

Templates Guide the Way

When the talk turned to tools at a recent woodworkers' meeting, I surprised myself by naming router templates as my favorite. Don't get me wrong: I love hand tools and use them constantly, but my work would be less efficient and less profitable without these simple but versatile templates.

Router templates can be used to create and fine-tune furniture forms before cutting into expensive stock. They allow me to see a design full-size and in relation to the other parts of a piece. Not to mention, templates make it easy to reproduce identical parts.

Almost all template-routing operations require only a handful of tools, including a router, two common bearing-guided bits, a bandsaw, a sander, and a shopmade template. With those items and a few drawing tools, such as a compass or even french curves, you are fully equipped to tackle any template-routing job.

Making a template

Templates can be made from any stiff sheet material with enough strength and thickness to guide the bearing on a router bit. In a pinch I've even used scrap wall paneling and old crate lumber, but there are better choices. Mainly, I use two materials: 1/8-in.-thick Masonite for one-offs and 1/4-in.-thick Baltic-birch plywood for production. Both have the basic characteristics of dimensional stability and consistency (no hard or soft spots), and are readily available.

Drawing the pattern—Trusting your eye is the quickest route to getting the shape you want in a template, but drawing tools will help you get there.

I usually begin by sketching the template pattern directly on the surface of the workpiece, especially when I'm working to preserve the grain in a particular board. Once I'm satisfied with the shape, I transfer it to the template stock.

When drawing the pattern on the template, it's a good idea to add at least 1 in. of material lead-in and exit beyond the workpiece edge wherever possible. Without it, the bit can catch as you try to make the first corner of the template meet the bearing. Believe me, I've done it.

Whether you draw a pattern freehand or with drawing tools, you often will be left with bumpy lines and rough transitions



Create elegant curves
and furniture parts
with router templates

BY DOUG PETERMAN

MAKING A TEMPLATE FOR ROUTING



Cut and sand the template. After roughing out the template on the bandsaw—cutting $\frac{1}{16}$ in. outside the line—smooth the template to its final shape using a belt sander (left) for flat or convex areas and a drum sander (right) for inside curves. Subtle irregularities are difficult to see, so inspect your template for dips and bumps by running your hand across its edge.



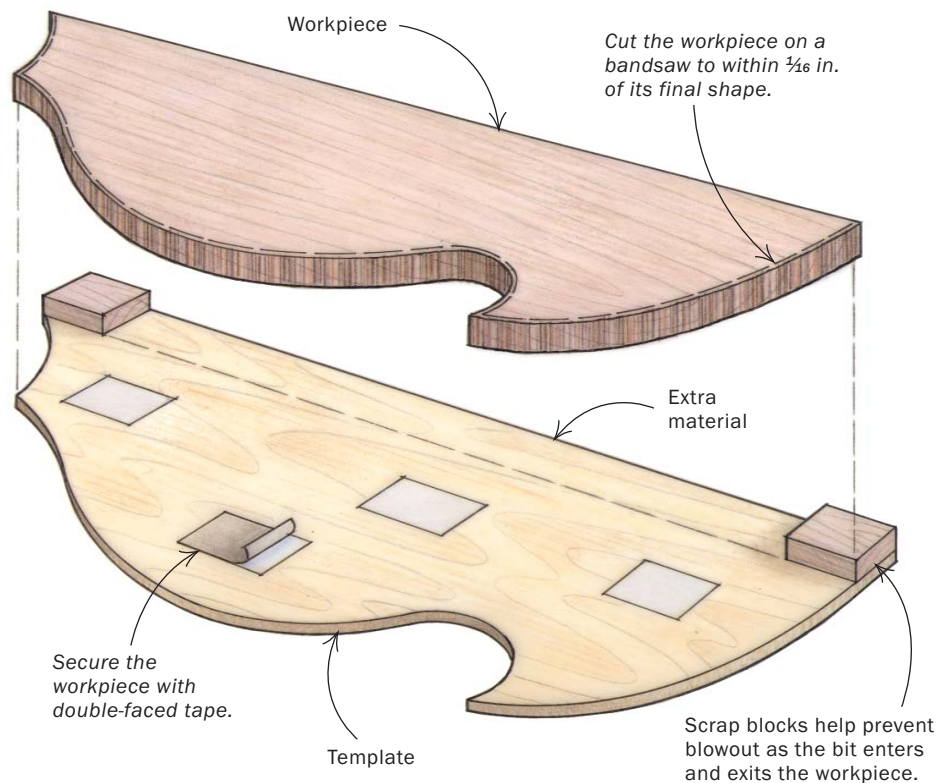
Glue scrap blocks to the template. The blocks prevent the bit from catching the corner of the workpiece and damaging it upon exit and entry.

that need to be smoothed out. The trick to achieving a smooth, or fair, curve is to get your eyes right down near the drawing surface and look along the line. Bumps and dips are easy to see, but also look for transitions that are too abrupt. Work your way along the line, refining it until the curves are fair.

Rough-cut on the bandsaw, then sand—When rough-cutting the template, keep the blade about $\frac{1}{16}$ in. from the pencil line to leave enough stock for sanding and final smoothing.

To get to the final shape, use a stationary belt sander. I use two—a 6-in. belt and a 1-in. belt—and both run with the table perpendicular to the vertical belt. For tight inside curves, a sanding drum mounted in the drill press is ideal.

Power sanding to a line involves a few simple rules. First, keep the material moving smoothly with even speed and light pressure. Never let it stop. Second, for optimal control, try to have the waste come off so that you hit the line just as the template passes the trailing edge of the belt or the center of the drum. This gives you one spot to watch and the comfort that the rest of the abrasive belt is safely cutting waste. Finally, work on bumps and dips by sanding the areas around them. Start before the fault, sand smoothly through it, and carry on a bit beyond.



If you don't have power-sanding equipment, templates can be smoothed by hand, using either files or sandpaper. I prefer files because it's easier to keep a square edge with them. Use a flat file along the edge on convex curves, and a half-round or round file pointed diagonally across the template but still moving along the edge for concave areas. Sand as the last step if you must, but

use a very firm or hard block to avoid rounding the edge.

To check your work, slide your hand over the finished piece to find any bumps or dips. Smooth them out as needed.

Using the router templates

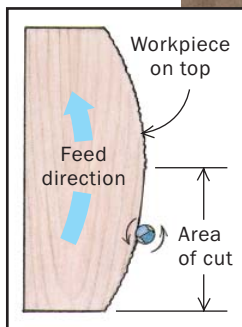
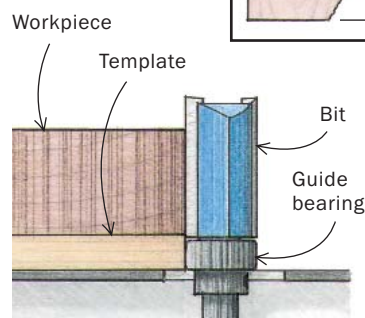
When routing a workpiece with a template, I use bearing-guided straight bits

TEMPLATE-ROUTING

To avoid tearout when the grain changes direction on a workpiece, flip the piece onto its opposite side to reverse the direction of the cut. At the same time, switch from a pattern bit to a flush-trimming bit instead of removing the template and remounting it on the other side.

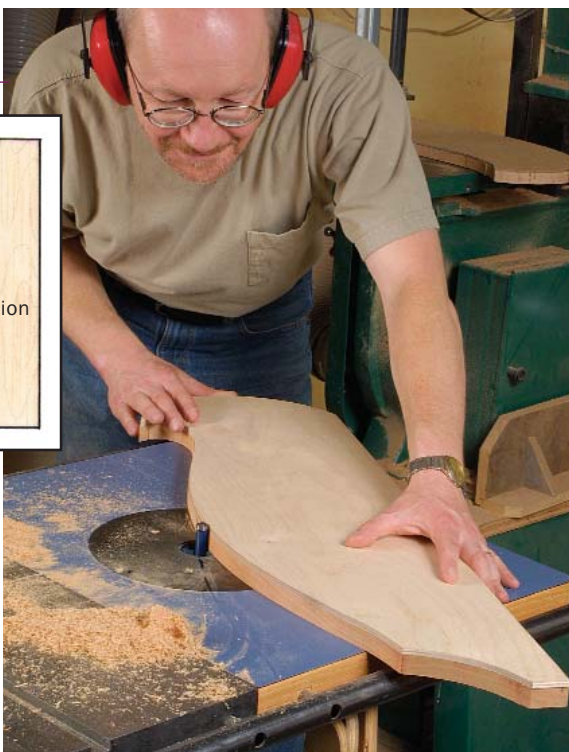
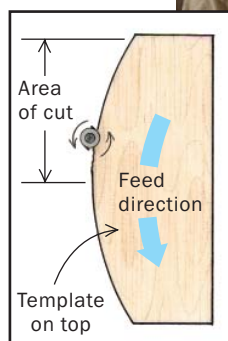
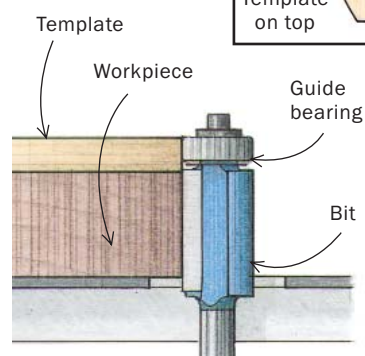
BEGIN WITH THE TEMPLATE ON THE BOTTOM

With the template on the underside of the workpiece, use the pattern bit to rout all of the areas where the bit is cutting in the same direction as the grain. Leave the remaining areas uncut.



FLIP THE WORKPIECE AND CHANGE THE BIT

With the template on top of the workpiece, use the flush-trimming bit to rout the remaining areas in the opposite direction.



that are known as flush-trimming bits when the bearing is on the tip, and pattern or template bits when the bearing is on the shank. You need one of each type; mine are 1/2-in. bits with a cutter length of 1 in. When using these straight bits with templates that are exactly the size of the finished piece, there's no need to add offset for a bushing, and no worries that a bushing may be off center.

The bearings should be exactly the same diameter as the cutter path to produce a flush cut. A good way to test is to make one pass with only the bit riding on the template edge; then make a second pass with the bearing riding on the surface that was just cut.

There should be no step between the first cut and the second cut. If the bearing has left an impression where it rolled along the cut surface, it means your router has excessive runout, you have a bad bearing, or the bit does not run true. In all of these cases, the bearing is acting like a

Troubleshooting common problems

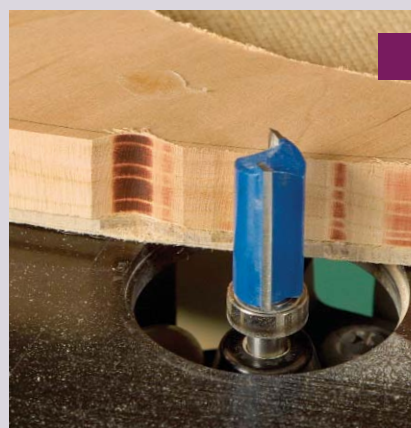
BUMPS

Bumps occur when the template loses contact with the bearing. This often is caused by chips impairing the edge of the template. Also, make sure the bearing is running against the template and not the workpiece, and then take another pass.



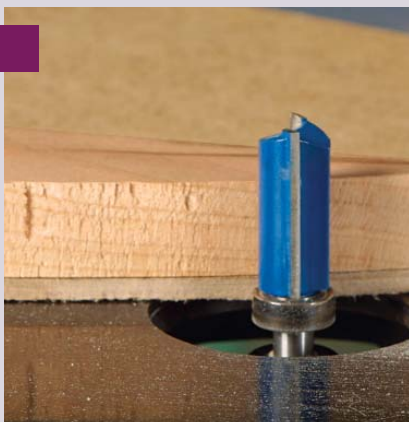
DIPS

If the router bit slips, the bearing will lose contact with the template, and the cutter will dig into the workpiece. To avoid this tough-to-repair mistake, make sure the router-bit height is locked securely, and keep steady pressure on the workpiece while cutting.



TEAROUT

Tearout results from cutting against the grain, when the bit lifts fibers and breaks off small chips. Routing with the grain is the simplest solution. When routing highly figured wood, you can avoid tearout by changing the cutting direction more frequently.



BURNING

Burn marks are left when the workpiece moves too slowly past the bit; they show up worst on end grain. To avoid burning the finished edge, move the workpiece more quickly past the bit for the final pass.



hammer as it swings around just off the center of rotation.

Secure the template to the workpiece—For quick one-off routing, attach a template with double-faced tape or a few globs of hot-melt glue.

If I have to make several parts with the same template, I try to use clamps (shop-made cam, wing nuts or knobs, toggle clamp, etc.) to hold the work. Vacuum clamping works well for production pieces where you need 360° access to the piece. Special needs call for creativity: Templates can be made into two-sided jigs or jigs that box in a piece—anything to get the template securely in place.

Trim the waste on the bandsaw—With the template attached to the workpiece, use a bandsaw to cut away the bulk of the waste. Cut to about $\frac{1}{16}$ in. from the line all around to reduce routing time. I used to leave more wood and hog it off with the

router, but those heavy cuts sometimes raised chips that ran into the grain below the template edge. For quick trimming—especially handy when producing multiple copies of a template—I attach a finger guide to the bandsaw tabletop to keep the template $\frac{1}{16}$ in. from the bandsaw blade. This also ensures that the cut stays on the waste side of the workpiece.

Use a router table and two straight bits—I do as much template routing as possible on the router table. Only when the workpiece is too large to be coaxed across the table will I take the router to the piece. Setup is very simple: Just mount the bit and raise or lower it until the bearing is lined up with the template.

As much as possible, rout with the grain. If you think of the grain as a stack of paper, the cutter should be making the edge of each sheet lie down, not lift up. This is why you need both types of bearing-guided router bits. To rout with the grain on all

edges of the workpiece, you must flip over the workpiece and alternate between the two bearing-guided router bits.

One thing to avoid is climb cutting, which is when the bit is spinning in the same direction as the workpiece is being fed. This is dangerous and should be attempted only where almost all of the waste has been trimmed off. Even so, always anticipate the workpiece being pulled forward into the cut, and keep your hands out of the bit's path.

Starting with the pattern bit in a router table, rout all of the areas that you can without lifting the grain. Change to the flush-trimming bit, flip the workpiece so that the template is on top, and rout the remaining uncut areas, going with the grain. If you have trouble keeping track of grain direction, draw arrows on the worksurface that point in the direction of the grain. □

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