clamp the fence to the tabletop, positioning it so that the bit removes only 1/16 in. to 1/8 in. of the edge. Only one edge of the tabletop needs to be straightened with the router; the other edge is ripped parallel on the tablesaw.

For large tabletops, I use a straightedge along with a jigsaw or circular saw to trim the ends square to the sides. Then I use the router and straightedge to further smooth the surfaces left rough from the saw. But because this is an end-grain cut, it's important to remove no more than about 1/32 in. of material and to move the bit quickly to avoid burning. With all four edges now trued, they have to be smoothed. A little work with a scraper or some hand-sanding will take care of that in short order. □

Gary Rogowski lives in Portland, Ore., where he runs The Northwest Woodworking Studio (www.northwestwoodworking.com).

TRIM THE ENDS

Rough-trim the ends of the top. *A jigsaw (shown) or a circular saw, guided by a straightedge, trims the uneven board ends on the tabletop to make them flush.*



Smooth the tabletop ends. *Use the router with a straight bit and an edge guide to further trim and smooth the jigsaw cuts on the ends of the top.*