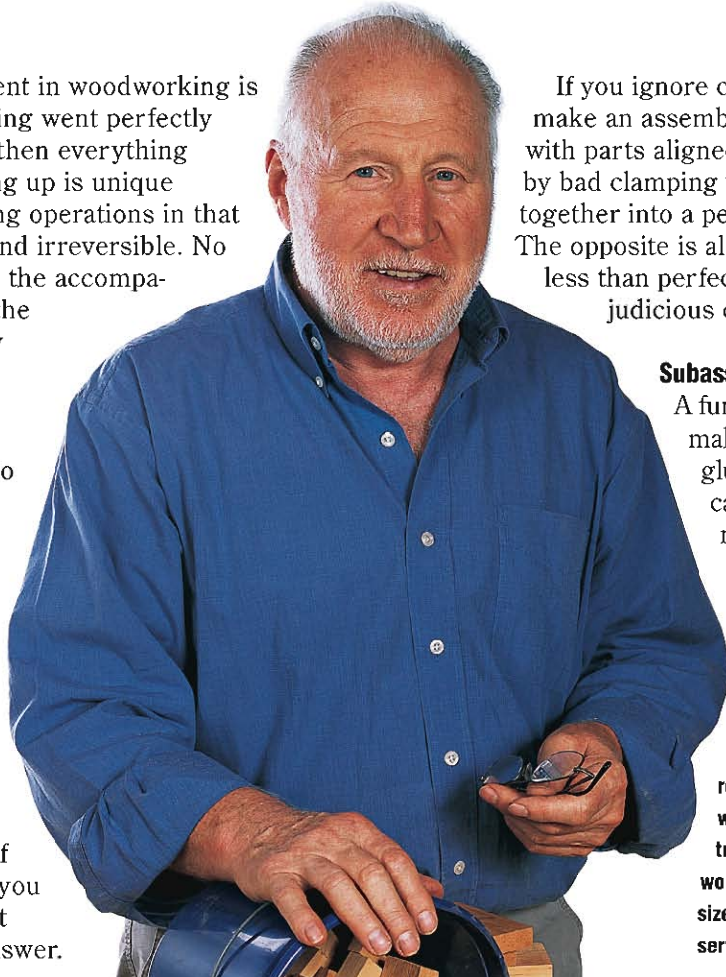


Gluing and Clamping with Confidence

Learn the keys to calm glueups and accurate assemblies.

By Ian Kirby

A common lament in woodworking is that “everything went perfectly until glueup, then everything went wrong.” Gluing up is unique among woodworking operations in that it’s time-sensitive and irreversible. No doubt that explains the accompanying tension and the frequently unhappy results. To avoid a calamity, you must apply the same rigorous methods to gluing up that you applied to selecting and preparing the material, measuring and marking out the parts, and cutting the joints. What follows is a methodology that works regardless of the type of clamps you use. Technique, not hardware, is the answer.



If you ignore clamping technique, you could make an assembly of perfect parts and joints, with parts aligned and shoulders spot-on, then by bad clamping you could glue the assembly together into a permanent state of inaccuracy. The opposite is also true: an assembly that is less than perfect can be made acceptable by judicious clamping.

Subassemblies and Dry Clamping

A fundamental technique of making a piece of furniture is to glue it up in small sections called “subassemblies.” The more subassemblies you can get together, the easier the

Clamping blocks are vital to a successful mortise-and-tenon glueup. Their incidental role is to protect the workpiece; their essential role is to transmit pressure exactly where it’s needed. Save your blocks and treat them as clamping tools, not scrap wood. After you have made about four sizes, chances are that used blocks will serve well for the next job.

Ian’s arsenal of applicators

My applicator arsenal consists of rollers, paddles, and brushes. Each type is capable of wetting the surface by rolling or rubbing. Although the nozzle of a glue bottle is a suitable dispenser, it’s a poor applicator because merely squeezing a bead of glue onto the joint surface cannot guarantee uniform coverage and a thorough wetting.



Three types of glue applicators that will cover most gluing requirements: roller, paddle, and brush.

Roller A roller is the best applicator for edge joints and veneering. It wets the surface quickly and effectively and controls and spreads the glue evenly. I use a short nap three-inch trim roller. After use, store roller and tray in a zip-lock freezer bag. I occasionally wash them and blow dry with an air gun nozzle.

“Gluing up is unique among woodworking operations in that it’s **time-sensitive and irreversible.**

No doubt that explains the accompanying **tension and the frequently unhappy results.”**

— Ian Kirby

total operation will be. At the end you glue all the subassemblies together as the “final assembly.” The absolutely essential step is that each subassembly and the final assembly are clamped together first without applying glue to the joints. This is called “dry clamping.”

Dry clamping obliges you to gather all the necessary clamps, clamping blocks, and measuring tools. It also allows you to practice and refine your assembly procedure and accuracy checks before committing to the permanence of glueup.

Preparing the Parts Before Glueup

Generally speaking, once a subassembly is glued together it will be more difficult to get at the inside faces with a plane or sanding tool than when it’s in bits. For this reason I “clean up” and “polish” all those faces of each piece before assembly. By clean up I mean prepare the surface ready to apply polish, and by polish I mean, in most cases, shellac and wax.

Cleanup entails the removal of machine marks and machine tearout, which on a flat surface will have come from a jointer or planer. Because it’s essential to retain the flat, straight, and accurate machined



A trim roller is ideal for edge joints. Load the roller in the tray, then spread to uniform thickness.



A paddle can be custom-shaped to apply glue effectively to hard-to-reach surfaces.

Paddle The great virtue of a paddle is that you can easily shape it to suit the situation. To ensure a wetted surface and uniform coverage, rub the paddle over the joint face several times. A tongue depressor makes an excellent paddle.

Brush A plumber’s flux brush fits into mortise joints and the tight pin spaces in dovetail joints. If the bristles are too flexible to spread glue firmly, stiffen them by cutting them shorter. The bristles can also be custom-shaped if

necessary. After use, store the brush in a jar of water and dry it on a paper towel before its next use.

Applying too much glue is the most common mistake. The right amount is gauged by minimal squeeze-out — no more than a thin bead at the joint line. This results from getting the right amount of glue in the right place. Excess glue that drips, drizzles, or oozes from the joint is a waste of money and a waste of time spent cleaning up the mess.

Applying Clamping Pressure

Because there isn't a "one size fits all" explanation of how to apply pressure in the right place, I'll use examples of several joints to explain different techniques.

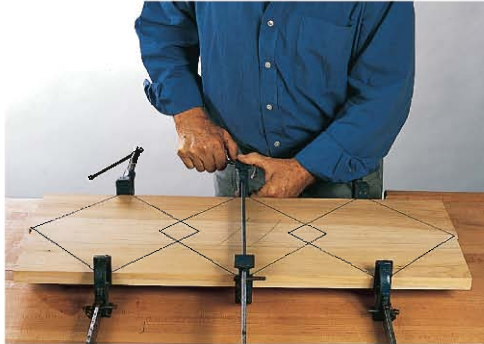
1. Edge-to-edge joints:

Let's start with a typical edge-to-edge joint, in this case two boards each about 6" wide and 18" long. We know from experience and measurements that if a bar clamp is placed on center across the panel, pressure from the clamp heads will fan out at about 45° from each side. In other words, there is a 90° fan that will deliver the same pressure on the glue line over the area of the fan. Understanding pressure fans enables you to determine how many clamps are required to glue up a joint between boards of any width and length. The number of clamps needed is a function of the width and length of the two boards. However, there's more to a successful glueup than spacing clamps according to pressure fans. If you put clamps all on the same side of the panel, it will curve or bow under pressure. To counter this, alternate the clamps on each side of the panel.

How much pressure to apply varies with each setup. Bar clamps generally have a 5/8" thick threaded rod going to the head. Pressure is delivered by turning a handle or lever on the end of the rod. Because pressure is controlled by two variables, muscle power and the length of the handle, I can only explain in generalities. One thing, however, should be



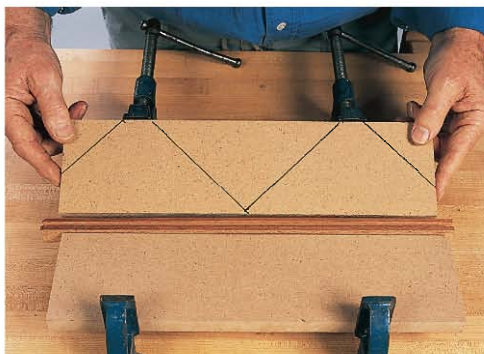
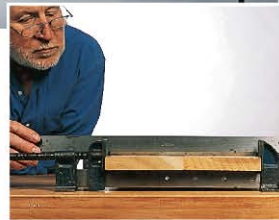
Clamping pressure fans out from the clamp heads at 45° in each direction and is transmitted to the glue line as indicated by the author.



Understanding pressure fans enables you to determine how many clamps are required to glue boards into a panel.



Too much pressure can bow a flat panel. Use a straightedge to check for flatness (inset). If it is bowed, reduce pressure and alternate clamps top and bottom.



Lippings are narrow strips of solid wood glued to the edge of plywood or MDF panels. To reduce the number of clamps needed, trap the lippings between two panels (which act as oversize clamping blocks), and take advantage of the extensive pressure fan.

obvious: tightened to maximum, that threaded rod exerts an enormous amount of pressure. If you have crunched the clamp heads into softwood boards 3/4" thick or deflected the fibers on the edge of 3/4" oak boards, then you have applied too much pressure. Apart from the obvious damage to the boards, so much glue has probably been forced from the joint that it's at risk of "glue starvation" and possible joint line failure.

Before closing the clamps on any edge-to-edge assembly, you must check that the joint line is tight and that the boards are aligned. Put one board in the vise or stand it on edge on the bench and put the second one on top. Using a straightedge, check that the two boards are aligned. Once you have glued and clamped the joint, confirm that the alignment is retained. Making a distorted panel from two flat boards is one of the commonest errors in woodworking.

2. Mortise-and-Tenon Joints:

Aligning the parts and closing the shoulder line of a mortise-and-tenon joint is more complex than other joints. You achieve both objectives only by directing clamp pressure at exactly the right place — accomplished by using specially prepared pieces of wood called clamping blocks. The dimensions of each block arc is critical because moving it one way or another is the key to clamping the assembly into accuracy. The clamping block must be wide enough not to

bend under load and its footprint on the mortise should equal the outside dimension of the shoulder being clamped. Assuming the joint has been accurately made, correct alignment of the clamping blocks with their corresponding shoulders will ensure that the assembly will check out accurately. There are three checks to make, and they can be explained in principle by describing how you would make them on two legs and a rail — one end of a simple table.

Alignment of parts — Using a straightedge, check that the faces of the legs are aligned. Achieve alignment by adjusting the clamping blocks up or down.

Parts square to one another — Determine that the assembly is square by checking that the diagonals are equal. First, check that the two opposite parts, the legs, are exactly equal in length. (If not, and you make the diagonals equal, you have just clamped it up out of square!) To make the assembly square, adjust the relevant clamping blocks up or down the leg.

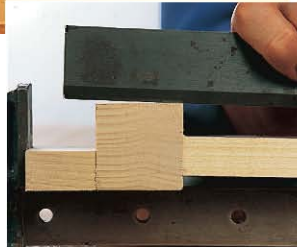
Assembly out of twist — Check for twist by sighting the parts one on another. A pair of winding sticks is very helpful. To correct for twist, first ease off the clamp pressure as much as you can without the clamping blocks falling out, then grab the legs and force them into the required flat geometry. Finally, retighten the clamp.

3. Angled Parts:

In these situations, the clamping blocks are angled to compensate for the shoulder



Confirm by straightedge that the faces of the legs are aligned. An incorrectly placed block (inset) causes misalignment.



Once you're sure the legs are aligned, confirm that they are equal in length.



Next, confirm that the diagonals are also equal.



Finally, confirm that the assembly isn't twisted. The author uses a pair of shop-made winding sticks for this process.

line angles. The key to holding them in the right place is to nail or glue a plywood pad onto the edge which faces the clamp. Where possible, I put the clamp on top of the assembly. This arrangement stabilizes the entire clamping setup, and you can best see what you're doing. The pad also protects the workpiece as the clamp heads are tightened.

4. Tongue-and-Groove Joints:

Manufactured sheet materials are often assembled with a tongue-and-groove corner joint. It's strong, useful, and can be made straight from a table saw. The length of the tongue need only be one-third the thickness of the material and the groove one pass over a 1/8" kerf blade. This leaves just a bit more material to the outer edge at the bottom of the groove where the joint is at its weakest.

The clamping problem is how to apply pressure only on the narrow strip of shoulder. A typical clamping block coupled with the vagaries of loose clamp heads will put pressure beyond the shoulder line and cause the sides to bow inward and the joint to open.

The answer is a clamping block with a rebate cut into it equal to the shoulder dimension. In this way, the otherwise thin block you would need is easily positioned and strengthened. It also protects the work from the clamps. The inside face must be thoroughly waxed to prevent it being glued to the workpiece. You don't need to run a rebate on a piece of wood. Instead, glue and staple

two pieces together. I used some 3/8" birch ply glued to softwood strips.

5. Bare-faced Mortise-and-Tenon:

A bare-faced mortise-and-tenon is one with no shoulder on one side. You will find it described in old woodworking books, and I saw it recently used in a magazine project. If you are ever tempted to use the joint, it's essential to make clamping blocks similar to those just described for the tongue-and-groove joint. I recommend, however, that you reject the joint entirely. I've never seen a job where you couldn't get at least a 1/16" shoulder on the other side of the tenon, which makes it a "normal" mortise-and-tenon joint. Absent that small shoulder, the slightest pressure without the correct clamping blocks will twist the assembly out of alignment. It's the kind of joint that looks OK in a diagram, but in real work it's a clamping nightmare.

6. Miter Joints

There are various types of band clamps and corner clamps designed to overcome some of the difficulties of clamping a miter joint. However, if you are making a case using mitered corners and



The clamping blocks and checking procedure for gluing up a door are the same as for a mortise-and-tenon.



Angled clamping blocks compensate for the shoulder line angle. The addition of a plywood pad helps hold the block in position and protects the workpiece.



The only way to apply pressure to the gluing surfaces of a mortise-and-tenon joint is by clamping across the joint faces.

it has to be made right, then mitered clamping blocks are the best solution. You can apply pressure across the joint exactly where and by how much you want, and it won't affect any other part of the assembly. The photo (page 33) shows a fast-acting clamp, but it could just as well be a C-clamp — it depends on the size of the job. Any softwood is OK for the blocks, which are glued in place leaving a gap for inspecting the joint line. Block dimensions are calculated by drawing lines at right angles to the base of the miter. I remove the blocks by band saw and hand plane. It's not the chore you might think — it's woodwork!

7: Dovetail Joints

Gluing dovetail joints is totally different from gluing mortise-and-tenon joints. If you follow my dovetail joinery practice, the end grain of the pins falls short of the long grain of the tails. This removes the need for elaborate and fussy clamping blocks. However, that's not the reason for making dovetail joints this way — it's just a fortuitous outcome. Using a brush or paddle, apply glue, assemble the joint, and clamp each dovetail



The right bench, rehearsal time and good clamps

It's impossible to make accurate glueups without an accurate table. A sturdy table, 36 inches high, with a flat top clad with plastic laminate, is ideal. Failing that, a piece of varnished Masonite, well-waxed to resist glue penetration, and placed over your benchtop will do just fine. Even the time of day is important. Most woodworkers like to glue up in the evening and let the

glue set overnight. To meet this goal, work often gets rushed, the clamp-up rehearsal is ignored or abbreviated, and, suddenly, all the elements for a disastrous glueup appear: fatigue, unpreparedness, and anxiety. It's far wiser to wait until morning. Your mind is fresh and the pressure to rush the job has gone.