



Woodsmith **PLANS**

MULTIPURPOSE SHOP CART



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A heavy-duty design, large worksurface, and loads of storage add up to a versatile project.



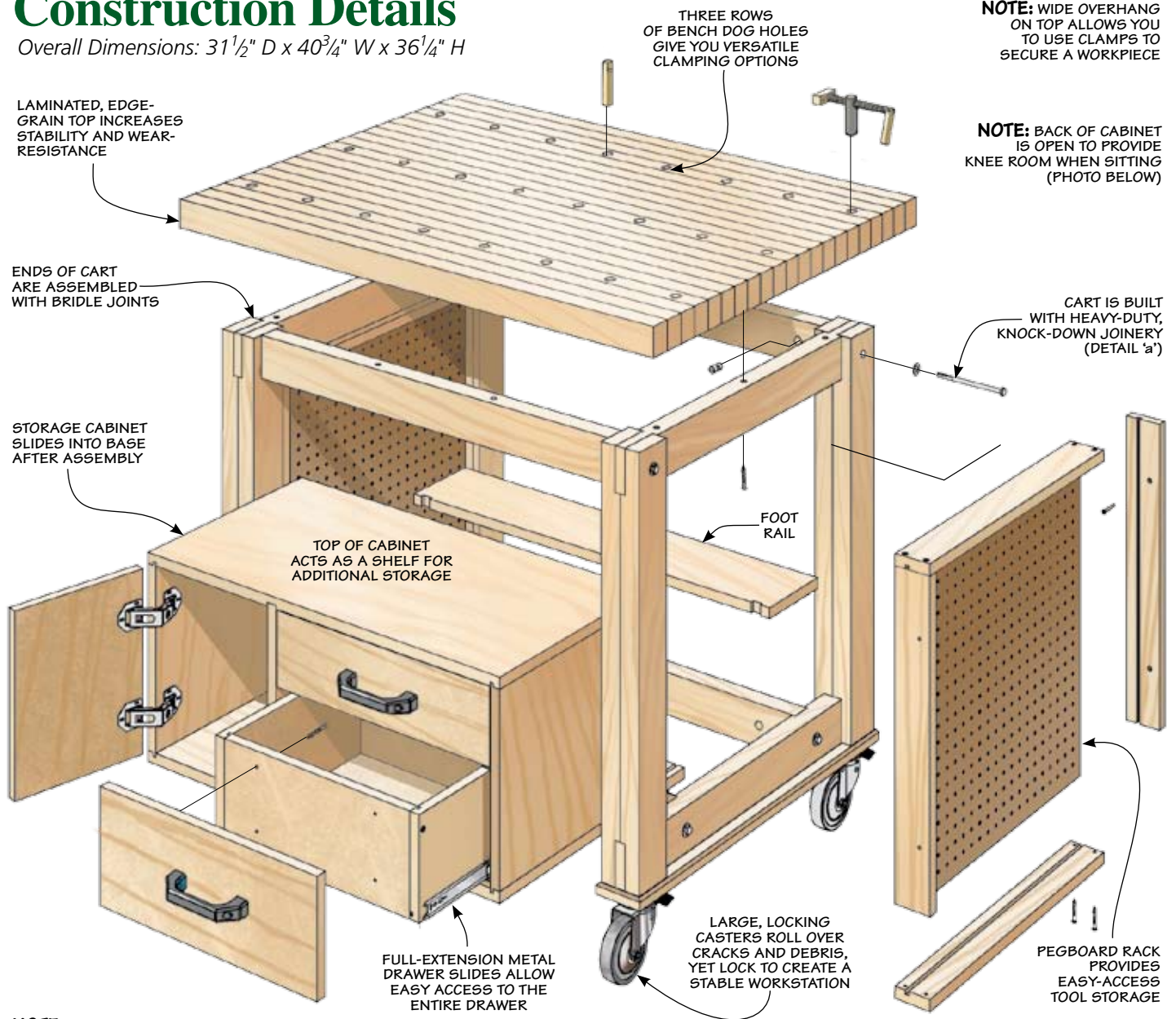
It's a good idea to have an extra worksurface in the shop for assembly, finishing, or just to have a place to stack parts and supplies. The trouble is you don't need it in the same place every time.

That's where this cart comes in. The solid-wood top provides a generous amount of space to work. It rests

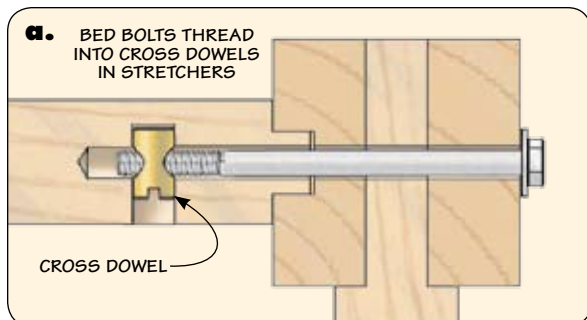
on a stout base that's built to stay strong and stable for years. The heavy-duty casters allow you to smoothly roll the cart wherever you need it. And finally, it has a storage cabinet and a pair of pegboard racks to keep tools and supplies close at hand. In fact, this sturdy cart would be a great rolling workbench for a small shop.

Construction Details

Overall Dimensions: 31 1/2" D x 40 3/4" W x 36 1/4" H

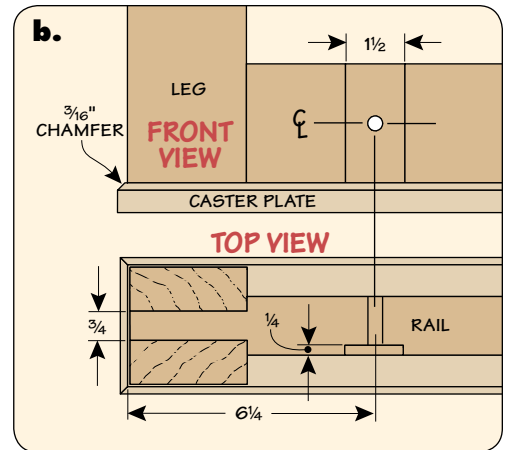
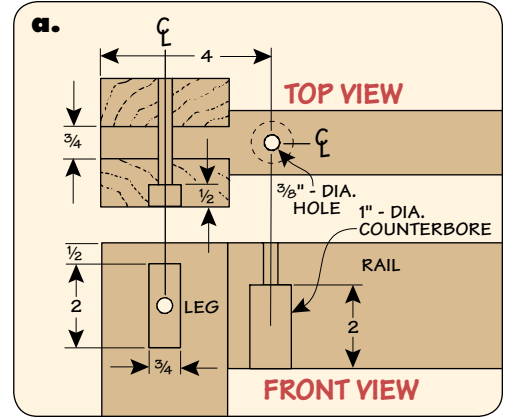
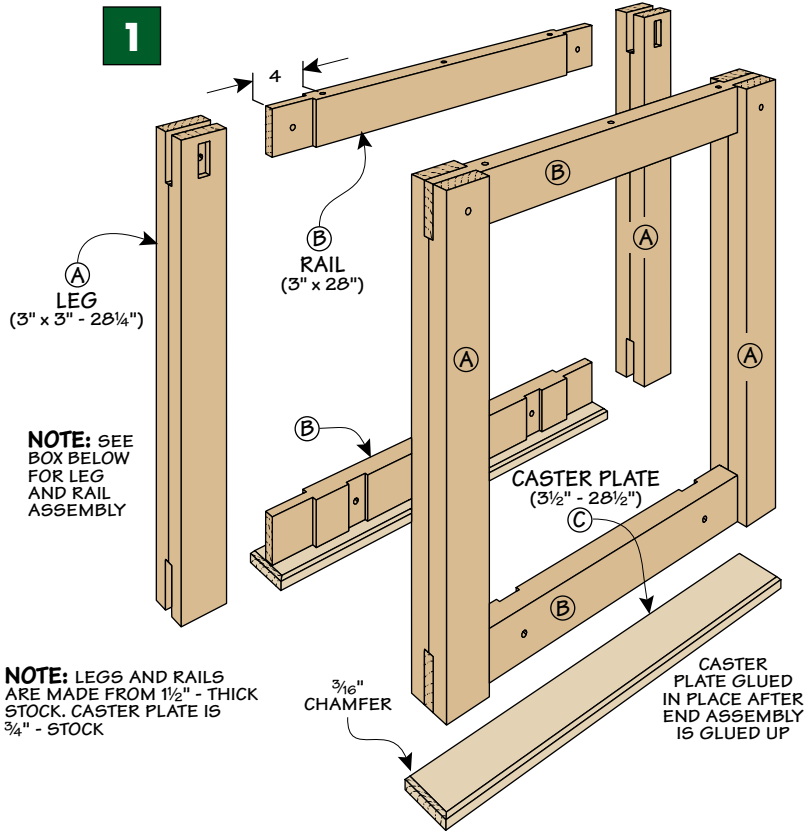


NOTE: CART BASE AND TOP ARE MADE FROM INEXPENSIVE "TWO-BY" CONSTRUCTION LUMBER



► **Open Back.** Inset stretchers and a shallow storage cabinet give you leg room at the back of the cart.





Heavy Duty Base

The core of the cart is the base. I had a few goals in mind when making it. The most important one was that it should be strong and rigid — and stay that way for years to come. As I said earlier, this cart can be a rolling workbench, so it should be just as tough as a regular workbench, too. To do this, I made the base from thick solid-wood parts

and traditional joinery — mortise and tenon, and bridle joinery.

Rolling around uneven floors puts a lot of stress on the frame of a cart. So my second goal was to make the base easy to tighten up if things get wobbly. To do this, I used bed bolts to secure some of the joints instead of glue. If necessary, you can snug up the joinery with a wrench. A side

benefit is that this makes assembling the base a breeze.

The final goal was to keep the materials inexpensive. So I used Douglas fir construction lumber.

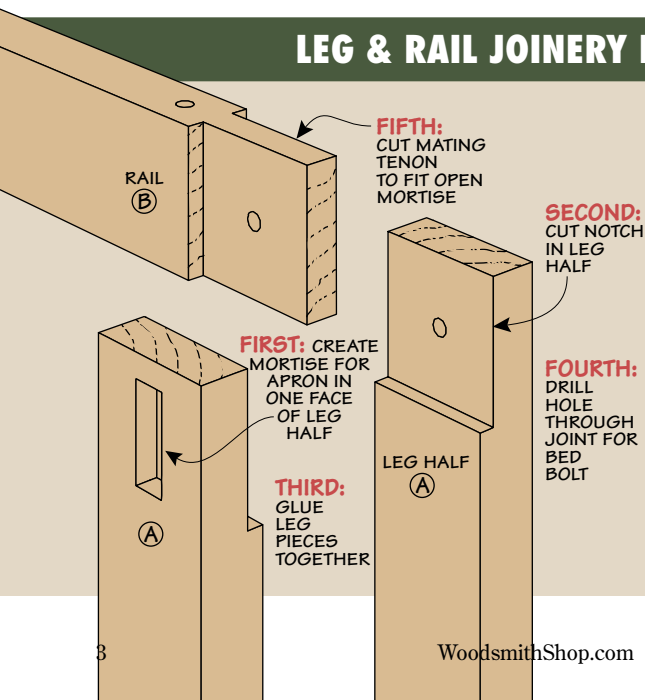
END FRAMES. In Figure 1, you can see how the parts go together. The base is made up of a pair of end frames that get connected by a set of stretchers and aprons. Each frame consists of a pair of legs and a pair of rails assembled with bridle joinery.

THICK LEGS. The thick legs that support the cart are 3"-square posts. They have an open mortise cut on each end to accept the rails. To create the legs, I glued up two pieces. This also makes it easier to make the open mortises. For more on the joinery, take a look at the box at left.

END RAILS. Once the legs are complete, the next task is the connecting rails. Each end rail has a tenon on the ends that fits the open mortise in the legs.

In addition, the upper rails have some deep, counterbored holes that are used to attach the benchtop later on, as you can see in Figure 1a.

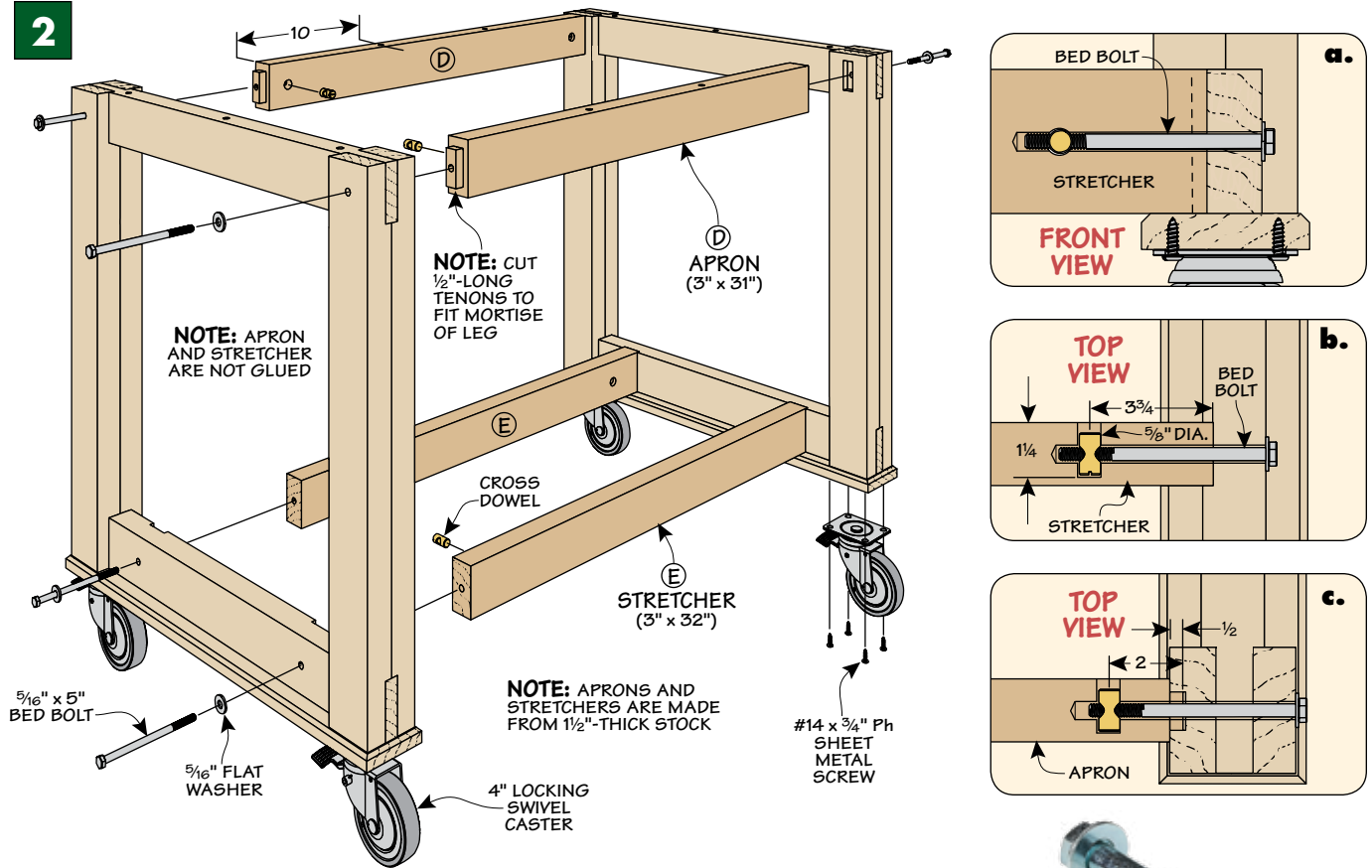
LEG & RAIL JOINERY DETAILS



The key to creating the leg to rail joinery is doing things in the right order. It will make the joints tighter and more accurate to align.

You can get started by cutting a mortise in one leg half. Then cut a shallow notch on each half. When you glue the halves together, it will create the open mortise for the bridle joint. Next, you can drill the bed bolt hole through the mortise at the drill press. After cutting the mating tenon on the rails, you can complete the hole with a hand drill.

2



At the bottom, the lower rails have a pair of dados cut on the inside faces. These dados accept stretchers that stiffen the lower part of the cart. There's also a hole through each dado to hold a bed bolt, as you can see in Figure 1b. I drilled these holes at the drill press so they were straight.

When you're ready to assemble the end frames, there are a few things to keep in mind. First, make sure the rails seat snugly in the mortises and at the shoulders. Then check that the assembled frame is flat and square.

CASTER PLATE. The last item to complete on each end frame is to make and attach a plate. This provides a solid mounting surface for the casters, as in Figure 2. The only detail to note is a small chamfer on the top edges (Figure 1b).

STRETCHERS & APRONS. Connecting the end frames are a set of aprons and stretchers. They're held in place with bed bolts (Figure 2). This technique doesn't require glue or clamps. The aprons have a tenon on each end to fit the mortise on

the legs (Figure 2c). And like the upper rails, the aprons are drilled and counterbored to attach the benchtop. The stretchers at the bottom of the cart are simply sized to fit in the dados in the lower rails.

The next step is to drill the aprons and stretchers to accept the special bed bolt and cross dowel hardware,

as shown in the right margin photo. What's important here is that the holes intersect in the right spot. The box below shows you how it's done.

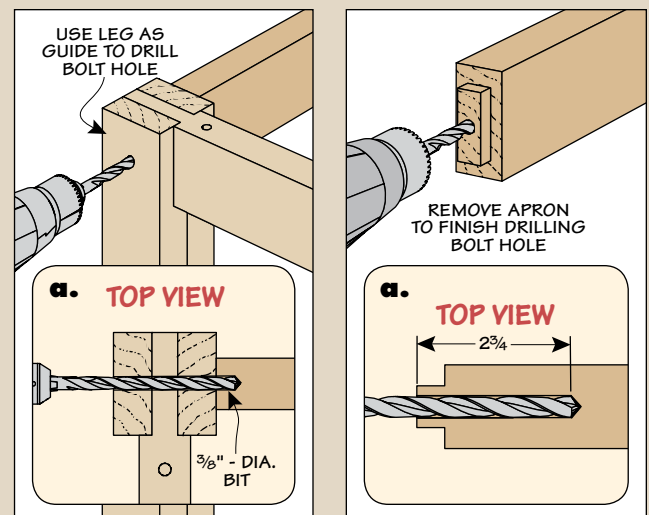
This completes the joinery work on the base. So the base can be assembled. The last thing to do is install the casters.

▲ **Solid Assembly.**
The base is held together with a set of bed bolts.

DRILLING FOR BED BOLTS

Installing bed bolts to assemble the base of the cart involves nothing more than drilling a few holes. You just need to make sure they're aligned. To do this, you can use the holes you drilled in the legs and lower rails as a guide, as in detail 'a' in the left drawing at right.

The drill bit isn't long enough to complete the hole. So you need to remove the apron and continue drilling to final depth (far right drawing). Finally, at the drill press, drill the intersecting hole for the cross dowel.



Laminated Benchtop

Capping the base of the shop cart is a large, solid-wood benchtop. I chose a wood top for a couple of reasons. The primary one is functional. A thick, wood top provides a durable, sag-resistant worksurface. So it can stand up to the heavy, long-term use that you'd expect from a traditional workbench.

The other reason has to do with appearance. The wood top matches the look of the base.

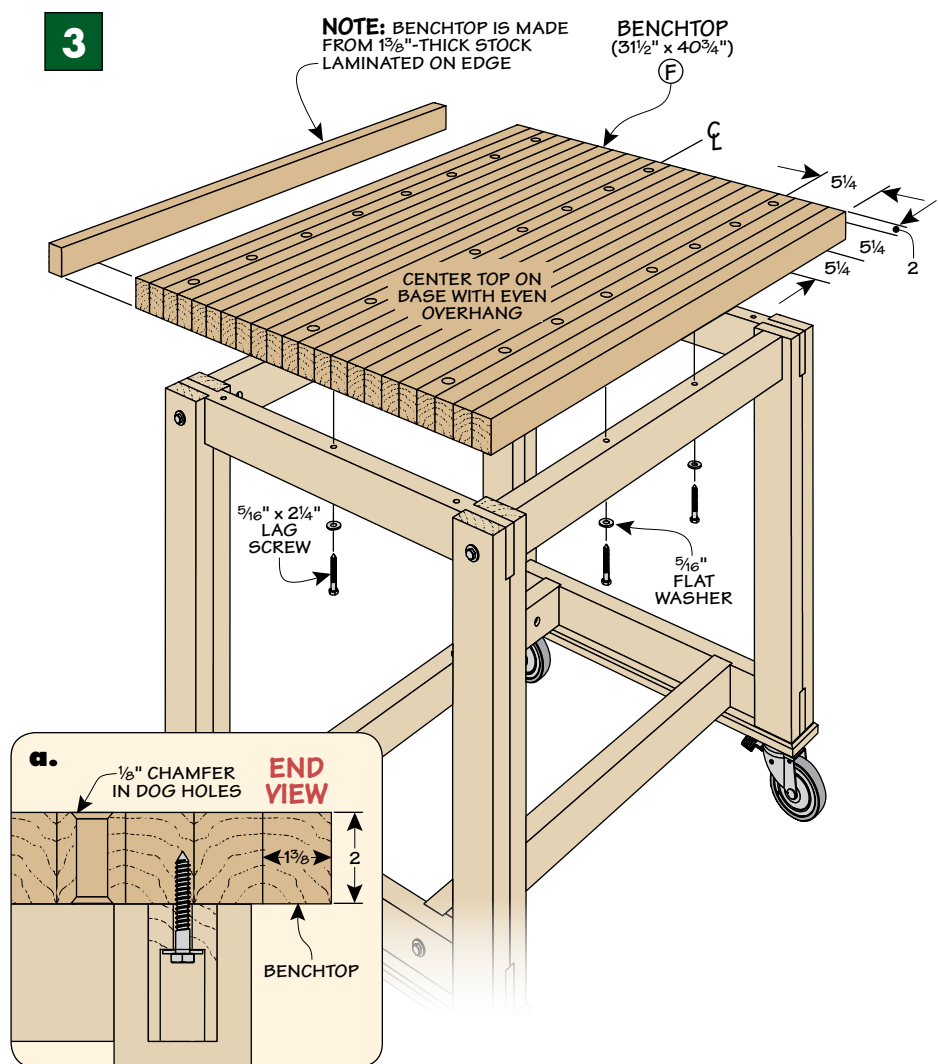
EDGE GRAIN. The benchtop is more than just a glued-up panel. Instead of simply gluing wide planks edge-to-edge, I ripped the wide boards into narrow strips.

Then the strips are turned on edge and glued "face to face" to expose the edge grain. This butcher block-like top is stronger and more wear resistant.

However, gluing all those strips into a flat, consistent top can be a real challenge. It's best to glue up a few sections at a time and then glue larger sections together.

There's one last thing I want to point out about the top. It's sized to overhang the base on all four sides. This provides a way to clamp a workpiece to the top without interference from the legs, aprons, or rails.

BENCH DOG HOLES. You can leave the benchtop as is, but I went ahead and drilled three rows of bench dog holes, as you can see in Figure 3. This way, I can use a variety of dogs, hold-downs, and other aids to secure a workpiece to the benchtop



without worrying about it shifting in use. You can see a few of these at the bottom of the next page.

Drilling the bench dog holes can be as easy as laying out the hole locations (as illustrated in Figure 3) and drilling them with a hand drill

and a $\frac{3}{4}$ "-dia. spade bit. Just take care to drill them as straight and square as possible.

CHAMFER THE HOLES. Once that's done, you'll need to ease the edges of the holes. You can do this using a hand-held router and a chamfer bit.

MATERIALS & HARDWARE

Base & Top

A Legs (4)	3 x 3 - 28 $\frac{1}{4}$
B Rails (4)	1 $\frac{1}{2}$ x 3 - 28
C Caster Plates (2)	$\frac{3}{4}$ x 3 $\frac{1}{2}$ x 28 $\frac{3}{4}$
D Aprons (2)	1 $\frac{1}{2}$ x 3 - 31
E Stretchers (2)	1 $\frac{1}{2}$ x 3 - 32
F Benchtop (1)	2 x 31 $\frac{1}{2}$ - 40 $\frac{3}{4}$

Tool Rack

G Tops/Bottoms (4)	$\frac{3}{4}$ x 2 $\frac{1}{2}$ - 22
H Sides (4)	$\frac{3}{4}$ x 2 $\frac{1}{2}$ - 20 $\frac{3}{4}$
I Tool Panels (2)	21 x 21 $\frac{1}{4}$ - $\frac{1}{4}$ pgbd.

Storage Cabinet

J Case Top (1)	15 $\frac{1}{2}$ x 30 - $\frac{3}{4}$ ply.
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K Case Bottom (1)	19 $\frac{3}{4}$ x 30 - $\frac{3}{4}$ ply.
L Case Sides (2)	15 $\frac{1}{2}$ x 13 - $\frac{3}{4}$ ply.
M Case Back (1)	13 x 29 - $\frac{1}{4}$ ply.
N Case Divider (1)	15 x 13 - $\frac{3}{4}$ ply.
O Foot Rail (1)	6 x 31 $\frac{1}{2}$ - $\frac{3}{4}$ ply.
P Lip (1)	1 $\frac{1}{2}$ x 30 - $\frac{3}{4}$ ply.
Q Upper Drawer Frt/Bk (2)	4 $\frac{1}{4}$ x 15 $\frac{3}{4}$ - $\frac{3}{4}$ ply.
R Upper Drawer Sides (2)	4 $\frac{1}{4}$ x 14 - $\frac{3}{4}$ ply.
S Drawer Bottoms (2)	13 x 15 $\frac{3}{4}$ - $\frac{1}{4}$ ply.
T Lower Drawer Frt/Bk (2)	6 $\frac{9}{16}$ x 15 $\frac{3}{4}$ - $\frac{3}{4}$ ply.
U Lower Drawer Sides (2)	6 $\frac{9}{16}$ x 14 - $\frac{3}{4}$ ply.
V Upper False Front (1)	5 x 17 $\frac{5}{8}$ - $\frac{3}{4}$ ply.
W Lower False Front (1)	7 $\frac{5}{16}$ x 17 $\frac{5}{8}$ - $\frac{3}{4}$ ply.

X Door (1)	9 $\frac{7}{8}$ x 12 $\frac{3}{8}$ - $\frac{3}{4}$ ply.
Y Door Stop (1)	$\frac{1}{4}$ x 1 - 1
(4) 4" Locking Swivel Casters	
(16) #14 x $\frac{3}{4}$ " Ph Sheet Metal Screws	
(2 sets) Bed Bolt Sets	
(44) #8 x 1 $\frac{1}{2}$ " Fh Woodscrews	
(10) $\frac{5}{16}$ " x 2 $\frac{1}{4}$ " Lag Screws	
(10) $\frac{5}{16}$ " Flat Washers	
(8) #8 x 1 $\frac{1}{4}$ " Fh Woodscrews	
(2 pr.) 14" Full-Ext. Drawer Slides w/Screws	
(3) 5 $\frac{3}{4}$ " Plastic Handles	
(6) #8 x 1 $\frac{1}{4}$ " Ph Sheet Metal Screws	
(1 pr.) Spring Hinges w/Screws	

This prevents the edges from splintering as you insert and remove bench dogs and other hold-downs.

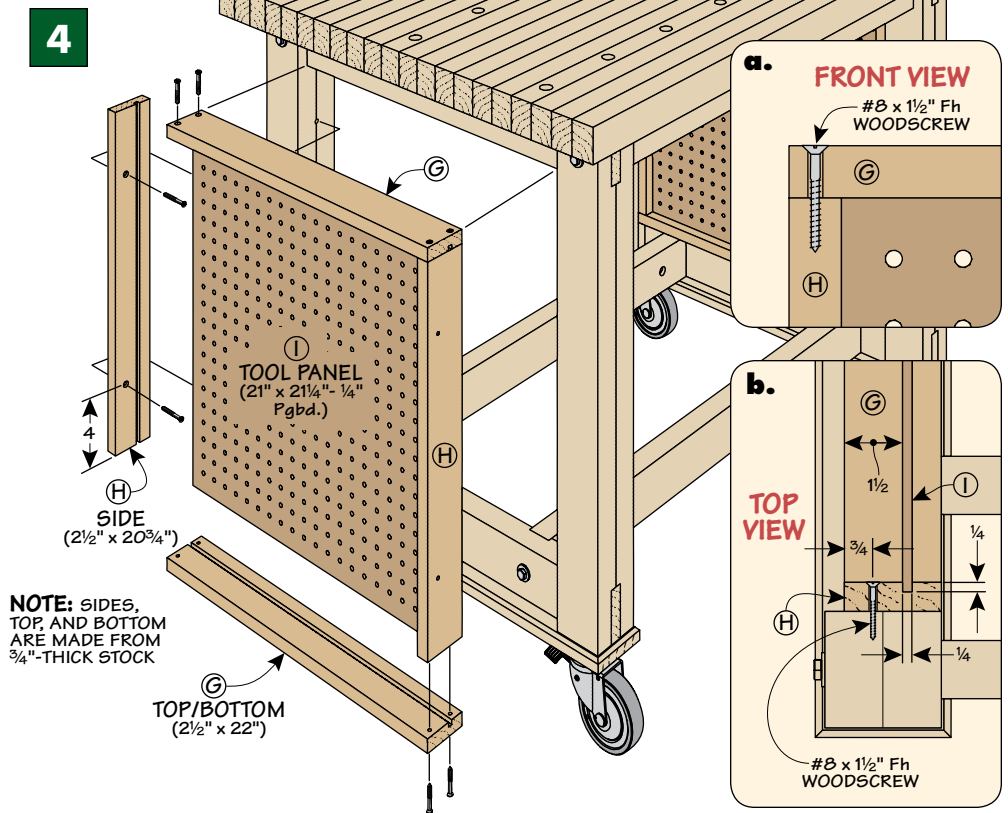
ATTACHING THE TOP. Using solid wood for the top does have another challenge — accommodating seasonal wood movement. An edge-grain panel won't move as much as a plank-type top, but you still need to allow for it.

The top is secured to the cart base with long lag screws and washers. The screws are seated in the holes you drilled earlier in the rails and aprons. These holes are slightly oversized (Figure 3a). This allows the screws to move with the top as it expands and contracts.

That wraps up the major construction of the shop cart. And you can use it just as it is. But I wanted to take advantage of the space in the base to add some storage.

TOOL STORAGE RACKS

One way to build in some storage space is to add some pegboard tool racks to each end assembly. The racks are simply wood frames that wrap around a pegboard panel. The frame not only stiffens the panel but also provides an easy way to attach the rack to the base, as illustrated in Figure 4.



NOTE: SIDES, TOP AND BOTTOM ARE MADE FROM 3/4"-THICK STOCK

MAKING THE FRAME. To make the racks, size the frame pieces to create a snug fit in the opening in each end assembly. Then cut the top and bottom pieces to fit between the legs in the base. Finally, cut the sides to fit between the top and bottom. To accept the pegboard panel,

there's a groove cut in each of the frame pieces, as in Figure 4b. The rack is assembled with glue and screws (Figures 4 and 4a).

After assembly, the racks can be screwed to the base (Figure 4b). The lower photos below show options for storing tools and supplies.



◀ **Clamping.** A round brass bench pup and a threaded Wonder Pup create a handy "bench vise."



◀ **Hold-Downs.** These cam-activated hold-downs secure a workpiece and allow you to reposition it quickly.



◀ **Racks.** You can make plywood shelves and racks to store all kinds of tools on the pegboard racks.



◀ **Hooks.** Reinforced plastic hooks lock into the pegboard so you never have to worry about them falling out.

Storage Cabinet

The open space created by the base of the cart is the perfect place for adding even more storage. The small cabinet you see in Figure 5 has a few interesting features. To provide several storage options, the cabinet contains two drawers and a door. And you can even use the top of the cabinet as a shelf to keep items within easy reach.

CASE

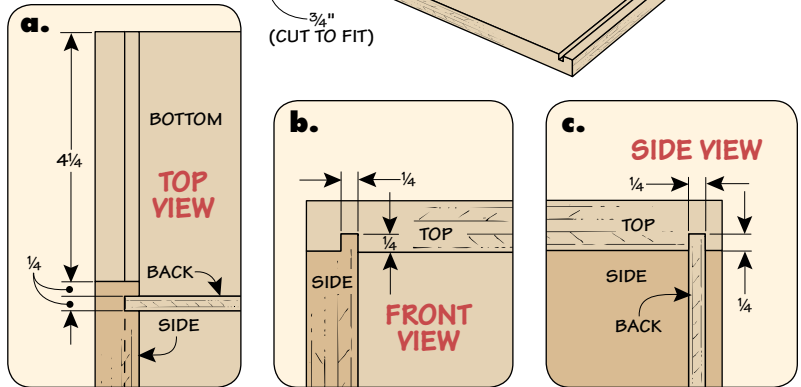
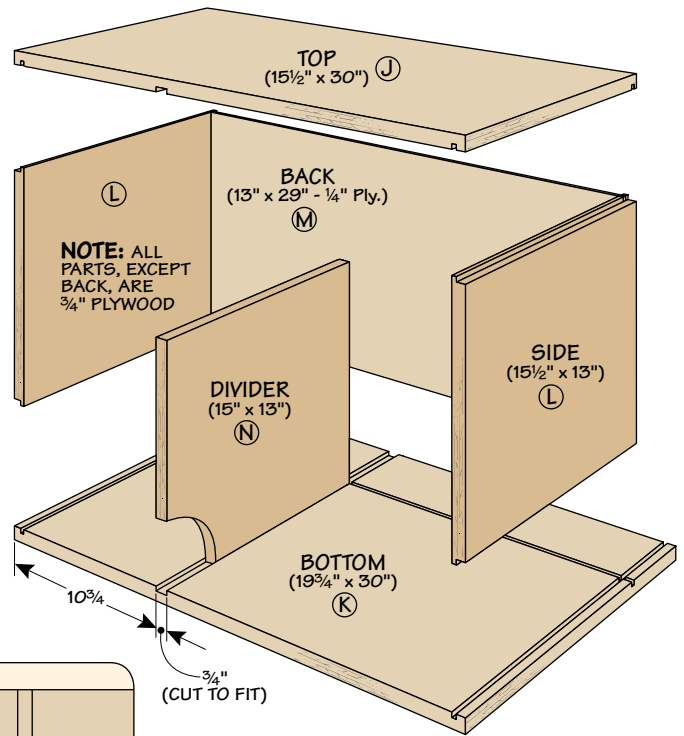
There's a lot of open space in the base, so it's tempting to fill it completely with a storage cabinet. But I built the case of the cabinet relatively shallow. There are a couple reasons for this. First, it would be too easy for things to get lost in the back of the door side of the cabinet. And, it provides leg room on the back side to allow me to sit at the bench on a stool while I'm working.

TOP & BOTTOM. I built the cabinet starting with the top and bottom. Each piece has a few dados and grooves to hold the sides, divider, and back, as in Figure 5.

I sized the dados for the sides and groove for the back to match the thickness of the $\frac{1}{4}$ " plywood that makes up the back. The dado for the divider, on the other hand, is sized to match the thickness of the $\frac{3}{4}$ " plywood I used for the other parts of the cabinet.

You'll notice that the bottom is wider than the top (Figure 5). This extra width allows the cabinet to rest

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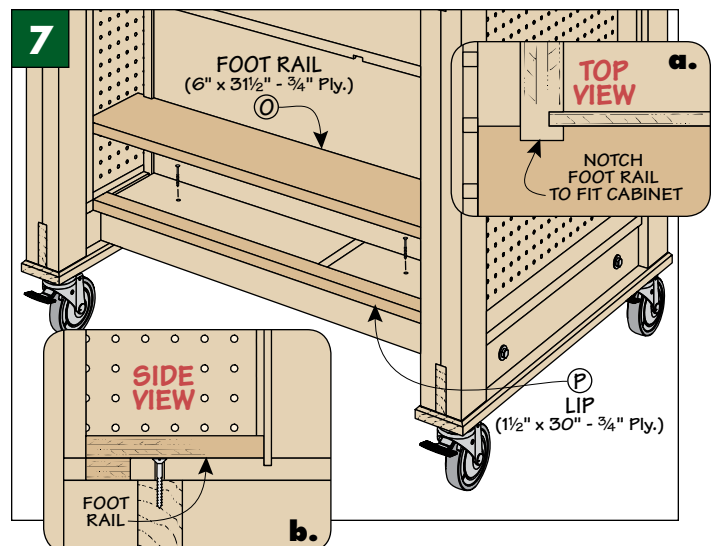
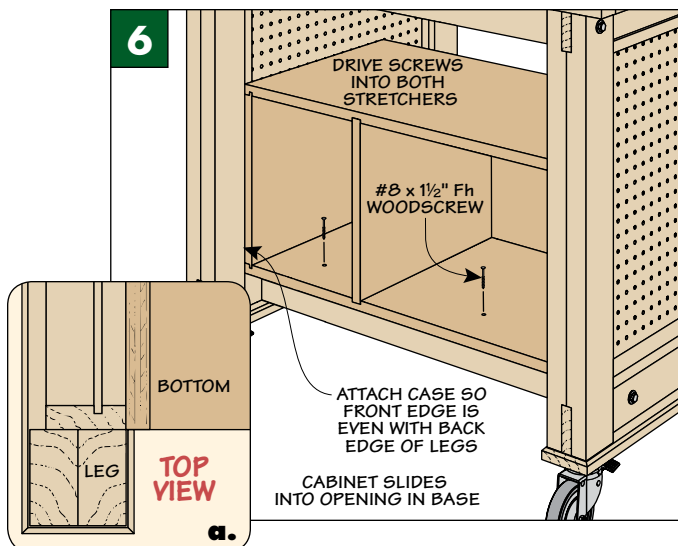


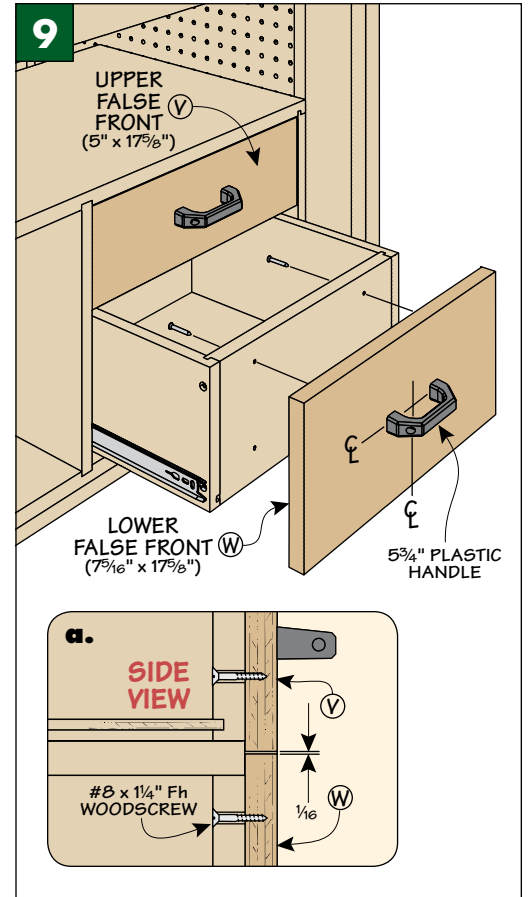
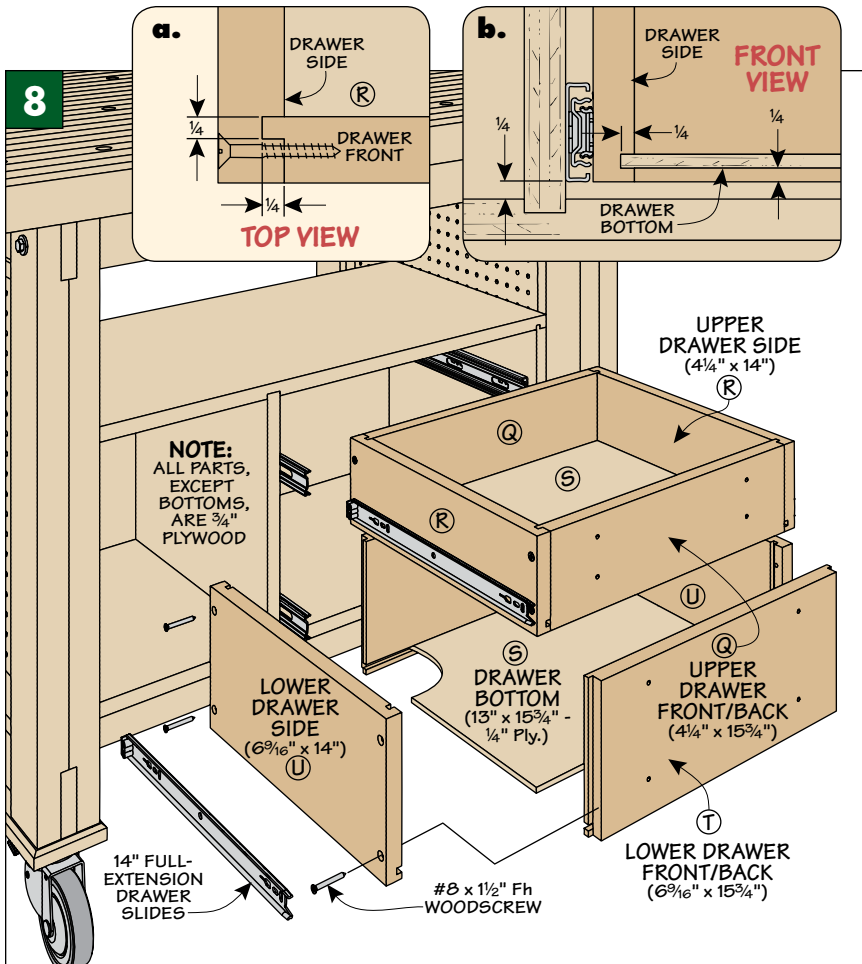
on both stretchers in the base of the cart. And it provides a place to add a foot rail later on.

SIDES & DIVIDER. The next step is to make the sides and divider. The sides have a tongue cut on each end to fit the dados in the top and bottom, as in Figure 5b. (The divider simply

slides into its matching dado.) I also cut and fit the case back.

SOME ASSEMBLY. At this point, the case is ready to be assembled. Start by gluing the sides in place, add the divider, and then attach the back. Finally, add the top and a few clamps to draw the joints tight.





In Figures 6 and 6a, you can see how the cabinet is attached to the base. I positioned the front edge of the case so that it's flush with the back edge of the legs.

FOOT RAIL. I mentioned earlier that the back of the case extends across both stretchers for stability. I wanted to cover the exposed dadoes on the back of the case bottom. So I added a foot rail and lip to cover the top face and back edge (Figure 7). It also provides a footrest when working on this side of the cart.

DRAWERS & DOOR

That takes care of the case of the cabinet. Now you can turn your attention to the two drawers and door.

DRAWERS. The drawers on the right side of the cabinet are the perfect place to store frequently used tools and supplies. They're slightly different sizes, but the construction process is the same (Figure 8).

Once the main drawer parts are cut to size, you can work on the joinery.

The drawers are assembled with tongue and dado joinery (Figure 8a). The sides have a dado cut near each end. And a mating tongue is cut on each end of the front and back.

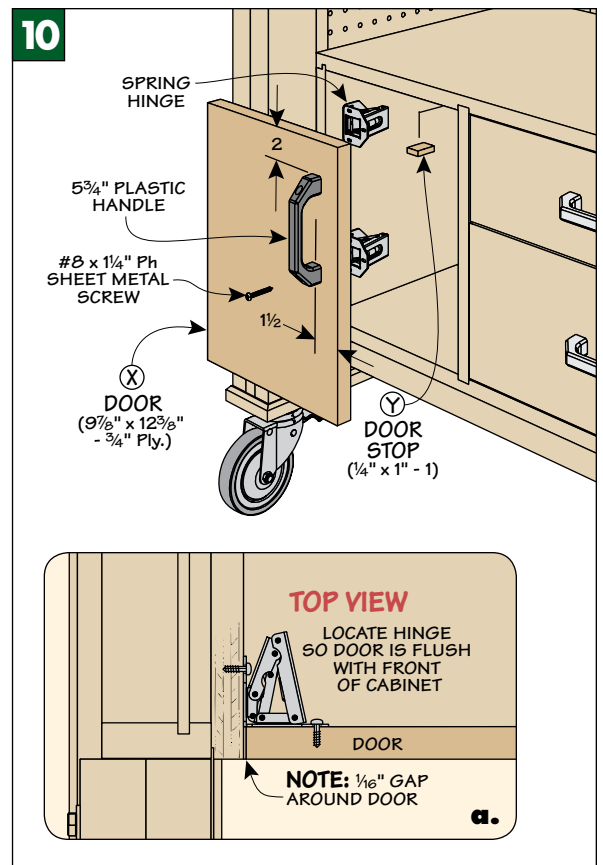
Next, a groove is cut in all the parts to hold the drawer bottom, as shown in Figure 8b. Once again, the groove is sized to match the thickness of $\frac{1}{4}$ " plywood.

After gluing the drawer box together, I added screws to reinforce the joinery (Figure 8).

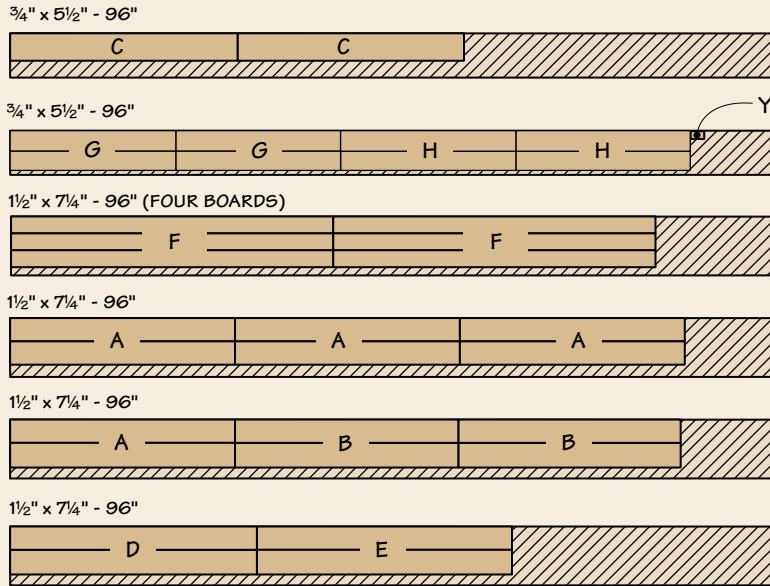
The final step on the drawers is to add a false front. This covers the end grain of the drawer sides and the exposed groove for the drawer bottom, as you can see in Figure 9. The false front is screwed in place and has a plastic pull attached.

DOOR. The last part of the cabinet is the door (Figure 10). It's simply a plywood panel that's sized to fit the opening with a $\frac{1}{16}$ " gap on all sides.

The cart can now be loaded up with supplies. And it will be a versatile addition to your shop.

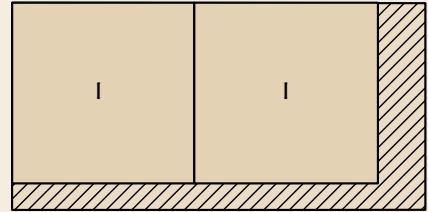


CUTTING DIAGRAM

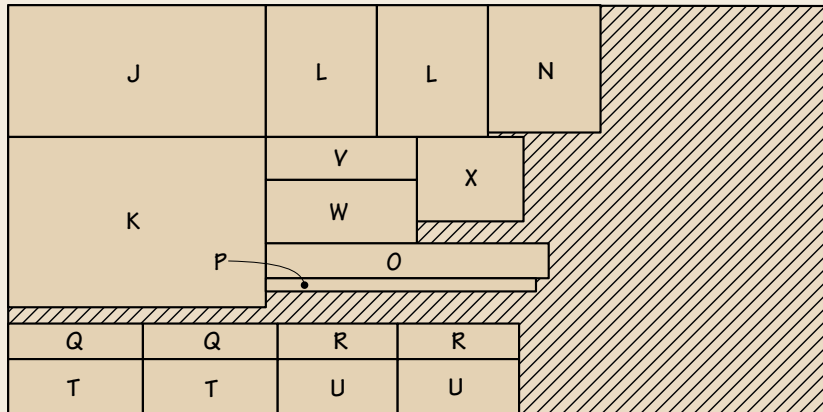


NOTE: DOOR STOP (Y) IS RESAWN AND PLANED TO 1/4" THICK

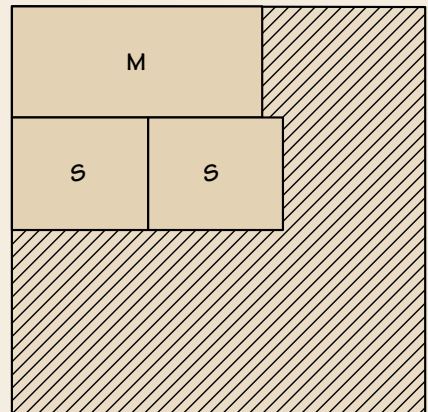
24" x 48" - 1/4" PEGBOARD



48" x 96" - 3/4" PLYWOOD



48" x 48" - 1/4" PLYWOOD



SOURCES

- | | |
|--|---|
| <ul style="list-style-type: none"> • LeeValley.com 4" Locking Casters 00K20.01 Bed Bolts 05G17.01 Veritas Pup Set 05G10.03 • ReidSupply.com Plastic Handles DUH-55 | <ul style="list-style-type: none"> • Rockler.com 14" Drawer Slides 32474 Spring Hinge 28845 Talon Pegboard Hooks 81351 • Woodcraft.com Leigh Bench Clamp 149059 |
|--|---|