Making Mitered Boxes

Techniques for grain matching and achieving strong corner joints

BY GARY ROGOWSKI

If a dovetailed box speaks volumes about your craftsmanship, what can a simple mitered box say? From a practical view, mitered joints require only a quick setup on the tablesaw, and once set up, the cuts are repeatable; so a mitered box says that you're frugal with your time. From an artistic view, mitered joints are beautiful, with only long grain showing around the sides of the box. Because mitered joints need strengthening, you have to add splines or keys, but these can impart a distinctive and elegant flavor to your design. So, in the end, a mitered box also can speak well about the level of your craft.

To achieve continuous grain on a box, resaw the parts from thick stock (see the facing page). For a four-sided box, cut carcase miters on the tablesaw with the blade tipped to 45°. Use a miter gauge or a dedicated crosscut jig for these cuts. Don't use a standard crosscut jig for your angled cuts or you'll end up with a gaping hole in the middle of the jig. Make a pair of practice cuts on scrapwood, and check the results with a combination square.

When making the cut on the second end of each side, be sure to use a stop on the jig to ensure that your cuts are made exactly to length. If you need to make minor adjustments or clean up a rough

Photos, except where noted: Mark Schofield; this page: Rodney Diaz

sawcut, use a tuned and sharpened handplane. I use a low-angle block plane because it cuts end grain effortlessly.

Assemble and glue up the boxes

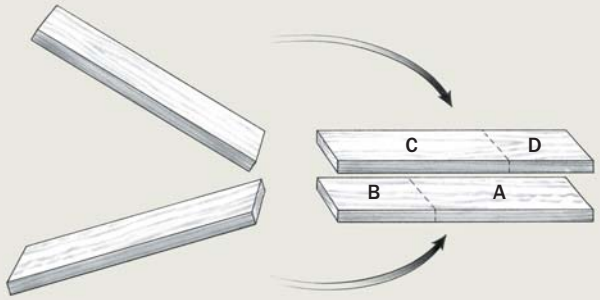
All but the smallest of carcase miters need strengthening. The mitered joint is actually a cross between long grain and end grain, so it's not the most optimal gluing surface. You can strengthen a joint either before or after the box has been assembled. In either case, assembling a box miter requires planning. Lay out and practice your clamping system before applying glue. Some finessing always is required to get the pressure in exactly the right spots.

Band clamps work well if they don't have to apply excessive pressure. Inaccurately cut joints will not pull together with band clamps, but well-cut joints will snug right up with just one or two band clamps. Masking tape also can provide light clamping pressure suitable for smaller boxes. Wrap a dry-assembled box with masking tape across the width of each of the miter joints. Then slice open one joint, lay out the box flat and apply glue to the joints. Fold the box back together and retape that last joint.

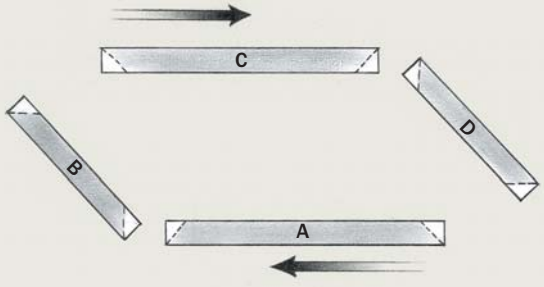
Whatever kind of strengthening you employ, it is a good idea to

Resawing for continuous grain

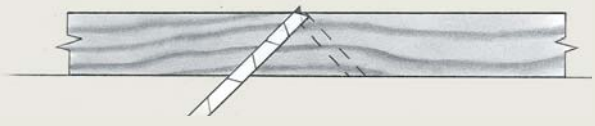
Sides resawn from thick stock on the bandsaw will produce a box with four matching corners.



Flipping over the resawn stock gives the outside of the box two corners of continuous grain and two corners of book-matched grain.



Before cutting the miters, label each side of the box so that the corners match up.



To minimize the gap in the grain caused by the miter cuts, set the blade height on the tablesaw to barely clear the top, or outside, face of the stock.

Drawings: Michael Gellatly

MITER AND GLUE UP THE BOX

Keep a carriage jig exclusively for cutting miters. *Use a stop block when cutting the second miter to ensure matching parts are cut to the same lengths.*

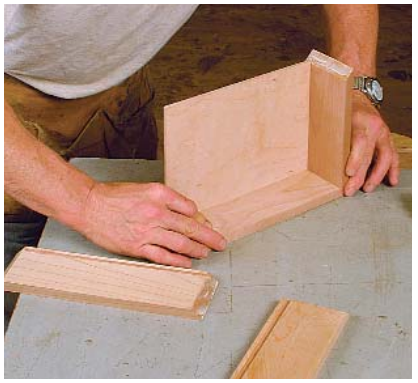
size the mitered end of each piece of wood before assembling the box. Wipe a thin layer of glue across the end grain and, before it has dried hard, scrape off the excess glue. Now the porous end grain won't suck up the glue and weaken the joint when you're ready for final assembly.

Strengthen miters before you assemble the box

The two simplest ways to strengthen the miter joints are to add biscuits or through-splines before gluing up the box. Because you cut them in the length of the joint, the sides of the box still show only long grain, and the biscuits and splines help align the joints during glue-up.

Biscuited miters provide unseen strength—With the miters cut and trimmed exactly to length, set the biscuit-joiner fence at 45° and adjust for the proper depth of cut. Make the cuts about one-third in from the inside edge to use the greatest depth of wood. If your biscuit joiner won't make a cut this close to the fence, attach a block of wood to the fence with double-sided tape (see the left photo below). Mark the center of the cut or cuts on the inside face of the stock, clamp the board securely and make the cuts.

Through-splined miters are strong and decorative—The easiest method of cutting through-splines is to use the tablesaw. With the blade already angled 45° from the miter cut, make the spline groove using a miter gauge and the saw fence. Set the blade height carefully and set the fence so that the groove is cut about two-thirds back from the outside corner. This makes for a longer and stronger spline. If available, use a flat-tooth blade for a square-bottom groove.



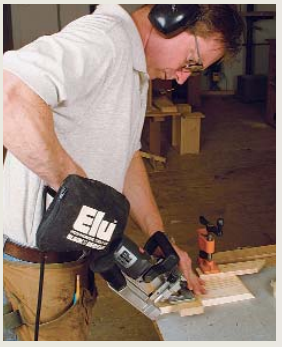
Preparations make perfect. *After a dry run with the band clamps set to the right length, apply glue to each mitered surface and assemble the box.*

Using band clamps. *Once you have verified that the joints are tight, crank down on the band clamps, but not so much that the webbing crushes the corners.*

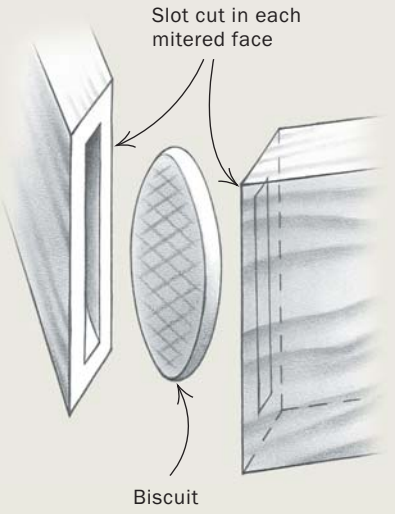
Two methods of strengthening a joint before assembly

Reinforcing a miter joint with a concealed biscuit or a through-spline aids assembly by aligning the sides during gluing.

BISCUITS

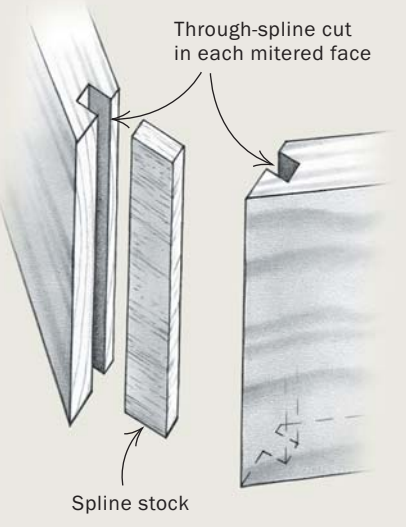


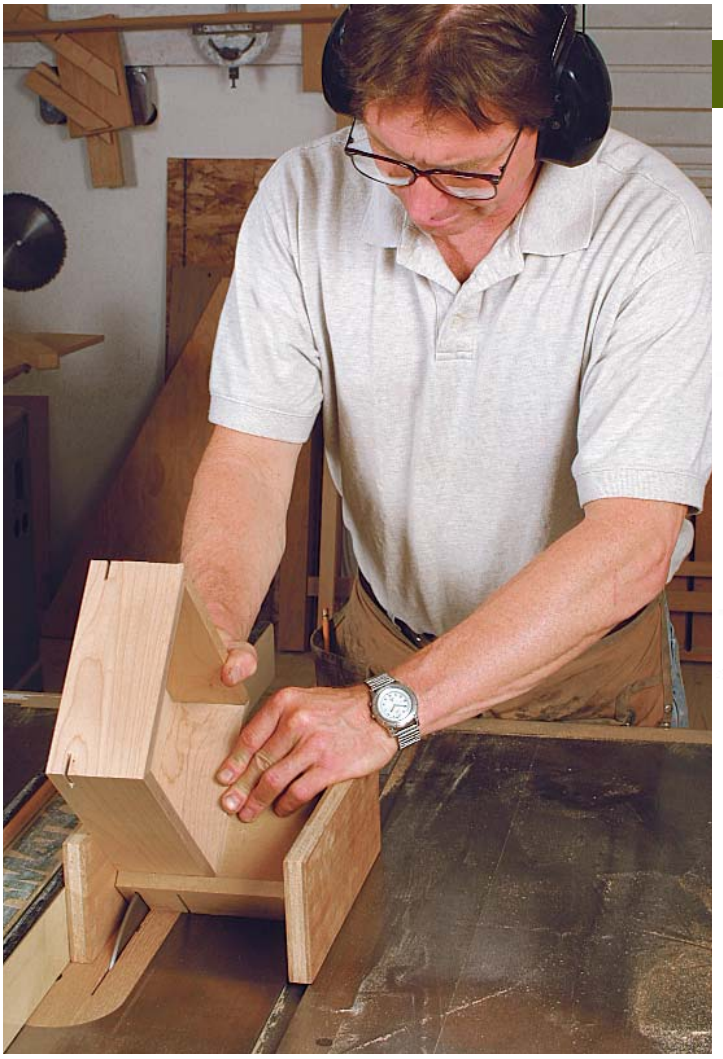
Cut the biscuit slot in the workpiece one-third of the way in from the inside face. An auxiliary fence on the biscuit joiner may be required.



SPLINES

When cutting splined miters on the tablesaw, set the blade and fence to make the spline cut in the thickest part of the workpiece.

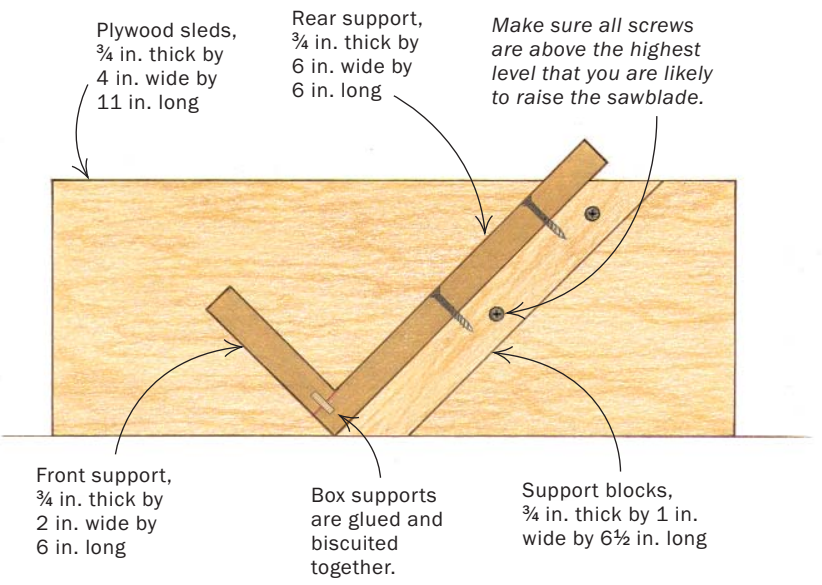




Cutting keys. *The carriage jig registers against the fence of the tablesaw and slides on two sleds.*

TABLESAWN KEYS

For easy and precise key slots cut on the tablesaw, use this cradle jig that carries the box at a 45° angle.



Well-stuck keys. *It is important that the keys are firmly seated at the bottom of the groove when they are glued in.*

Don't break the keys. *Plane away from the corner of the box to avoid breaking out the short grain of the keys.*

Watch it on the web

For a video on cutting keys on the tablesaw, go to www.finewoodworking.com.

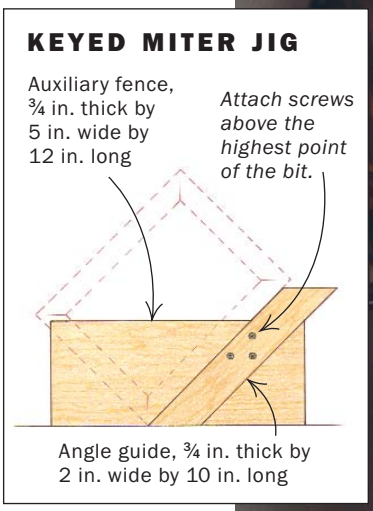
For an interesting design detail, I like to make up spline stock from a contrasting wood. When doing so, it's important that the grain runs in the same direction as the box sides so that all of the parts shrink and expand in unison, but this is also the strongest orientation for the splines. Rough out the stock on the bandsaw as wide as you need it and close to thickness. Make the stock long enough to easily hang onto, and trim it to thickness as if it were a tenon, using a tenoning jig or holder to support the piece as you pass it vertically by the sawblade. Then cut off a length of spline material.

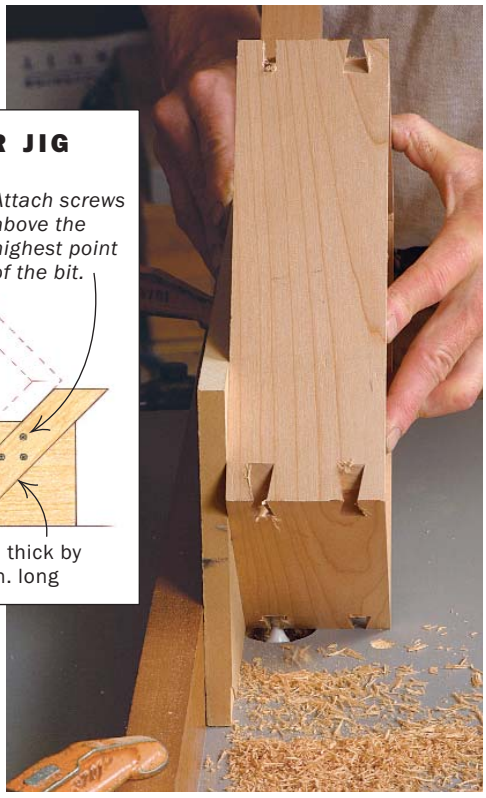
You'll be working with some wide short-grain stock that will likely break in your capable hands, but that won't matter as long as the spline pieces fit snugly in the groove when you glue up. Make sure to cut the splines exactly to length, or a hair under, so that the miters still fit together nicely. Use a block plane and a bench hook to trim the splines to length or thickness. Leave the splines a bit wider than necessary and clean them after you're finished gluing up.

Unlock different looks with keyed miters

Pieces of wood inserted diagonally into the outside corner of miter joints are known as keys. Added after the box has been as-

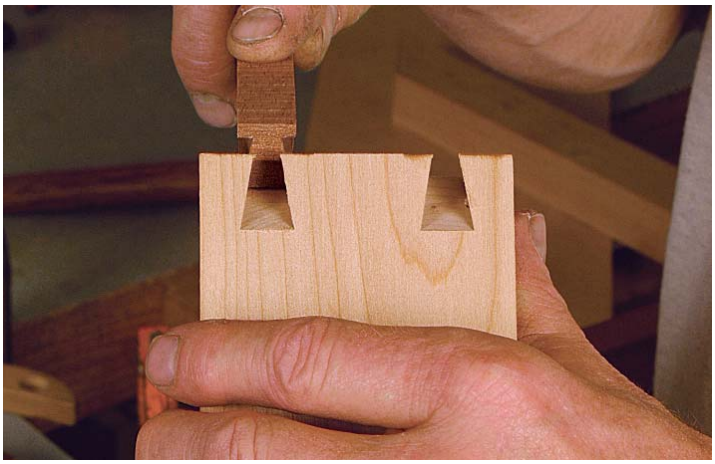
DOVETAILED KEYS





Two-step dovetails. *Remove part of the waste with a straight bit, then use a dovetail bit to cut the finished profile.*

Use a dovetail bit to form the dovetail key. *Cut the stock higher than needed to provide a surface to ride against the fence.*



The right key. *Check the fit of the key. If it is too tight, plane off a little from the bottom of the key.*

sembled, keys can be made from wood that matches the carcase or from a contrasting wood.

Hand-cut keyed miters—Place the box in a vise and, using your best backsaw, cut across the joint, making sure your sawcut depth is consistent on both sides. Use veneer stock for the key and fit this to your sawcuts. If the veneer is too thick, pound it with a metal hammer. Don't worry if it's a bit loose; when the key hits the glue in the joint, it will swell up, providing a nice long-grain to long-grain joint. If you use the same wood, the keys almost disappear into the joint and the surrounding wood.

Keyed miters on the tablesaw—There are two jigs you can use to hold the work when you cut keyed miters on the tablesaw. For smaller boxes, a keyed miter jig run against the tablesaw fence works fine. Screw a straight fence to a piece of medium-density fiberboard (MDF) or plywood at a 45° angle. Make sure the screws are higher than any possible cut you'll ever make.

A more secure method for holding larger boxes is to use a cradle jig. Make this out of plywood or MDF with a right-angle support in the center. Hold the box in the cradle and run the jig right against the fence to make the cut.

After the first cut has been made, rotate the box for the next corner. When all four corners on the bottom are done, spin the box and do the matching joints for the top of the box. Use a flat-tooth blade for the nicest look, or clean up the bottom of the cuts with a ⅛-in. chisel.

On the bandsaw, rough out stock for the keys, making them oversize in width but close in thickness and long enough to hang onto. Your key stock should be inserted with its grain running parallel to the long grain of the box. Pass it by the tablesaw blade to trim it to size, using a thin push stick to hold it securely. When gluing in keys, use a hammer to tap down each key to the bottom of the slot on both sides of the corner.

Dovetails meet miters—Dovetailed keys employ the same keyed miter jig used on the tablesaw. A cradle jig also may be used, but you likely will need a dovetail bit with an extralong shaft for

Take the top off your box

Like the base, the lid fits into a groove in the box sides. After the box has been glued together, plan the spacing of the keys to match where the lid will be sawn off; then saw it off with a tablesaw and a handsaw. Clean up the edges with a block plane and attach hinges.

HAND-CUT KEYS

Hand-cut key slots. *Use a backsaw to cut diagonally into the corner. Make sure the depth of cut is even on both sides.*

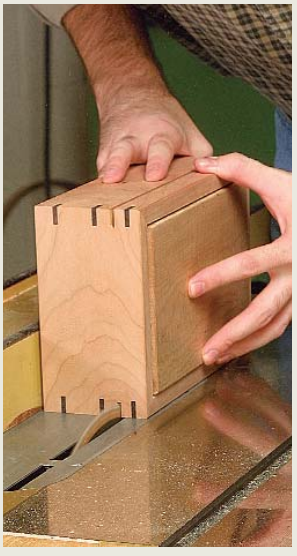
Tenderized veneer. *If the veneer spline is too thick to slide into the sawkerf, a few hammer blows will persuade it to fit.*

Thin but strong. *Despite its flexibility, the long-grain to long-grain glue bond strengthens the whole joint.*

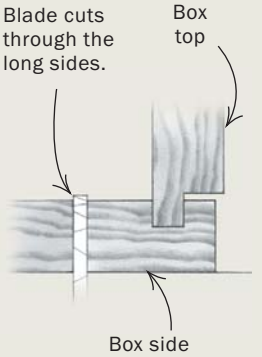
this jig. First, rough out the waste with a straight bit, then set the dovetail bit to the final depth of cut and make the pass.

Mill the key stock out of a contrasting wood almost to width and taller than required. This way, when routing the keys, there will be some wood left to run against the fence. Use the same bit to rout the dovetail slots, but set it for a slightly taller cut to make the key stock, which will allow the keys to slide more easily into the slots. Trim both faces of the stock. If a key is just a hair too thick, plane off a shaving from the bottom where it's widest. Cut the keys overlong and glue them in place on the box. Clean up all your keyed miter joints on the bandsaw first. Then, working down and away from the corner of the box, use a block plane to smooth the keys. If you work toward the corner, you will tear out the short grain of the keys. □

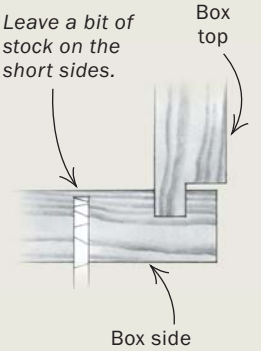
Gary Rogowski runs the Northwest Woodworking Studio in Portland, Ore., and is a contributing editor.



1. Through-cut. *Set the tablesaw blade slightly higher than the thickness of the sides to cut through the two long sides.*



2. Partial cut. *Lower the blade to leave 1/16 in. of wood on the short sides. This alleviates clamping or supporting the lid with shims during the final cut.*



3. Final cut. *Use a handsaw to cut through the two short sides. Clean up the edges of the box and the lid with a block plane.*

Photos, this page (bottom three): Michael Pekovich