Cutting Coves on the Tablesaw

Safe, accurate methods to make your own molding

BY STUART SABOL

Coves often are used as a decorative element in the design of furniture and architectural moldings. Whether in the feet of a chest, in a transition section between upper and lower cases, or in crown molding, coves create delicate shadow lines that accent and enhance a workpiece.

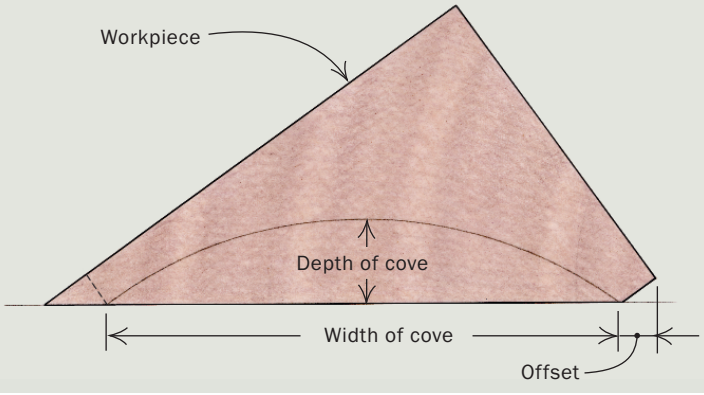
There are two broad categories of coves: symmetrical and asymmetrical. A symmetrical cove has its apex (highest point) in the center. The apex of an asymmetrical cove is offset from the center (see the photos and drawings on the facing page).

Large professional shops cut coves on a shaper, but few ama-

MAKING A SYMMETRICAL COVE

START WITH A FULL-SIZE DRAWING

To set up the tablesaw for cutting a cove, first make a full-size drawing of the desired cove. To vary the depth and width of a cove, adjust the height of the blade and the angle at which the workpiece approaches it. The cove's offset is determined by the distance between the fence and the sawblade.



Setting the blade height for a symmetrical cove. *Raise the blade to match the depth of the cove. The blade is lowered after the setup to cut in ⅛-in. increments.*

Photos: Mark Schofield

teurs can justify the expense of one of these industrial machines. The alternative method is to cut coves on a tablesaw; no expensive attachments are needed, and an infinite variety of coves is possible. The drawback, however, is that it can be difficult to set up the tablesaw to cut coves to precise shapes.

I use two methods that simplify the tablesaw setup: The first involves the use of a simple shopmade parallelogram for cutting symmetrical coves; the second uses a computer spreadsheet program to establish the correct angles when cutting the more complicated asymmetrical coves.

Symmetrical coves are cut with the blade at 90°

A cove has two defining dimensions: the depth of the cut that equals the height of the blade above the table, and the width of the cove measured at its base (see the drawing on the facing page). These two dimensions are varied by adjusting the height of the sawblade and by varying the angle at which the workpiece approaches the sawblade. Make a scaled drawing of the design or use a scaled plan, and measure the depth of the cove and the width at the base.

Use a shopmade parallelogram to set up the cuts—The parallelogram makes it easy to determine the fence angle for a symmetrical cove. The parallelogram is roughly 1 ft. by 2 ft. and is made from any straight-edged scraps of wood. Join the pieces with machine screws and wing nuts, and countersink the heads of the screws so that the parallelogram can lie flat on the saw table.

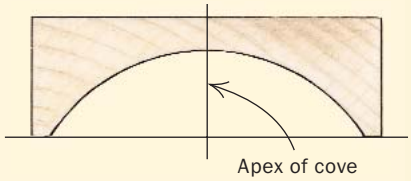
Raise the sawblade to match the depth of the cove. Measure the width of the cove and set the inside gap between the long sides of the parallelogram to match it. Lay the parallelogram on the tablesaw so that it straddles the blade. Rotate the parallelogram until the front tooth of the saw is just touching the front of the parallelogram and the back tooth is just touching the back (see the drawing below). Mark the front inside edge of the parallelogram. Set the miter gauge to this angle and use it to determine the angle of the fence. Before clamping the fence to the saw table, allow for the offset of

SYMMETRICAL VS. ASYMMETRICAL COVES

The waist and crown moldings on this cabinet were made on the tablesaw by feeding the stock across the blade at an angle. The symmetrical waist molding was cut with the sawblade perpendicular to the tablesaw top. The elongated crown molding was created by tilting the sawblade.

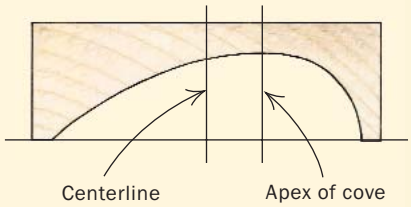
SYMMETRICAL

An upright blade produces a cove that has its apex at the center.



ASYMMETRICAL

A tilted blade produces a cove with an off-center apex.



USE A PARALLELOGRAM TO DETERMINE THE FENCE ANGLE

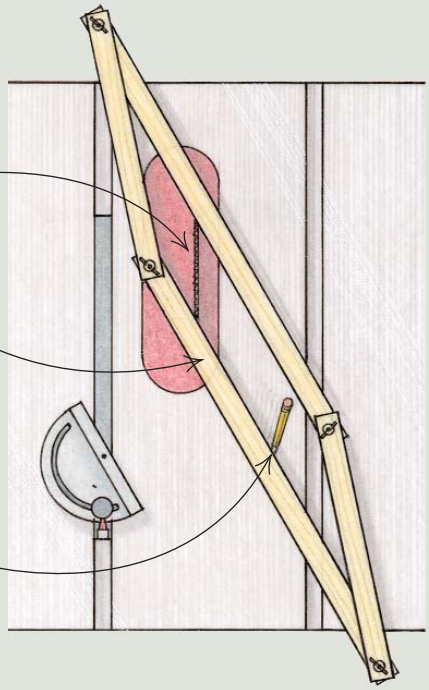
The shopmade parallelogram (about 1 ft. by 2 ft.) is made from scraps of wood, joined with machine screws and wing nuts. The screws are countersunk so that the parallelogram can lie flat.

***Setting the width.** Adjust the parallelogram to match the width of the cove. Then place it on the tablesaw and rotate it until the teeth at table level just touch both sides.*

1. Set the blade height to match the cove depth.

2. Set the width of the parallelogram (photo left). Rotate the parallelogram until its two internal long sides just contact the blade's teeth.

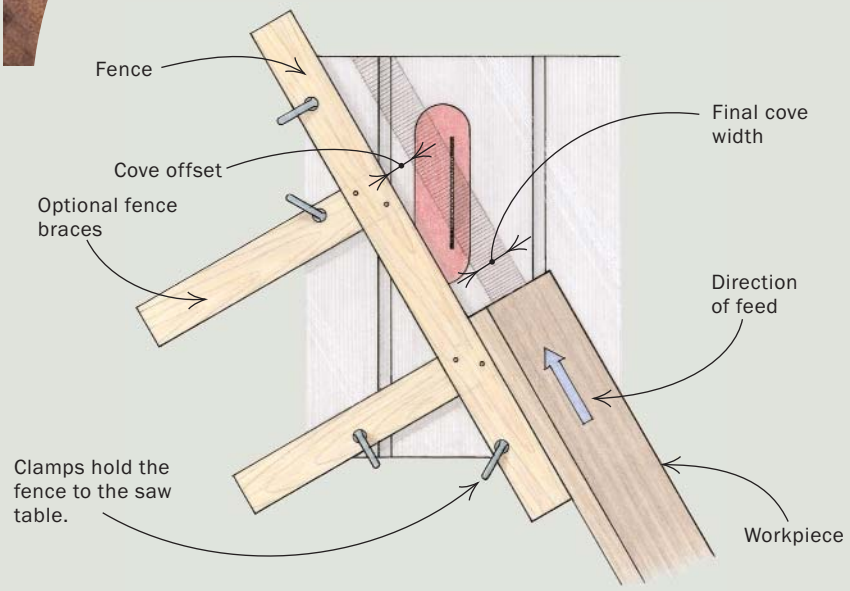
3. Draw a pencil line on the inside front edge of the parallelogram. Align the miter gauge with that line (see p. 70).

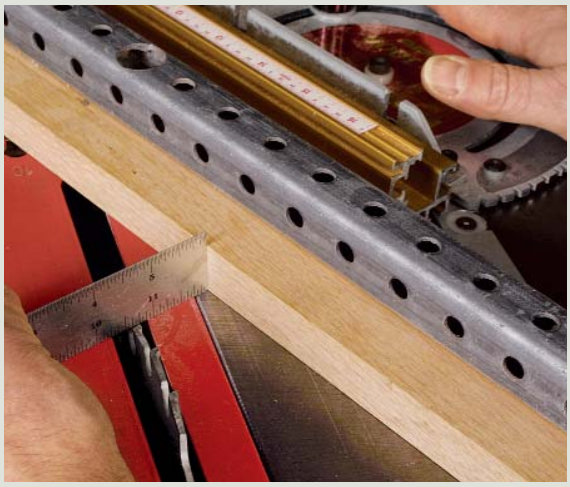


Drawings: Vince Babak

LOCATE AND SECURE THE FENCE

Rest the fence against the miter gauge and measure any offset required. The fence should be at least ¾ in. thick by 3 in. wide and jointed on two adjacent sides. Clamp both ends of the fence to the tablesaw. Add braces, if necessary, for additional support.





Set the offset. *If the cove does not reach the edge of the workpiece, this gap, known as the offset, must be allowed for when setting the fence. The distance is perpendicular from the fence to the edge of the front sawtooth.*

the cove from the edge of the workpiece. The offset is measured perpendicular from the fence to the closest blade tooth.

Symmetrical coves can be cut with one fence. It should be at least ¾ in. thick, 3 in. wide, and 3 ft. to 4 ft. long, jointed on two adjacent edges. (If it is difficult to set a clamp on the front rail, clamp braces to an extension table, as shown above.) If your design leaves the workpiece thin above the apex of the cove, add a second fence behind the sawblade to support the workpiece as you bear down on it. The rear fence also lessens the chance of the wood splitting along the line of the apex.

Lower the blade to just below the table, noting how many turns of the handle this takes; as a backup, mark the final depth of the cove on the end of the workpiece. Make a dry run to practice the feed rate, to make sure the fence gives adequate guidance, and to check that none of the clamps is an obstruction.

Cut in small bites, and feed slowly—The cut is made by passing the workpiece at an angle over the blade rather than straight into the cutting edge. This means that the blade teeth are in contact over the full arc of the cove and remove a considerable amount of wood; therefore, a cove must be cut in small increments, no more than about ⅛ in. at a time. Also, you need to employ a slow feed

Extend the range of angles. *If your miter gauge has a limited range, cut a wedge, subtract that angle from the desired angle, and set the miter gauge to that angle. In this case, 75° is obtained by using a 30° wedge and setting the angle at 45°.*

Coving with different miter gauges

There are two main variations in the graduations of a miter gauge: The first is the number of degrees that the fence of the gauge can swing through. Most gauges that come with a tablesaw can move through 120°, but some are restricted to 90°. Many aftermarket gauges can swing through 180°, making them ideal for this process. Instead of buying another gauge, a simple solution is to cut a wedge that, when placed in front of the gauge, extends the angle range. Thus, if your gauge travels only 60° each side, a 30° wedge will extend that range to 90°.

The second variation is the different numbering methods of miter gauges. On some gauges, the midpoint is 90°, with the numbering system extending to 30° on each side. On other gauges, the midpoint is at 0°, and the numbers extend to 60° on both sides. The spreadsheet program (see p. 72) will work with both types of miter gauges.

Clamp the fence. *Once the fence angle and the offset distance have been set, clamp the fence securely to the table. If it is difficult to set a clamp on the front rail, use braces clamped to the extension table.*

Apply steady pressure and take small bites. *Because the workpiece is being pushed across the blade and not through it, the blade should be raised by only ⅛ in. for each pass. Push down and toward the fence with a large padded push block, such as this tile-grout trowel, and forward with a push stick.*

rate because the thrust is against the side of the blade—a cut for which the blade is not designed. For a deep cove, each pass should remove less and less material because the arc length increases, requiring more power from the saw to make the cut.

To cut coves safely on the tablesaw, be sure to use push sticks or, better yet, a pair of padded push blocks like those normally used with a jointer.

When you've almost reached the cove's final depth, make a very shallow cut to leave the surface of the cove as smooth as possible. You also can make a second pass with the blade at the final height to further reduce the amount of scraping and sanding.

Asymmetrical coves are cut with the blade tilted

As the sun sets, an object's shadow becomes elongated; circles become ovals, stretching until almost losing their curvature just before night falls. In a similar way, tilting the blade distorts and elongates a cove. As the angles of the blade and the auxiliary fence become more oblique, the apex of the blade is moved to a point away from the cove centerline.

While you can use the parallelogram to measure the angle of approach, it cannot reveal the shape of the cove if the blade is tilted. The traditional method has been to sight across the blade and experiment with blade and fence angles until the profile of the blade matches that of the cove. This method requires repeated trial cuts with scrapwood. A better approach is to use a spreadsheet program to calculate the blade and fence angles (see p. 72). The spreadsheet program also can be used to find the fence angle to cut symmetrical coves.

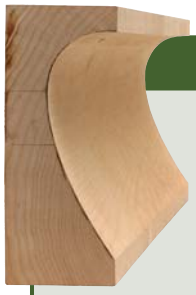
As with a symmetrical cove, an asymmetrical cove starts with a scale drawing. Measure the cove's depth, length, and apex offset. Enter the data in the spreadsheet. Start with your tablesaw's blade diameter; then enter the desired depth of the cove, the desired

TABLESAWN COVES NEED CLEANING UP

However slow the final pass, some sawmarks will remain. The two best ways to achieve a smooth surface are either to use a gooseneck scraper, which has a variable profile that should fit any cove, or to sand the surface.

Scrape away sawmarks. *A gooseneck scraper should fit any cove profile. Turn an edge on the scraper with the burnisher.*

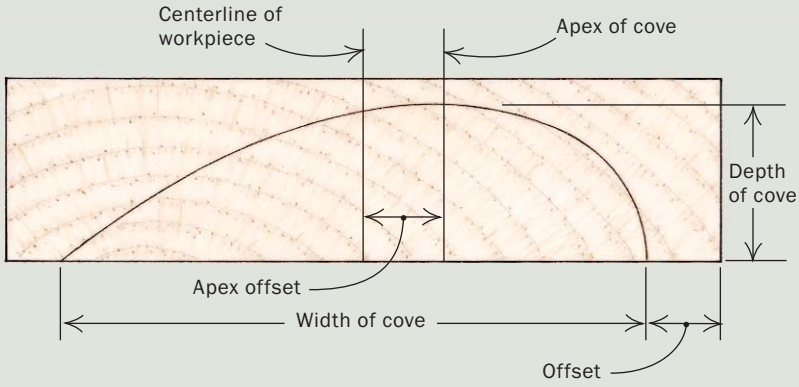
Shopmade profile sander. *Transfer the shape of the cove onto some building foam (left) and then cut the foam to shape on a bandsaw. With sandpaper wrapped around the custom-shaped foam block (right), sanding the cove goes smoothly.*

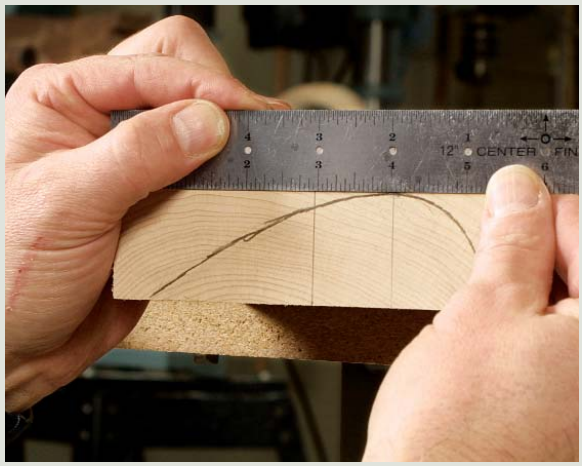


MAKING AN ASYMMETRICAL COVE

THE AMOUNT OF BLADE TILT WILL DETERMINE THE COVE SHAPE

As the blade is tilted toward 45°, the shape of the cove becomes increasingly asymmetrical, with the apex of the cove farther and farther away from the centerline of the workpiece.





This cove has three dimensions. *Record the width and depth of the cove and measure the distance between the centerline of the workpiece and the apex of the cove; in this case, it's just over an inch.*

Use a computer spreadsheet to establish blade-tilt and fence angles

Computer help. *Sabol's spreadsheet program determines the correct fence and blade angles. It also will tell you if the dimensions of the cove are beyond the capabilities of your tablesaw.*

My spreadsheet will help you calculate the proper blade and fence angles to cut coves on the tablesaw (you'll find a link to the program at www.finewoodworking.com). Enter data only in the five squares in the center of the spreadsheet. Simply enter the diameter of your sawblade, the desired cove depth, length, and apex offset, hit *Calculate*, and the spreadsheet will calculate the correct angle to tilt the sawblade and to set the auxiliary fence. If your cove dimensions fall outside the limitations of your tablesaw, the spreadsheet also will show you the maximum possible dimensions. You can customize the spreadsheet for your miter gauge by entering 90 or 0, depending on your gauge's midpoint setting. You also can use the spreadsheet for symmetrical coves by entering 0 for the apex offset, which eliminates the value for the blade-tilt angle.

coveangles1.0.xls

	A	B	C	D	E	F
1	Cove Calculations					
2	Copyright 2003 Stuart B. Sabol, all rights reserved.					
3	This spreadsheet and formulations contained herein are intended for private use.					
4	Any commercial application, distribution or otherwise is prohibited without the prior written consent of St					
5	All inquiries should be addressed to The Taunton Press.					
6						
7	(input values in)	yellow background with blue numbers				
8						
9	Blade Diameter	in.	10			
10	Desired Cove Depth	in.	2	Max Possible Values		
11	Desired Cove Length	in.	0.500	5.990	Calculate	
12	Desired Apex Offset	in.	0.14	1.996		
13	Miter Gauge Midpoint Angle	90°/0°	90			
14						
15	Fence Angle	°	3.8			
16	Blade Tilt Angle	°	4			
17						
18	Check Cove Length	in.	0.501			
19	Check Apex Offset	in.	0.135			
20						

length of the cove, and the length of the apex offset. Enter 0 or 90, according to the midpoint setting on your miter gauge. Then click on the *Calculate* button, and the spreadsheet will show you the correct angle to tilt your sawblade and the correct angle to align your auxiliary fence.

The spreadsheet also displays the exact cove length and apex offset these blade and fence angles will produce. They should be almost identical to your desired dimensions.

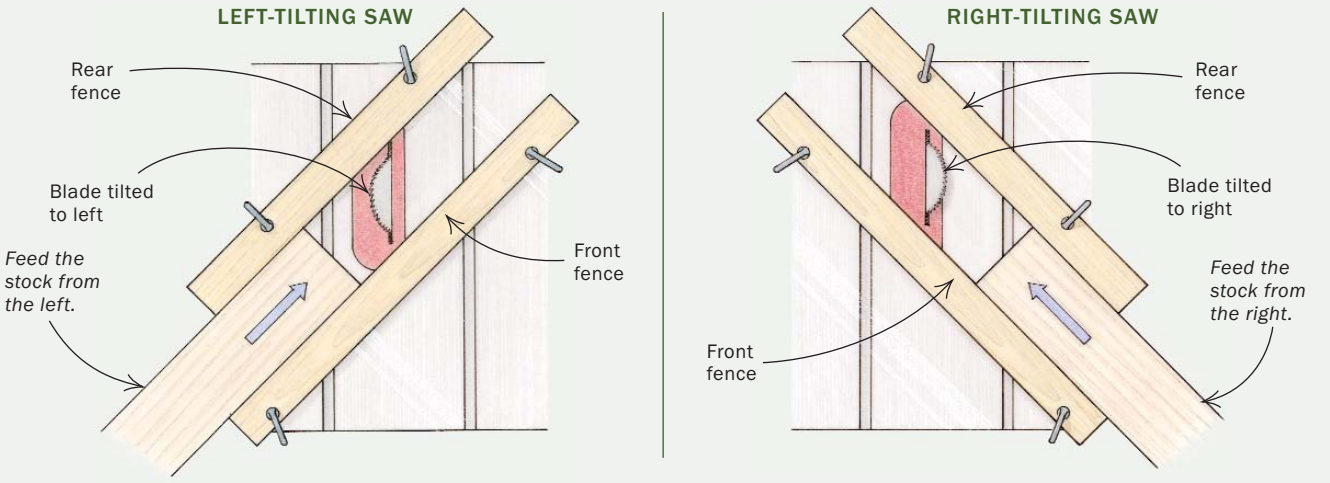
Use extra caution when cutting asymmetrical coves—It's important to use two fences to cut asymmetrical coves: one in the front and one in the rear (see the drawings on the facing page). The extra fence will allow you to apply more downward force and will keep the workpiece aligned over the blade.

Watch it on the Web To see the author cut a cove, go to www.finewoodworking.com.

When cutting symmetrical coves with the blade vertical, it is safe to feed the work from either side of the blade. With asymmetrical coves, the blade is tilted, and you must feed the work from the side the blade is tilted toward. If you try to feed the work in the same direction the blade is tilting, there is a risk of the work sliding up the tilting blade, rising above the level of the front fence, and being thrown back at you. For a left-tilting saw, feed from the left front; for a right-tilting saw, feed from the right front.

BLADE-TILT DIRECTION DETERMINES THE FEED DIRECTION

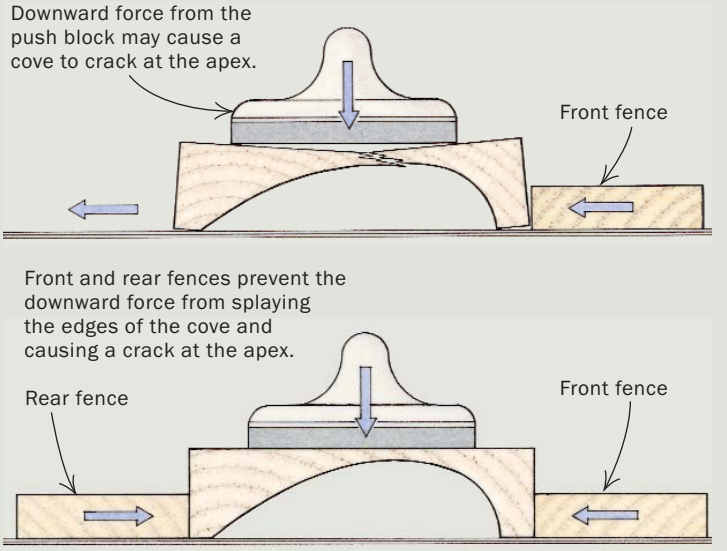
The correct feed direction will prevent the workpiece from riding up the tilted blade. For a left-tilting blade, feed from the left; for a right-tilting blade, feed from the right.



Feed into the tilting blade. *The workpiece should approach from the side that the blade is tilting toward. Otherwise, there is a risk that the workpiece may slide up the sloping blade and over the front fence.*

DEEP COVES REQUIRE TWO FENCES

If the design leaves the workpiece thin above the apex of the cove, it is a good idea to add a second fence. Like the buttress of a bridge, this fence supports the workpiece as you bear down on it and lessens the chance of the wood splitting.



Once the feed direction has been determined, set up the auxiliary fence in the correct orientation (see the top drawings above). The apex will be offset from the centerline of the cove in a direction opposite from where you feed the workpiece. Feeding into the blade from the front of the table moves the apex to the back of the workpiece. Lay out the asymmetrical cove on the workpiece so that it will blend with any other decorative elements, and orient the board so that the apex is translated in the proper direction before starting your passes over the blade.

Tablesawn coves have limitations

The maximum cove length that can be cut on the tablesaw is directly related to the diameter of the blade and its cutting depth, and this relationship cannot be changed. You will be able to lengthen a cove with the same depth by tilting the blade and making an asymmetrical cove, but this technique reaches its limit rather quickly. If a cove with a shallow cut and a long sweeping shape is desired, another method to shape the cove may be required, such as multiple cuts with a router and extensive cleanup.

In addition, narrow coves appear less circular and more elliptical, perhaps distracting from the initial intent of the designer. For narrow coves, using a smaller-diameter blade can produce a cove with a more circular shape. □

Stuart Sabol is an engineer and amateur woodworker who lives in Houston, Texas.