



# ALL ABOUT WORKBENCHES

From the Editors of **Popular Woodworking Magazine**

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## 21st-Century Workbench

PAGE 1

## 10 Rules for Workbenches

PAGE 9

## Fix Your Workbench

PAGE 16



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# 21st-Century Workbench

BY ROBERT W. LANG

This hybrid design holds work any which way you want it to.



Good design is little more than selective thievery. This workbench is a good example of that. A combination of features from several historic forms, ranging from the Roubo to the Workmate, becomes a new form, suited to being the center of a modern woodworking shop.

I've never seen a workbench that I was entirely happy with. I have love/hate relationships with many common features. I like tool trays, but hate the way shavings and other detritus collects in them.

I want to be able to clamp work quickly, but speed means nothing if the clamping isn't solid and secure. Good design is also the art of compromise, finding the happy medium between extremes.

This bench began with the idea of building a reproduction of an English Nicholson bench. The Nicholson was popular in Colonial America, and variations of it appeared in woodworking books until the 1920s. The dominant feature on the Nicholson is a wide front apron, which allows work to be secured to the front of the bench as well as to the top.

The drawback to the extended apron is that it limits the ability to clamp down to the top of the bench from the edge. I narrowed and lowered the apron so I could clamp work to the bench in two directions. I was also intrigued by the knock-down joinery on some of the historic Nicholson benches. While I don't plan on moving my

bench very often, I decided to make it in manageable chunks, to ease the process of making it and assembling it.

The design is based on function in the completed bench, and also on the process of making, moving and maintaining it. The tools I used to make it are basic home-shop equipment – a 10" hybrid table saw, a 6" jointer and a 12" "lunchbox" planer. And I didn't need a bench to build my bench. I made the top first, then placed that on a pair of horses.

## GETTING IT STRAIGHT, ONE PART AT A TIME

The best reason for assembling the top of the bench first is that when it is complete, it can be put to work to fabricate and assemble all the other parts. It's almost as good as having a place to sit down when you're halfway through building a chair.

I began with rough 8/4 ash lumber, and picked through my stock for the straightest pieces to use for the top. After running one edge over the jointer, I ripped each piece to a rough width of 3¾". Then I dressed one face of each piece flat on the jointer. When I had 14 pieces ready, I moved to the planer.

I wanted the stock to be at least 1⅞" thick, but stopped milling when I had two clean faces. Each half of the top consists of six pieces glued face to face, and leaving the parts as thick as possible allowed me to maximize the width. If the stock had ended up thinner than planned, I would have added a seventh piece. The goal was to have the halves of the top finish at least 11½" wide, but less than 12".

The length of the bench was also a vari-



*A disposable paint roller applies an even coat of yellow glue quickly. Apply the glue to one side of the lamination only. Doing both sides wastes time and glue.*

able. I wanted a minimum length of 84", but I was able to get clean lengths of 90" from the 8'-long rough material. After all the parts were milled, I let them sit over a weekend to be sure the wood wasn't going to move or warp.

I began laminating the top boards in pairs glued face to face. To keep them flat, I clamped them together on the strongest,

straightest surface available: an I-beam made of ¾"-thick plywood. I let each pair sit in the clamps for at least four hours, and let them all sit for 24 hours to allow the glue to dry.

## BACK TO MILLING, THEN SERIOUS GLUING

I ran the edges of each glued pair over the jointer to get a straight, square edge on each lamination. I then ran the boards on edge through the planer. Once again, I stopped when I had two clean surfaces rather than taking the boards to a specific thickness.

The cleaned-up pairs were slightly over my planned 3" thickness, but I would still need to remove some material after gluing up each top section. How much to remove would depend on how well these pieces went together.

I set two long boards between my horses, and placed square boards across them, about a foot apart. This gave me a nice level surface to work on, and provided the ability to reach around, over or under the tops as I was setting the clamps. A test-stacking of three pairs of boards gave me the confidence to glue each half-top

section in one go.

With nearly every clamp in the shop standing by, I spread yellow glue on one face of two of the parts with a 3"-wide paint roller. With an even coat of glue applied, I turned the parts 90° and starting tightening the clamps, working from the center out to the ends.

Wooden handscrews across the ends of the glue joints prevented the parts from sliding out of place. I removed any glue squeeze-out with a wet rag and a scraper, and let the pieces sit in the clamps overnight.

Because I had carefully milled the parts before gluing, and glued carefully on a flat surface, the tops were in good shape coming out of the clamps. I knocked down the high spots with a handplane to get a flat surface, and ran the assembled tops through the portable thickness planer.

Leaving the top halves less than 12" wide allowed me to use this small machine for surfacing. At some point in the future I may need to resurface the top, and the little planer will always be an option. This strategy also allowed me to cut each top half to length with my sliding compound miter saw.



*This bench was designed around available machinery. After cleaning one surface with a handplane, the opposite surface is planed on a portable machine.*



*Trimming the top halves to final length is within the capacity of this 12" sliding compound miter saw.*



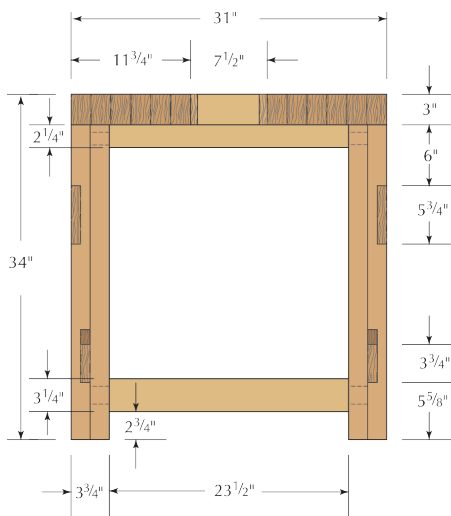
## THE STRUCTURE DOWN BELOW

Joinery on a bench is on a different scale than joinery for furniture. The parts are larger, and the emphasis is more on function and strength than appearance. The legs are two pieces glued face to face, and each pair of legs is connected with an upper and a lower stretcher with mortise-and-tenon joints.

The legs and stretchers are assembled into units, and the two ends are connected with rails running the length of the bench. The large scale of the components made it possible to locate joints for the knock-down connections in the outer halves of the legs, and these joints were cut before the legs were laminated together.

In furniture I use through-tenons to show off, but in this bench I used them to make life easier. The mortises are only cut in the inner half of each leg. After laying out the joints, I removed most of the waste at the drill press with a  $\frac{3}{4}$ "-diameter Forstner bit.

Working on my new benchtops placed on horses, I used a chisel to square the mortises to the layout lines. I then cut the tenons to fit the mortises. I cut most of the shoulders by hand, but also cut some on the table saw to compare techniques. The hand-cut shoulders were a bit neater, and



PROFILE

didn't take much longer to make. After cutting the shoulders, I removed the waste around the tenons at the table saw, using the miter gauge to guide the boards across a stack-dado set.

With a shoulder plane and rasp, I fine-tuned the fit of the joints. After tweaking a couple to a perfect fit, I realized I could make the tenons narrow in width, widen the outside of the mortises with a quick chisel cut, then secure the joints from outside with wedges.

This saved time, and gave stronger joints. With the tenons wedged, they can't pull out of the mortises. After letting the glue dry, I trimmed the wedges with a flush-cutting saw, followed by a block plane.

## GREAT BIG DOVETAILS

It's easy to think of dovetails as decorative joints, but there are many practical reasons for using this joint to hold the ends of the bench together. Most of the stress on a bench in use is end to end, and the wedged shape of the rail-to-leg joints can't be pulled apart. In fact, if you push the base of this bench from the end, the joints tighten rather than loosen.

The dovetails also serve to positively locate and align the parts during final assembly. As the joints come together, they fit where they fit; it isn't possible to put them together in the wrong place.

Both upper and lower dovetail joints are half-lapped with the outer dovetail portion of the leg. The lower joint is on the inside of the leg and is a half dovetail; the other half of the joint is a removable wedge. The upper joint is on the outside of the leg and secured by a lag bolt.

After cutting the shoulders by hand, I removed the waste with the stack dado on the table saw, and used a roller stand to support the long workpieces. The angled cuts were made with a jigsaw.

I smoothed out the waste left by the dado cutters with a chisel, shoulder plane and rasp, then marked the locations of the sockets on the outer legs directly from the



After laying out the tenon locations on the stretchers, lines are transferred to mark the matching mortises on the inner parts of the legs.



A bit of chisel work cleans up the mortises to the layout lines at top and bottom. Widening the sides allows an easier fit and stronger joint with the addition of wedges.



I think it's faster to cut the shoulders by hand and avoid exacting setups on a machine. It's just a matter of cutting to the lines.



After making the male part of the joint, the socket is laid out directly from the finished part. Simply lay the rail in position, line up the top and knife in the angled line.



After fitting the dovetail for the lower rail, a matching wedge is cut and fit. Thanks to working on only half the leg, this process is entirely visible.

tails. I cut the angled ends of the sockets with a backsaw, and removed most of the waste in between at the table saw.

The remaining waste was removed with a chisel, followed by a shoulder plane. Then I used a plane maker's float to achieve a flat bottom on these joints. The upper joints need to be equal in thickness so that the outer surfaces of the legs and rails will be flush when the bench is assembled.

Down at the lower rail, the tail needs to be thinner than the socket so that the

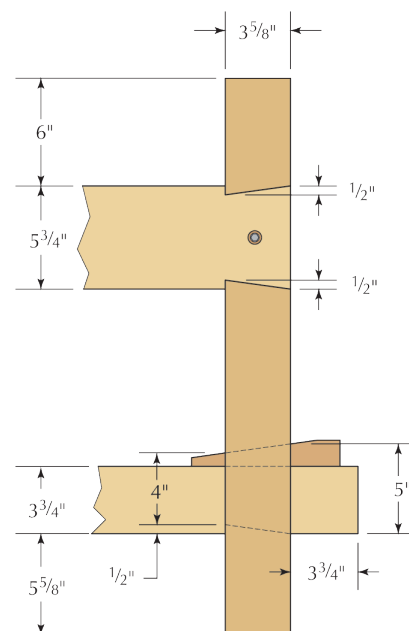
end of the rail can easily pass through the socket in the leg. The socket also needs to be wide enough to allow the square end of the rail to enter the narrow portion of the joint, then drop down into place.

This requires some fussing, but because the outer half of the leg is loose at this point, it's easy to see what is going on while adjusting the joint. After fitting the lower portion of the tail, I cut and fit the removable wedges.

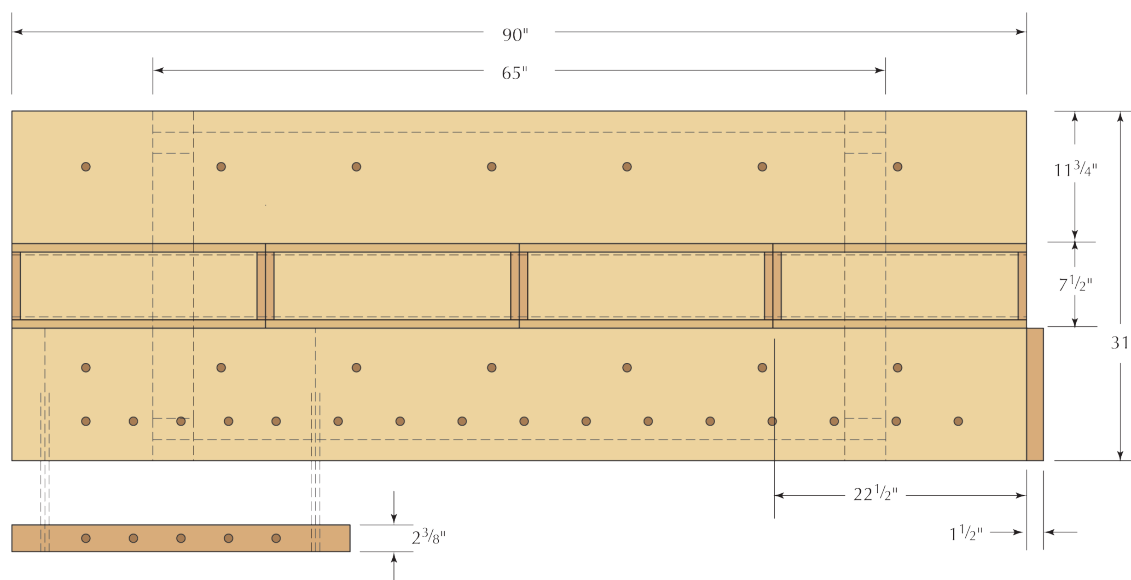
With the joinery complete, I spread glue on the inside surface, and glued the outer



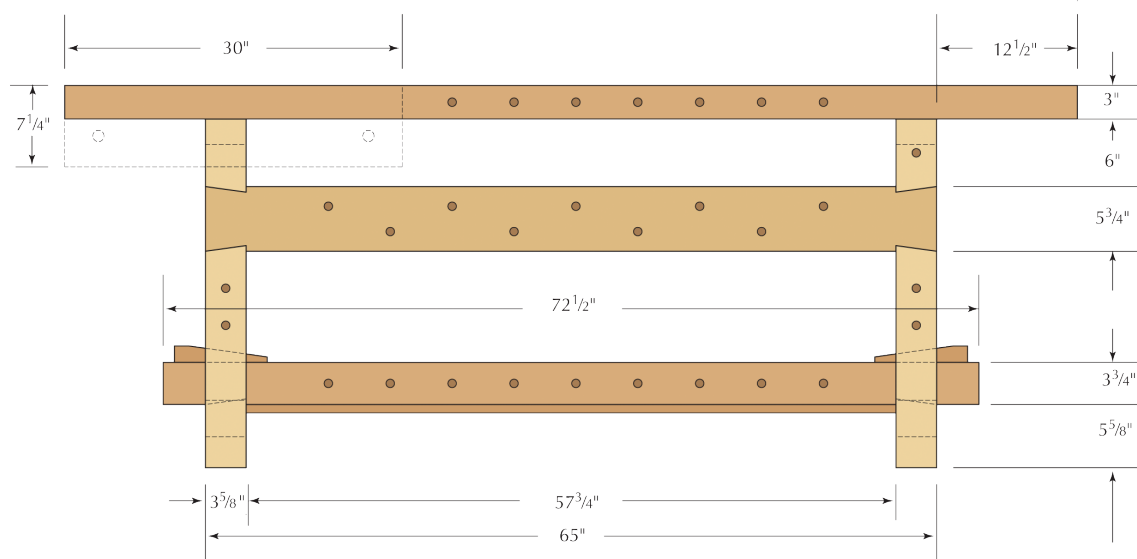
The dovetails on the ends of the horizontal rails are half-lapped. I removed most of the material with a stack dado set on the table saw. An adjustable roller stand supports the other end of the long parts.



LEG DETAIL



PLAN



ELEVATION

legs to the previously assembled inner legs and stretchers, taking care to keep the parts aligned. After letting the glue dry overnight, I was anxious to see the completed bench.

## SCREWS, WEDGES AND THE HOLE STORY

I set the completed end units on the floor, and inserted the two lower rails into one end, knocked in the wedges then slid the rails into the other end. The upper rails were

knocked into place, and after marking the centers of the tails, I made a  $\frac{3}{4}$ "-diameter counterbore deep enough to leave the head of a lag screw about  $\frac{1}{8}$ " below the surface. Then I drilled a pilot hole and drove in a  $\frac{1}{4}$ " x 2" lag screw. I set the tops in place on the assembled base, with the edges even with the outside of the legs and a consistent distance in between.

I drilled  $\frac{3}{8}$ "-diameter through holes in the upper stretchers, and  $\frac{1}{4}$ "-diameter pilot holes in the bottom surface of the

tops. Four  $\frac{5}{16}$ " x  $3\frac{1}{2}$ " lag screws secure each top section to the base. After admiring the assembly for a while, I laid the bench on its side, and flushed the joints to each other.

The front of the bench is really a working work-holding surface, so I took care to level all the parts to be in the same plane. While I was at it, I used my block plane to bring the ends of the tails even with the edges of the legs.

Setting the bench back on its feet, I



*The legs are permanently assembled by gluing. Judicious placement of glue to keep it out of the joint, and a clamp across the bottom to keep the parts from sliding, make the process painless.*

laid out the locations of the vises, as well as the  $\frac{3}{4}$ "-diameter holes in the top, front rails and front legs. A Veritas twin-screw vise straddles the left-front leg, and a small quick-release vise is in the tail-vise position. I routed out a recess in the end of the benchtop for the tail vise, and glued two 2"-thick x  $4\frac{1}{4}$ "-wide blocks to the bottom to hold the screws for the larger, twin-screw vise.

There is a line of holes in the top, centered on the dog location in the end vise. I drew a line the length of the bench at this distance, then marked a hole to just miss each side of the right hand leg. I set a pair of dividers at this distance and stepped off the center-to-center marks for this line of holes.

I carried these marks down to the front rails using a framing square. The holes in the lower rail are centered vertically, and the ones in the upper rail alternate high and low,  $1\frac{3}{4}$ " in from the edges. The holes in the rails don't need to line up with the holes in the top, but it seemed a reasonable

spacing. It was easier to transfer the existing layout than to think about a new one. The holes in the front will be used with a surface clamp, or a simple dog to support work from below.

On the inside edge of the top, I marked out locations for holdfast holes on 12" centers, 3" in from the back edge on the front half. On the back half is another row of holdfast holes, also on 12" centers. I wanted these roughly in the middle of the top, but didn't want to drill into the glue line, so I centered them in the middle of the board beyond the center of the rear top.

There are five holes in the front jaw of the vise, lining up with the holes in the top, roughly in the center and near each end of the jaw. Each of the front legs also has holes, two in the left, equally spaced between the upper and lower rails. The holes in the right leg match, with an additional hole in the space between the upper rail and the benchtop.



*A short side trip. After assembling the rails and top halves, the bench is turned on its side to level the front surfaces.*



*The lag bolts that secure the upper rails are counterbored to keep the heads well below the surface. The faces of the rails are made flush to the legs.*



*The top halves are heavy, but with the aid of a stand they can be brought to the drill press for boring the dog and holdfast holes.*

Because the parts of the bench are relatively manageable components, I took the bench apart and drilled all of the holes at the drill press using a 3/4"-diameter brad point bit at a low speed, about 500 rpm. I used my roller stand to support the long parts that hung off the drill press table.

## WHERE WILL THE HAMSTERS SLEEP?

Between the two lower rails is a shelf that is supported by 2"-wide cleats nailed to the bottom of the rails. The shelf boards are random widths of 4/4 material, with opposing rabbets on the long edges. The boards at each end have a rabbet on only

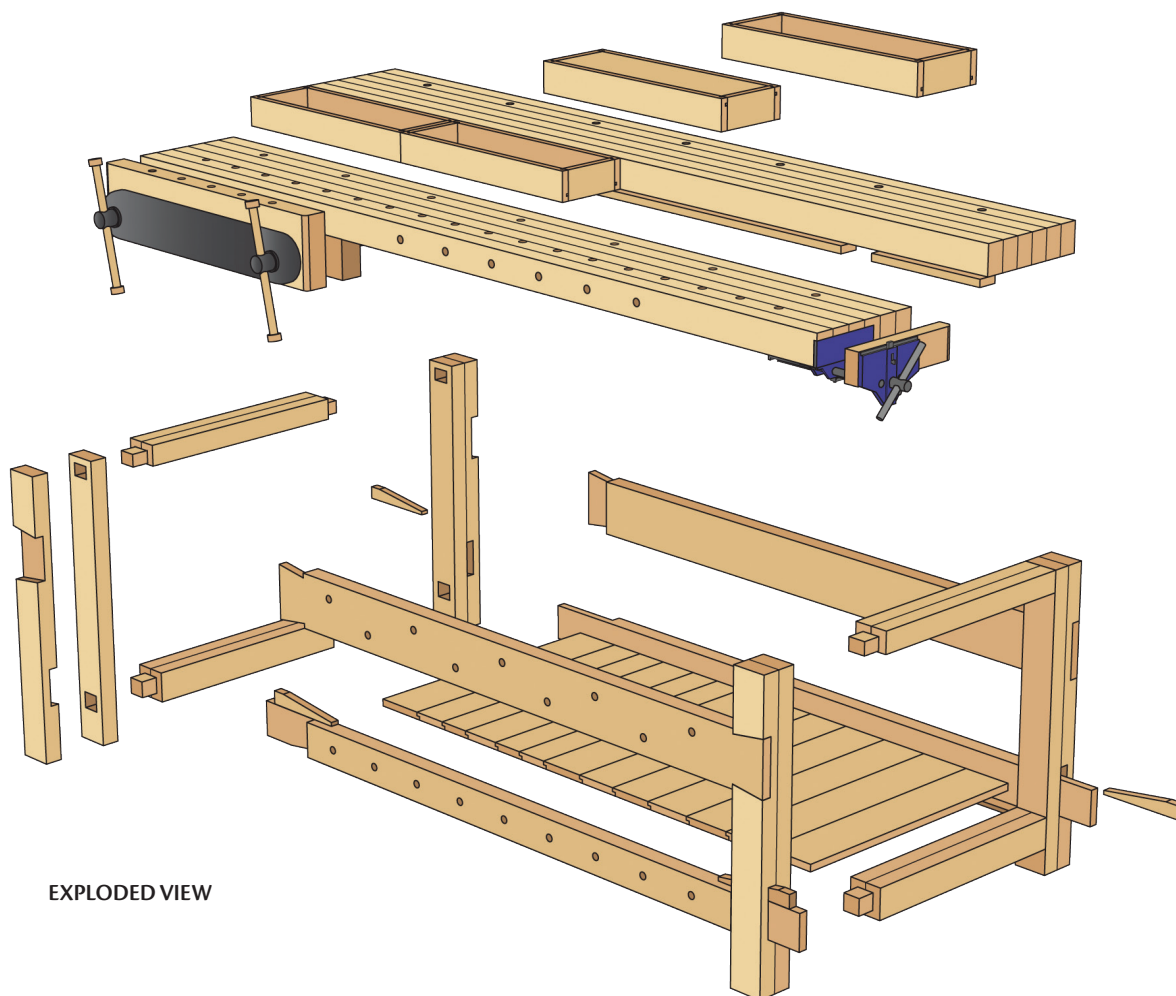
one edge, and butt against the inside edge of the lower stretchers.

The shelf boards and cleats were left as thick as possible, and cleats were also nailed to the underside of each inside edge of the top sections to support the removable tool trays. The trays are open-topped boxes, made from 3/4"-thick solid wood. The corners are held together with simple rabbit-in-groove joints. The bottom is rabbeted to fit in a 1/4"-wide groove, with the face of the bottom even with the bottom edges of the box sides.

The tool trays can be turned upside down if desired to make the entire bench, or just portions of it, one wide flat surface.

Or they can be removed to allow clamping to the middle of the benchtop. They can also be easily carried to return tools to their homes, or to the trash can to remove the inevitable accumulation of shavings and other trash.

I don't believe that a bench needs a fine finish. After planing all the surfaces, I knocked off the sharp corners of the edges, and applied a coat of Danish oil. With a few holdfasts and holddowns, along with some F-style clamps, I can hold work securely in almost any position. That's what a good bench is for. It is the tool that makes the work of all the other tools easier and more efficient. **PWM**



EXPLODED VIEW

## 21ST-CENTURY WORKBENCH

NO.	ITEM	DIMENSIONS (INCHES)			MATERIAL	COMMENTS
		T	W	L		
12	Top laminates	1 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	90	Ash	Mill TAP*, 6 per half
4	Inner legs	1 <sup>15</sup> / <sub>16</sub>	3	31	Ash	Mill TAP*, 1 <sup>3</sup> / <sub>4</sub> " minimum
4	Outer legs	1 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	31	Ash	Mill TAP*, 1 <sup>3</sup> / <sub>4</sub> " minimum
4	Upper stretchers	1 <sup>15</sup> / <sub>16</sub>	2 <sup>1</sup> / <sub>4</sub>	31	Ash	Mill TAP*, 1 <sup>3</sup> / <sub>4</sub> " minimum
4	Lower stretchers	1 <sup>15</sup> / <sub>16</sub>	3 <sup>1</sup> / <sub>4</sub>	31	Ash	Mill TAP*, 1 <sup>3</sup> / <sub>4</sub> " minimum
2	Upper rails	1 <sup>15</sup> / <sub>16</sub>	6	65	Ash	Mill TAP*, 1 <sup>3</sup> / <sub>4</sub> " minimum
2	Lower rails	1 <sup>15</sup> / <sub>16</sub>	3 <sup>3</sup> / <sub>4</sub>	72 <sup>1</sup> / <sub>2</sub>	Ash	Mill TAP*, 1 <sup>3</sup> / <sub>4</sub> " minimum
4	Wedges	7 <sup>7</sup> / <sub>8</sub>	1 <sup>3</sup> / <sub>8</sub>	8 <sup>5</sup> / <sub>8</sub>	Ash	Mill TAP*, 1 <sup>3</sup> / <sub>4</sub> " minimum
4	Cleats	1 <sup>3</sup> / <sub>16</sub>	2	90	Ash	Cut to fit between ends
8	Box sides	3 <sup>3</sup> / <sub>4</sub>	3	22 <sup>1</sup> / <sub>2</sub>	Ash	
8	Box ends	3 <sup>3</sup> / <sub>4</sub>	3	6 <sup>3</sup> / <sub>4</sub>	Ash	
4	Box bottoms	3 <sup>3</sup> / <sub>4</sub>	6 <sup>3</sup> / <sub>4</sub>	20 <sup>1</sup> / <sub>2</sub>	Ash	
1	Shelf	3 <sup>3</sup> / <sub>4</sub>	22 <sup>3</sup> / <sub>8</sub>	58	Ash	Random width shiplapped boards
1	Face vise blocks	2	4 <sup>1</sup> / <sub>4</sub>	30	Ash	Total length, trim for each side of leg
1	Face vise chop	2 <sup>1</sup> / <sub>4</sub>	7 <sup>1</sup> / <sub>4</sub>	30	Ash	Laminated from 3 pieces
1	Tail vise chop	1 <sup>1</sup> / <sub>2</sub>	3	11 <sup>5</sup> / <sub>8</sub>	Ash	

\*TAP=Thick as possible

# 10 Rules For Workbenches

BY CHRISTOPHER SCHWARZ

When it comes to building or buying a bench, most woodworkers get wrapped up in what form it should take. Should it be a continental bench popularized by Frank Klausz? A Shaker bench like the one at the Hancock community? How about a British version like Ian Kirby's?

Copying a well-known form is a natural tack to take. After all, when woodworkers buy or build their first workbench, they are in the early stages of learning the craft. They don't know what sort of bench or vises they need, or why one bench looks different than another. So they pick a form that looks good to them—occasionally mixing and matching bits

and pieces from different forms – and get busy.

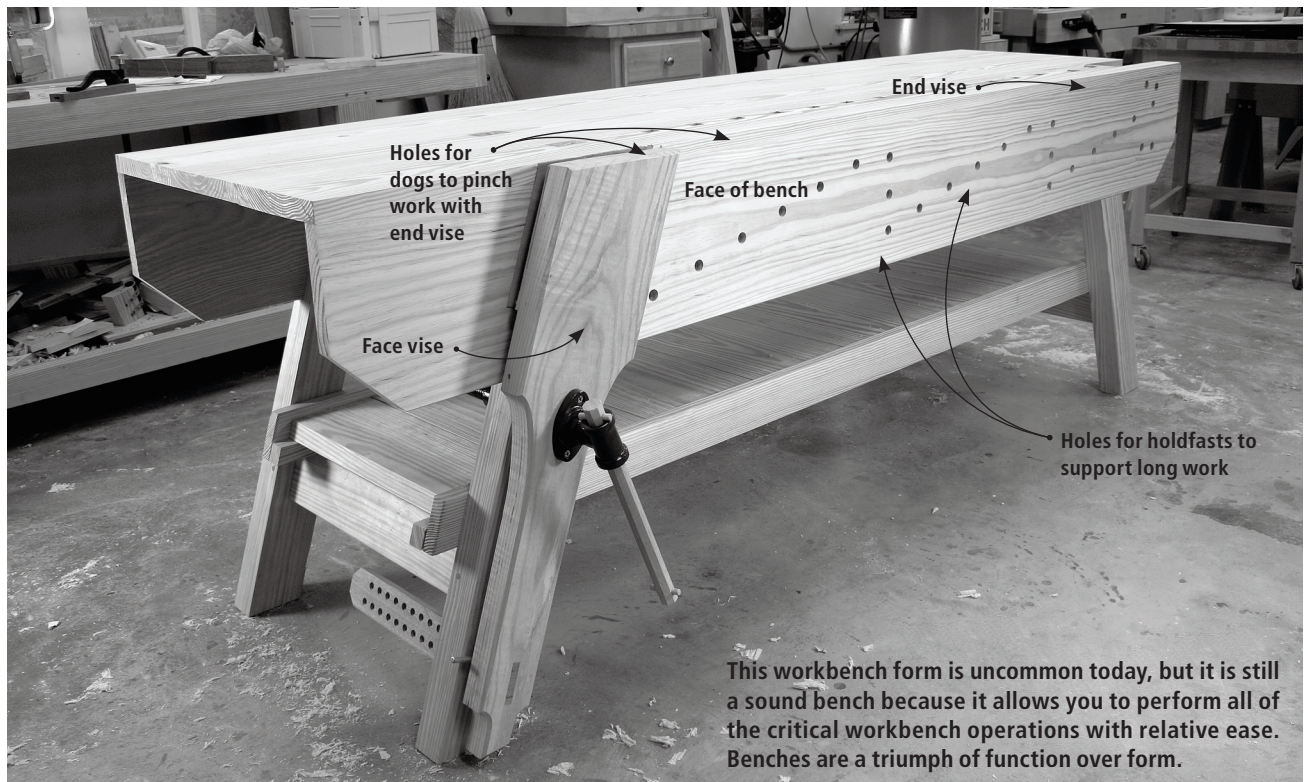
That, I believe, is the seed of the problem with workbenches today. Many commercial workbenches are missing key functions that make work-holding easier. And many classic bench forms get built with modifications that make them frustrating in use.

What's worse, the user might not even know that he or she is struggling. Woodworking is a solitary pursuit, and it's rare to use someone else's bench.

During the last 10 years, I've built a number of classic bench forms, and I've worked on craftsman-made and commercial ben-

ches of different stripes. I've been stunned by how awful some workbenches can be at some tasks, and I've also seen brilliantly realized designs.

And now, after all this work, I've concluded that it doesn't matter what sort of bench you have as long as it performs a set of core functions with ease. I've boiled down these core functions into 10 rules for building (or buying) a workbench. As long as your bench obeys these rules (or most of them), you will be able to hold almost any workpiece for any task with a minimum of fuss. This will add speed and enjoyment to your time in the shop and reduce the amount of time you fuss with setups.



## DO YOU EVEN NEED A BENCH?

Before we get to the rules, it's fair to say that a lot of the best commercial woodworking today is done on benches that disregard many of these rules. In production shops, it's rare to find a traditional bench used in a traditional manner. More often, a commercial woodworker will have something akin to a clamping table, or even a door on sawhorses. And they can turn out high-quality work that will blow you away.

In 2006 I was teaching a class in hand work at a school where Thomas Stangeland, a maestro at Greene & Greene-inspired work, was also teaching a class. Though we both strive for the same result in craftsmanship, the processes we use couldn't be more different. He builds furniture for a living, and he enjoys it. I build furniture because I enjoy it, and I sell an occasional piece.

One evening we each gave a presentation to the students about our work and I showed an image of the enormous French workbench I'd built the year before and discussed its unusual history.

Thomas then got up and said he wished he had a picture of his workbench: a door on a couple horses. He said that a commercial shop had no time to waste on building a traditional bench. And with his power-tool approach, all he needs is a flat surface. It's hard to argue with the end result. His furniture is beautiful.

But what's important here is that while you can build with the door-off-the-floor approach, there are many commercial woodworkers who still see the utility of a traditional workbench. Chairmaker and furniture maker Brian Boggs uses more newfangled routers and shop-made devices with aluminum extrusions than I have ever seen. And he still has two enormous traditional workbenches that see constant use. Before Kelly Mehler opened a woodworking school, I visited his commercial shop and got a chance to inspect his vintage bench, which saw daily use.

The point is that a good bench won't make you a better woodworker, and a

not-quite-a-bench won't doom you to failure. But a good bench will make many operations easier. It's simply a tool: the biggest clamp in the shop.

## 1 | ALWAYS ADD MASS

Always overbuild your workbench by adding mass. There is a saying in boatbuilding: If it looks fair, it is fair. For workbenches, here's a maxim: If it looks stout, then make it doubly so. Everything about a workbench takes punishment that is akin to a kitchen chair in a house full of 8-year-old boys.

Early Roman workbenches were built like a Windsor chair. Stout legs were tenoned into a massive top and wedged in place. Traditional French workbenches had massive tops (6" thick), with legs that were big enough to be called tree trunks. Later workbenches relied more on engineering than mass. The classic continental-style workbench uses a trestle design and dovetails in the aprons and vises to create a bench for the ages. The 19th-century English workbench uses an early torsion-box design to create a stable place to work. And good-quality modern workbenches use threaded rods and bolts to tighten up a design that lacks mass.



*This French-style workbench weighs more than 325 pounds. The top is 4" thick. The legs are 5" square. All this mass absorbs vibration and makes every cutting operation smoother.*



*Spindly workbenches are nothing new. This anemic example from the early 20th century is too small and lacks mass. Sadly, there are modern ones that are even worse.*

Many inexpensive commercial benches are ridiculously rickety. They sway and rack under hand pressure. You can push them across your shop by performing simple operations: routing, sawing, planing. If the bench looks delicate or its components are sized like a modern dining table, I would take a closer look before committing.

A big thick top and stout legs add mass that will help your work. Heavy cabinet saws with lots of cast iron tend to run smoother. The same goes with benches. Once your bench hits about 300 pounds, it won't move unless you want it to move.



Think big when cutting the joints for your workbench. The small tenons are 1¼" thick and 2½" long. The larger tenons are 2½" thick and 2" long.

## 2 | USE STOUT JOINTS

Overbuild your workbench by using the best joints. These are times to whip out the through-tenon and dovetail.

If you followed rule No. 1, then rule No. 2 should be no problem. Your joints will be sized to fit the massive scale of your components. If you cannot rely on mass, then you should beef things up with superior joinery. While dovetails and through-tenons are overkill for a towel rack, they are good for a bench.

That's because you are applying racking force to the workbench with typical operations and your vises will do their best to tear apart your bench. All wooden vises need to be overbuilt or they will self-destruct when you cinch them down hard. I have even seen a vise rip a benchtop from its base.

Make your tenons thick and your mortises deep. If you know how to drawbore a mortise-and-tenon joint, this is one good application. Have you ever been in a timber-framed barn? Did you look at the joints? They're massive and pegged. Imitate that.

I think benches are a good place to practice your skills at cutting these classic

joints, but some woodworkers still resist. If that is you, you should investigate hardware to strengthen your bench. Threaded rods, bed bolts, Veritas bench bolts or even stove bolts can turn a spindly assembly into something rigid that can be snugged up if it loosens. The hardware would not give you mass, but it will strengthen a rickety assembly.

## 3 | PICK YOUR WOOD BASED ON STIFFNESS, NOT ITS SPECIES

Use a stiff, inexpensive and common wood to build your bench. Showcase benches made from exotic materials are nice. No argument there. But focus on the functions before the flash. I would rather have a construction-lumber bench that followed all these rules than a beautiful European beech bench that skipped even one of these concepts.

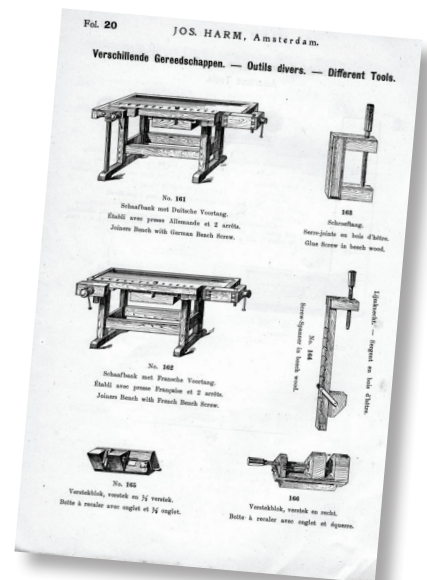
There's a lot of confusion on picking a wood for a bench. Most European benches were built using fine-grained steamed European beech. And many woodworkers go to lengths to purchase precious beech for their workbenches. After all, who wants to argue with hundreds of years of tradition?

I do. European cabinetmakers didn't

choose beech because of some magic quality of *Fagus sylvatica*. They chose it because it was dense, stiff, plentiful and inexpensive. In the United States, beech is dense, stiff, hard to find and (sometimes) a bit spendy. You can, of course, use it to build a bench, but you will pay a pretty penny for the privilege. And it will have no demonstrable advantage over a bench built from a cheaper species.

Other woodworkers, tacking toward the sensible, use hard or soft maple for their benches, rationalizing that it is like the beech of the New World. And indeed, the maples have all the qualities of a good species for a workbench.

Maple is stiff, resists denting and can span long distances without much of a support structure below it. But so can other species. In fact, if you went by the numbers from the wood technologists alone, you'd build your bench from shagbark hickory, despite its difficult nature. Once you look at the characteristics that make a good species for a workbench, you'll see that white oak, Southern yellow pine, fir or just about any species (excepting basswood and the soft white pines) will perform fine.



These classic European workbenches were made from fine-grained steamed European beech. Shouldn't you do the same? Not necessarily. Choose a wood that is like beech is in Europe: stiff, inexpensive and plentiful.

## 4 | USE A TESTED DESIGN

After you sketch out your workbench design but before you cut any wood, compare your design with historical designs of benches. If your bench appears to be a radical design or looks unlike anything built before, chances are your design is flawed.

I've seen workbenches with pneumatic face vises. Why? I've seen a workbench that had two twin-screw vises: One vise for the right end of the workbench that was matched to work with two long rows of dogs along the length of the benchtop; and a second twin-screw vise on the face of the bench that was matched to two more rows of dogs across the width of the bench.

Now I'm certain that there are a few woodworkers who would really need this arrangement – perhaps someone who has to work on a circular tabletop on one end of the bench and a Windsor chair seat at the other. But for most people who build cabinets and furniture, this setup is redundant and neglects some critical bench functions.

## 5 | OVERALL DIMENSIONS OF YOUR BENCH ARE CRITICAL

Your bench design cannot be too heavy or too long. But its top can easily be too wide or too tall. I think your benchtop should be as long as possible. Find the wall where your workbench will go (hint: Pick the wall that has a window). Measure that space. Subtract four feet from that measurement and that's a good length for the top. Note: The benchtop must be at least 5' long unless you build only small-scale items. Furniture-sized parts typically range up to 48" long and you want to support these fully with a little room to spare.

I've made tops that are 8' long. My next bench will be a 10-footer, the maximum that will fit in my shop. It is difficult



*Here's proof that odd workbench designs are nothing new. This Hammacher, Schlemmer & Co. bench from an old catalog is a study in tool storage. I've seen one of these in person and I can say this: I won't want to have to build anything using it.*

to make or imagine a workbench that is too long. The same goes for thickness. It is the thickness that allows the top to be that long. If you make the top really thick (4" or more), then it will offer unerring support and allow you to build your bench without any support system beneath. The top can perch on the legs and will not sag under its own weight.

The width is a different matter. You can have a bench that is too wide for a one-person shop. I've worked on benches that are 36" wide and they have downsides. For starters, if you park them against the wall you will have to stretch to reach the tools hanging on the wall. If you assemble projects on your bench, you will find yourself dancing around it a lot more than you should.

But there is more. Cabinetwork is sized in standard chunks. These sizes come from the human body; they are not arbitrary. A kitchen's base cabinet is generally 24" deep and 34½" high. This is important for a couple reasons. First: It means you do not really need a bench that's much more than 24" deep to build cabinets. With that 24" depth, you actually get some advantages, including the fact that you can clamp the cabinet to your bench from as many as three sides of your bench.

That is dang handy. A deep bench allows you to clamp your cabinets to the bench on only two sides (with a couple exceptions). Here's the other thing to keep in mind: Kitchen cabinets are themselves a highly studied work surface. There's a good reason that kitchen cabinets are 24" deep. And it's the same reason you don't want your workbench much deeper either.

Now I am not going to argue with you if you build really big stuff or have a bench that you share with another woodworker facing you; you might need more depth. But if you are like the rest of us, a 24"-deep bench is a powerful and right-sized tool.

On the issue of workbench height: Many bench builders worry about it and there are a wide variety of rules and advice. The bottom line is the bench must fit you and your work. And in the end, there are no hard-and-fast rules. I wish there were. Some people like low benches; some like them high.

So consider the following as a good place to start. After taking in my crackpot theories, your next stop should be a friend's house or a woodworking supply store to use their benches and get a feel for what is right (it could be as simple as having a bad back that requires you to have a high bench, or a love for wooden handplanes that dictates a low bench).

Here is my experience with bench height: I started with a bench that was 36" high, which seemed right for someone who is 6' 3½" tall. And for machine woodworking I was right. The high bench brought the work close to my eyes. I loved it. And then my passion for handwork reared its ugly head.

If you get into hand tools, a high bench becomes less attractive. I started with a jack plane and a few smoothing planes. They worked OK with a high bench, but I became fatigued quickly.

After reading the screed on bench heights, I lowered the height of my 36" bench. It seemed radical, but one day I got the nerve up and sawed 2" off the legs.



Here is how high my workbench is compared to my hand, which is hanging loosely by my side. I use hand and power tools in my work, and I've found this height is ideal.

Those two inches changed my attitude toward planing.

The 34"-bench height allowed me to use my long leg muscles to propel the plane forward instead of my arms.

Now, before you build your next bench at 34" high, stop for a minute. That might not be right for you. Do you use wooden stock planes? If so, you need to consider that the wooden body planes can hold your arms about 3" to 4" higher off the workbench than a metal plane can. As a result, a wooden plane user's workbench should be lower.

This is as good reason as ever to get to know someone who has a good shop you can visit and discuss your ideas with. It's better not to make this decision on paper alone.

But there are other factors you must consider when settling on the bench's height. How tall are you? If you are over 6' tall, you should scale your bench a bit higher. Start high and cut it down if it's too high. And prop it up on some blocks of wood if it's too low. Experiment. It is not a highboy; it's a workbench.

Here are other things to consider: Do you work with machinery? If so, a bench that's 34" from the floor – or a bit lower – can be good. The top of a table saw is typically 34" from the floor, so a workbench could be (at most) a great outfeed

table or (at least) not in the way of your crosscutting and ripping.

Of course, everyone wants a ballpark idea for where to start. So here it is: Stand up straight and drop your arms against your sides in a relaxed manner. Measure from the floor to the place where your pinky joins your hand. That has been the sweet spot for me.

## 6 BENCHES MUST HOLD THE WORK IN THREE WAYS

All benches should be able to grip the wood so you can easily work on the faces, the ends and the edges. Many commercial benches fail on this point.

Submit your bench to what I call the Kitchen Cabinet Door Test. Imagine a typical kitchen door that is  $\frac{3}{4}$ " thick, 15" wide and 23" long. How would you affix that door flat on your bench to level its joints and then sand (or plane) it flat? How would you clamp the door so you could work on the ends to trim the top rail and tops of the stiles so the door will fit its opening? And how will you secure that door on edge so you can rout its hinge

mortise and plane off the saw-blade marks without the door flopping around? Does your bench pass this test? OK, now ask the same questions with a door that is  $\frac{3}{4}$ " x 15" x 38". And then try a board that is  $\frac{3}{4}$ " x 12" x 6'.

How you accomplish each of these three functions is up to you and your taste and budget. To work on the faces of boards, you can use a planing stop, a grippy sanding pad, a tail vise with dogs, clamps or hold-downs.

To work on the ends of boards, you can choose a shoulder vise (especially for dovetailing), a metal quick-release vise, a leg vise or a twin-screw vise. And you can use all of these in conjunction with a clamp across your bench. The vise holds one corner of the work; the clamp holds the other corner.

Working the long edges of boards is tricky with most benches. In fact, most benches make it difficult to work the edges of long boards, doors or face frames. There are a couple ways to solve this. Older benches had the front edge of the bench-top flush with the front of the legs and stretchers so you could clamp your frames and long boards to the legs. And the older



This early 20th-century airplane factory had the right idea when it came to workbench length. With a long bench, you can work on one end and assemble at the other – no need for an assembly bench. Thus, a big bench actually saves floorspace.



Most benches are easy to set up to work on the faces of boards or assemblies. In this example, a door is clamped between dogs. You can even work simpler and plane against a planing stop.



Working on the ends of boards—especially wide boards—can be a challenge for face vises. Adding a clamp to the setup stabilizes the work for sawing or whatever.



This primitive bench still allows you to work on long edges of boards. The crochet (or hook) grips the board. Holdfasts and a scrap support from below. Simple and brilliant.

benches also would have a sliding deadman (sometimes called a board jack). It would slide back and forth and had an adjustable peg to support the work from below. Another old form of bench, an English design, had a wide front apron that came down from the top that was bored with holes for a peg to support long work.

## 7 MAKE YOUR BENCH FRIENDLY TO CLAMPS

Your bench is a three-dimensional clamping surface. Anything that interferes with clamping work to your benchtop (aprons, a drawer bank, doors, supports, etc.) can make some operations a challenge.

We had a phase at Popular Woodworking where we tried to design a cupholder into every project. It started innocently with a deck chair. Who doesn't want a cool beverage at hand? Then there was the dartboard. What goes better with darts than beer? I think we came to our senses when designing a series of cupholders into a Gustav Stickley Morris chair reproduction. Do you really need a Big Gulp-sized hole in your Morris chair? I didn't think so.

The point of this story is to illustrate a

trend in workbench design that I personally find troubling. It's a knee-jerk reaction to a common American complaint: We don't think we have enough space in our shops to store our tools and accessories. And how do we solve this problem with our workbenches? By designing them like kitchen cabinets with a countertop work surface.

This design approach gives us lots of drawers below the benchtop, which is great for storing the things you reach for every day. It also can make your bench a pain in the hiney to use for many common operations, such as clamping things to your bench.

Filling up the space below the benchtop also prohibits you from using any type of holdfast or hold-down that I am aware of.

If you build drawers below the top, how will you clamp objects to the benchtop to work with them? Typically, the banks of drawers below the benchtop prohibit a typical F-style clamp from sneaking in there and lending a hand with the setup. So you can't use a typical clamp to affix a router template to the bench. There are ways around these problems (a tail vise comes to mind) but the tail vise can be a challenge to install, set and use.

You can try to cheat (as I have) and install the drawer bank so there is a substantial space underneath the benchtop for holdfasts and clamps. Or you can give your bench a large overhang to allow clamping (as some Shaker-style workbenches did) but then you have to start engineering a way to hold long boards and assemblies on edge.



Here's another historical bench that shows some difficulties. The drawers will interfere with clamping things down to the bench. With no dogs or tail vise, this bench could be frustrating to work on.



## 8 | THERE ARE GOOD RULES FOR PLACING VISES ON YOUR BENCH

Place your vises so they work with your tools. Vises confuse many workbench builders. They are bewildering if you have never spent much time working at a bench to develop a taste for the peccadilloes of all the idiosyncratic forms. There are a lot of weird configurations in the world, from a table with no vises to the bench with a vise on every corner.

Classic workbenches have some sort of vise at the front left corner of the bench. This is called the face vise. Why is it at the left? When we work with hand tools, especially planes, right-handers work from right to left. So having the vise at the left end of the bench is handy because you will always be planing into the vise that is gripping your work, and the work can be braced against the screws of the vise. So if you are a lefty, placing your vise on the front right corner makes sense.

So with that left corner occupied by a vise, where are you going to put the a second vise that is designed to grip boards so you can work on their faces? (The classic vise for this is a tail vise.) Well the right side of the bench is free (for right-handers) and there is no



*An oil-varnish blend (any brand) is an ideal finish for a workbench. It resists stains, doesn't build up a film and is easy to apply. Two coats are all I ever use.*



*With your workbench against the wall, you have the wall and the mass of your bench holding things steady as you saw your workpieces. You also can keep your tools at arm's length. And, the windows cast a useful light on your workbench.*

disadvantage to placing it there, so that is where it generally goes.

Messing with this arrangement can be trouble. I've seen face vises on the right corner of the bench of people who are right-handed. They said they liked it better for crosscutting with a handsaw. But when and if you start handplaning, that vise will be in the way because it would not be ideal for gripping long stock. It will be holding the tail end of the board and the plane will be trying to pull it out of the vise.

## 9 | NO FANCY FINISHES

When finishing a workbench, less is more. A shiny film finish allows your work to scoot all over the bench. And a film finish will crack when struck by a hammer or dead-blow mallet. Choose a finish that is easy to apply, offers some protection and doesn't build up a thick film. I like an oil/varnish blend (sold as Danish oil), or just boiled linseed oil.

## 10 | GET A WINDOW SEAT

Try to place your bench against a wall and under a window, especially if you use hand tools. The wall braces the workbench as you are planing cross-grain and sawing. The light from the window points out the flaws in the work that your hand tools are trying to remove. (When I work with hand tools, I turn the overhead lights off. I can see much better with fewer light sources.)

For machine work, I find that placing the bench by a window helps with some operations, though not all. When power sanding, for example, the raking window light points out scratches better than overhead fluorescents.

In general, when working with power tools, I tend to pull my workbench away from the wall so I can work on all sides of it. When working with routers, you may have to work with odd clamping setups so that you can rout around a template. So having access to all four sides of the bench is handy. Power tool setups thrive on overhead light—and lots of it. So the window is nice, but not as necessary. *PWM*

# FIX YOUR WORKBENCH

Most workbench books begin with a grand statement about how the workbench is the most useful tool in the shop. I'm not so sure I agree with that statement as it stands. I think it's correct to say that a well-designed, solidly built and properly outfitted bench is the most useful tool in the workshop. Anything less is only making you struggle. However, you do not have to build or buy a new workbench if you are frustrated with the one you have. There are ways to improve your bench so it will be more useful. Here are some strategies.

—Christopher Schwarz

1

## PROBLEM:

*My bench is too lightweight. I chase it around the shop when working.*

Add weight by building a tray below the bench and fill it with sand. Or rebuild your bench base with massive components and joints. You also can build drawers near the floor (so they do not impede clamping things to the top). That adds weight and storage.

2

## PROBLEM:

*My bench sways and vibrates when I work, making my saw cuts and attempts at planing into a regged mess.*

Your problem is most likely in the base of the bench. Commercial benches can be too spindly for woodworking. Rebuild the base from massive components and better joints. If you cannot do that, stiffen the bench by running all-thread rod through the legs and cinching the base tight with nuts.

3

## PROBLEM:

*My workbench has a lacquer finish that looks nasty and lets the work slide everywhere.*

Flatten the top of your workbench and then refinish the top with an oil/varnish blend.

4

## PROBLEM:

*I think I want a fancy twin-screw vise, Emmert patternmaker's vise or tail vise on my bench. Plus something for working metal.*

Before you drop serious coin on vises and put them on every corner, start with a simple face vise. Then buy a tail vise. Then decide after a year of working on the bench if you need the fancier vises. The answer might be yes. You also might forget that you ever wanted those vises.

5

## PROBLEM:

*I like my bench in the middle of the room so I can work on all sides.*

Perhaps you do. Try putting it under a window and against the wall and work that way for a few months. Don't have a window? Directional compact fluorescent fixtures can help. Or you can save your pennies and have a window installed. I did. It was the best \$1,000 I have ever spent on my shop.

6

## PROBLEM:

*My bench makes it difficult to work on the long edges of boards.*

First, detach the benchtop from its base and reattach it so the legs are flush with the front edge of the benchtop. If your bench has a sled foot or a trestle design, there is an easier fix. Scab on extra pieces to the legs to bring them flush with the front of the benchtop. Now build a sliding deadman or a bench slave and you will be in business.

7

## PROBLEM:

*My commercial bench came with a face vise and tail vise. Both rack horribly. How do I improve them?*

By throwing them in the fireplace and installing a real face vise on the front and tail vise on the end.

8

## PROBLEM:

*My bench looks like a kitchen counter with drawers below. Clamping to the bench is a problem.*

You might be stuck here. Some commercial designs allow you to remove the drawer bank (they sell them separately) and you can install it someplace else handy, such as under a table saw's wing. If your bench is a door on top of base cabinets, consider making a new base and use that cabinet as a cabinet.

9

## PROBLEM:

*I want a new bench, but I'm low on funds.*

Build your bench using Southern yellow pine or fir, both of which are stiff, plentiful and cheap (you can build a bench of your dreams for less than \$300). You'll have to pick your lumber with care and let it reach equilibrium with your shop. But in the end, you'll have a great bench.

10

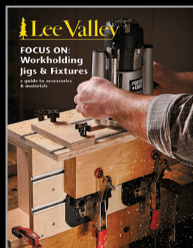
## PROBLEM:

*My bench is too short in length, too wide, narrow, high or low.*

If your bench is too short in length you should probably build a new top. Keep the base if you can. If it's too wide, rip it down (removing a tool tray will help). You might need to cut the base a bit narrower as well. This is doable: Cut the stretchers on the sides shorter and then cut tenons on their ends. Cut new mortises on the legs and assemble it. If your bench is too narrow, scab on new material at the back, which will add mass as well. If your bench is too high, cut down the legs or the sled foot. If it's too low, build a sled foot to raise it.

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