

Strip Laminate Bending



At one time or another, you may have avoided making a project with curved components, simply because you didn't know how to go about bending the wood. Perhaps you wanted to create some curved legs for a table or a curved arm for a chair. Strip laminating gives you a simple, down-to-earth way to form curves in wood...without belching steamers, toxic chemicals or Rube-Goldberg-looking apparatuses.

Actually, strip laminate bending is nothing more than ripping or resawing thick stock into thin strips, then reassembling them into the shape you want. In other words...turning straight wood into curved wood. It's a process that not only throws wide the doors to your project design capabilities...but also creates projects that are far stronger and more durable than those crafted by cutting curved pieces from solid stock.

Step 1: Getting Started

Perhaps above all else, strip laminate bending requires careful planning. Whether you're using someone else's plan or designing your own project, a full-scale drawing is **essential**! Next, use this drawing to create a full-scale template of your curve, using a rigid material such as 1/8" or 1/4" tempered hardboard or hardwood plywood containing no voids. Use a Bandsaw or Scroll Saw to cut out your template.

Step 2: Designing Your Form

Strip laminate bending can be performed using either a *Single-Piece Form* or a *Positive/Negative Form*.

With a *Single-Piece Form*, clamps are used to hold the laminated strips tightly against the curved form (See Fig. 1).

With a *Positive/Negative Form*, the laminated strips are "sandwiched" between two mating forms, which are then clamped together.

As you can see in Figure 1, when using a *Single-Piece Form*, it's best to position your clamps with their bars on the outside edge of the curve to keep the clamps from interfering with one another.

Figure 2 clearly shows how a *Positive/Negative Form* requires fewer clamps and spreads the clamping pressure more evenly. However, it will require more time to make.

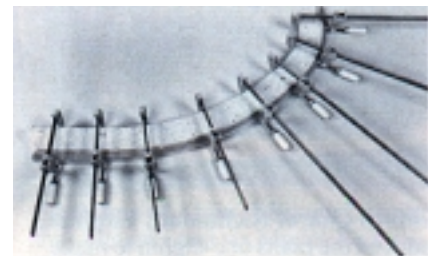


Fig. 1. A *Single-Piece Form*

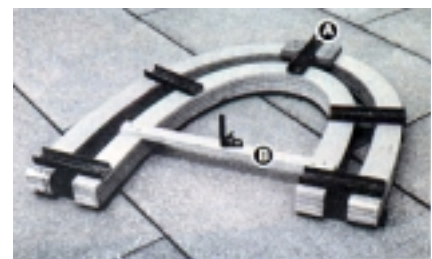


Fig. 2. A *Positive/Negative Form*

Step 3: Fabricating Your Form

The best materials for making bending forms are dense particleboard or plywood. To reduce flex and provide rigidity during clamping, forms should be no less than 3” wide and about an inch thicker than the stock to be bent.

For smaller forms, glue and nail the layers of particleboard or plywood together, then trace your curved design onto the top layer and use your Bandsaw to cut out the form. Use your Disc Sander and Drum Sanders to obtain your final contours.

Tip: The up-down motion of Shopsmith’s Oscillating Drum Sander Attachment will help you achieve greatly improved results when sanding forms that are 3” or more wide.

For larger forms, use your Bandsaw to cut out the first (bottom) layer of the form. Next, use your Disc and Drum Sanders to sand this layer to its final shape. Cut out the next layer. This must be a little over-sized and **not** under-sized. Glue and nail it to the first layer. Using a Router Table or a Hand-Held Router with the bearing pilot of a Flush-Trim Bit riding against the edge of your first layer, trim the second layer flush with the first (See Fig. 3). Continue adding layers and trimming them flush until your form is the required thickness.

Tip: If you don’t have enough large pieces of stock to create all the layers you need, you can make all but the bottom (original) layers by gluing-up smaller pieces of stock. Just be sure to stagger the joints from layer-to-layer for maximum form strength.

You can extend the life of your form by adding masking tape or 1/8” hardboard to all inside edges. Then apply a coat of paste wax to the inside surfaces to ease the removal of your glued-up pieces. Finally, attach locating guides to ensure proper positioning...and a brace(s) to prevent distortion of your shape (See Fig. 2).

Step 4: Preparing Your Stock

Select the stock for your project based on bendability, color, availability and ease of shaping or machining. Woods such as red oak, ash, hickory and elm allow tighter curves per thickness of laminate. The porous grain in woods such as red oak and ash also help disguise glue lines.

To determine the thickness of your laminated layers, experiment by bending several different thicknesses of test strips around your form. It’s best to use the thickest strip you can...without breaking the strip.

Tip: To bend thicker strips, soak them in hot water for about an hour...then clamp them into the form overnight. Remove them from the form and allow them to dry thoroughly and completely before gluing-up your project.

Remember to always crosscut your stock to several inches longer than the length of your bent piece – allowing extra stock for trimming and joining later. Also, make your strips 1/4” wider than your finished piece to allow for slippage during glue-up and final machining. Before ripping your stock, be sure to mark it so it can be reassembled in the same sequence during the gluing stage.

If you’re planning to resaw thin laminate strips from thicker stock, the widths of those strips will be limited by the depth-of-cut of your Bandsaw (6” for Shopsmith’s Bandsaw). Your ability to make those strips a consistent thickness will be determined by whether or not you’re planning to use a Jointer or a Thickness Planer to bring them to final dimension.

If you have a Thickness Planer, you can simply run your resawn stock through it to achieve



Fig. 3. Using a hand-held router with a bearing piloted flush-trim bit to trim successive layers of the form even with the first layer

the proper thickness.

If, on the other hand, you don't have a Thickness Planer but do have a Jointer, your ability to smooth the surfaces of your laminated strips will be limited by the width of your Jointer Knives (4" for Shopsmith Jointers). With the Jointer method, start by jointing one edge of your stock. Next, resaw off a strip using your Bandsaw...then run the opposing side over your Jointer knives, bringing it to final dimension.

CAUTION: The faces of stock thinner than 1/4" should **never** be run over a jointer. For stock 1/4" or thicker, be sure to use Push Blocks and Feather Boards to control your stock when performing these operations.

You can also use the Table Saw setup shown in Figure 4 to remove bandsaw kerf marks. For best results, use a Carbide-Tipped or Hollow Ground Saw Blade.

Repeat the chosen processes above until you have all the laminate strip stock you need to create your project component(s).

TIP: Butt together shorter laminate strips and attach with masking tape. Gluing masking tape into the lamination prevents voids between the butted pieces and will not show or substantially weaken the bend. Stagger the strips joined with tape between the single-piece layers.

Step 5: Glue-Up Preparation

Clamping is **critical** ! You must carefully plan out how you are going to clamp the laminate strips into your form.

For a *Single-Piece Form*, use C-Clamps, Bar Clamps, Pipe Clamps, Handscrew Clamps, old bicycle innertubes, Cam Clamps or even wooden blocks connected with bolts, nuts and washers. The sizes of the clamps you use will have to be adjusted to the application, of course.

For a *Positive/Negative Form*, you'll need more pressure but fewer clamps. Half-inch threaded rod and channel iron work well for these forms (See Fig. 5). Once you've planned your clamps, go through a dry run to decide how you're going to make it all work and whether you can do it fast enough.

Depending on whether or not you want your joints to be waterproof, there are a number of glues to use. If your project is for indoor use, you can use conventional aliphatic resin (yellow) woodworker's glue. There are also "Extended Open Time" versions of this glue that will give you more time for assembly before they start to set-up. If your project is for exterior use, you'll find a host of products on the market that are impervious to moisture.

Step 6: Gluing-Up

On a workbench or table, position the strips (in order) next to the form. Arrange your clamps nearby in an orderly fashion so you can access them quickly at the appropriate time. For *Single-Form* bends, an extra strip, waxed on both sides, is set aside. This piece will go between the clamps and the strips to serve as a "caul" to prevent the clamps from marring your finished piece.

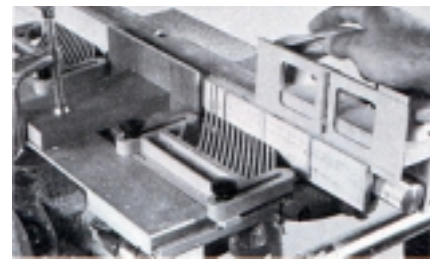


Fig. 4. The table saw is used to remove bandsaw marks from the strips. Note positions of the Feather Boards and Fence Straddler.
NOTE: Auxiliary guard, made from 1/4" plywood and 3/4" scrap wood are required



Fig. 5. Clamps for *Positive/Negative Forms* can be made from channel iron and 1/2" threaded rod

If your project only has a few layers, glue bottles and spreading sticks make adequate spreaders. If you'll be laminating many strips, use paint rollers and pans to speed the process...or use an extended open time glue. Gluing laminated strips together is a very messy job...so be sure to have lots of water-soaked rags and special solvents (in the case of some glues) handy for clean-up.

Start by flipping the top strip over and laying it on your work surface next to the stack. Apply glue to this strip and to the next strip on the top of the stack (See Fig. 6). It's important to note that applying glue to both sides of the laminate strips helps ensure a good glue bond.

After applying glue to just one side of the bottom strip, place the waxed strip on top of the stack, then align the stack by picking it up and placing it on its edge.

Next, place the stack on the form with the waxed strip toward the outside. To properly locate the stack, lightly clamp the bend in several places. Once you have the stack located evenly on the form, start applying final clamping pressure at the **center** of the bend. Working from this center outward in both directions, evenly apply clamping pressure on all clamps from end-to-end, being careful not to over-tighten the clamps. Following this procedure will reduce the possibilities of glue voids or pockets.

Allow the bend to remain clamped in the form until the glue has dried thoroughly.

Tip: For best results during glue-up, **get a helper**. The extra hands make the glue-up procedure less hectic and much more enjoyable.

Step 7: Bend Preparation

After the glue has dried, lift the bend off the form. The bend will stabilize after it's thoroughly dry...but excess glue on the surface will slow that drying time. Since some glues can be extremely difficult to remove when dried, you may have to use a grinder, cabinet scraper, rasp or belt sander to eliminate the excess.

Step 8: Using The Bend

Machine and finish a laminated bend just as you would solid wood. Stretching and compression forces are concentrated, however, in the outer layers. Cutting all the way across these layers will weaken the bend and may cause de-lamination. Therefore, when cutting mortises or drilling holes on the surface of the bend, do not cut or drill across the entire width of the bend.



Fig. 6. Apply glue to both sides of the inside strips and to only one side of each outside strip. An assistant is an invaluable aid during the glue-up process.