



Fine Furniture from

Custom thicknesses, matched grain and seams, and solid-wood details beat the plywood-box look

BY MARK EDMUNDSON

One look at a stack of hardwood plywood and you know why there are fewer and fewer nice planks in a unit of lumber. The best logs are scooped up by veneer mills, ending up in kitchen cabinets and mass-produced entertainment centers. Wanting to rescue these attractive panels, I had to find a way to turn them into pieces my clients would accept as custom furniture. The freestanding cabinet featured here incorporates many of the techniques I've developed for overcoming the inherent drawbacks of using plywood.

By laminating 1/4-in.-thick panels around a core of medium-density fiberboard (MDF), I create custom panels that are thicker than the standard 3/4 in. This technique also allows me to contrast the exterior wood with a different interior species—in the cabinet shown here I used cherry and maple. I also locate the veneer seams carefully to create a solid-wood effect. The solid legs, corner posts and door frames add to the furniture feel. Other custom touches include the raised-panel treatment on the plywood door panels and the mitered edge-banding on the top and bottom. The

top also has a raised lip, or “pencil roll,” applied at the back edge. An attractive drawer box, custom door pulls and nice hinges complete the piece.

Plywood can overcome its deficiencies

While plywood presents a number of problems to the custom furniture maker, it also offers the solutions. The hardwood plywood at a lumber dealer is probably “A-1,” which refers to a grading system. On the A side you'll find very impressive veneers, all book-matched and ready for sanding. But the other side (the “1” side) is usually uninspiring, consisting of veneers with sap and from different logs or flitches. Even if you put this side on the inside of a cabinet, it still detracts from the overall quality and appeal.

At some point I came up with the idea of sandwiching 1/4-in.-thick A-1 on both sides of an MDF core. The idea allows me to get rid of the inconsistent side and gives me the freedom to choose an alternative wood for the interior of a cabinet, something I usually do when I cut my own veneers. Also, the center core can be whatever



Some of the finest logs end up as plywood veneers. Most hardwood plywood dealers sell attractive sheet goods in a variety of common species, featuring rotary-sliced, book-matched and quarter-sliced veneers.

Selecting sheet goods

Woodworkers can choose from a wide selection of hardwood plywood. Whatever you want is likely to be available somewhere, especially if you live in a city. And if your dealer doesn't have it in stock, the dealer can order it from a supplier. Most places carry a pretty good selection of 1/4-in.-thick hardwood plywood (another reason to use my sandwich system rather than 3/4-in.-thick plywood). If you're forced to order something sight unseen, try to be as specific as you can about your needs. Most places will let you decline something if it's not up to your expectations.

You'll most likely have to make decisions about veneer slice, core type, face grade and back grade. I put the highest

value on the veneer slice, which is the manner in which the veneer has been cut. The best choices for the exterior are either a plain-sliced or quarter-sliced veneer. Both of these are cut in a straight line, duplicating the figure of sawn lumber. Rotary slicing involves centering the log in a lathe and turning it against a broad cutting knife. The grain pattern does not match that typically found in solid wood.

For a hardwood plywood core, I prefer MDF because there's no chance of a void being telegraphed onto the surface veneers. The face grade will most likely be A if you've chosen plain- or quarter-sliced veneer. It's also helpful to know that veneer-

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Plywood

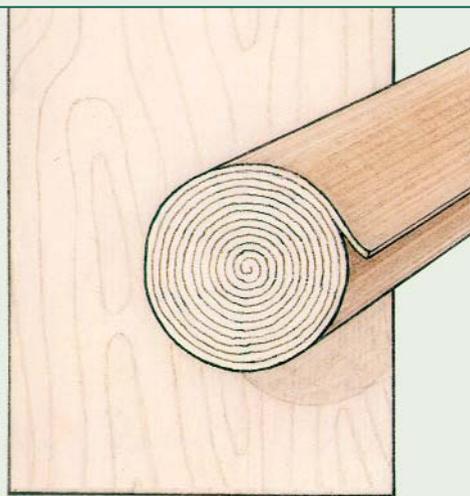


er thickness I want, further distancing a piece from the plywood-box look. Last, plywood is much easier to laminate onto a substrate than thin veneer is.

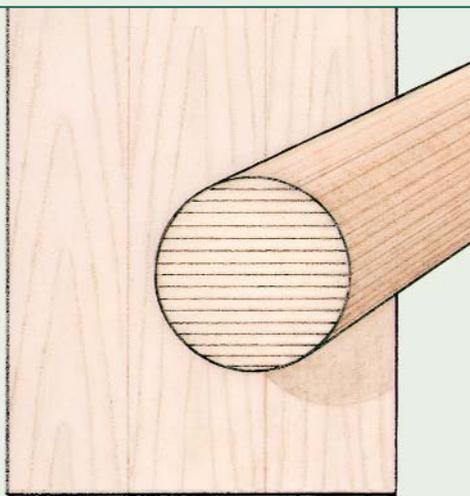
Avoiding the $\frac{3}{4}$ -in. edge thickness is important on the top and bottom as well as on the sides of a cabinet like this. I like the top to be at least 1 in. thick. An even thicker bottom gives a piece a sturdy and substantial feel. In this case I wanted to use applied feet, so the thicker bottom allowed more purchase for the joinery. The core MDF is $\frac{1}{2}$ in. or thicker, and I often glue up the core from thinner MDF plies. For the bottom of this cabinet, I used one $\frac{3}{8}$ -in.-thick ply and one $\frac{1}{4}$ -in.-thick ply to achieve a $\frac{5}{8}$ -in.-thick core, an overall thickness of $1\frac{1}{8}$ in.

Treat the plywood veneers as you would solid wood. Use to your advantage the grain orientation, the position of veneer seams, the book-matches and the runs of veneers from the same flitch. For this cabinet I was able to line up the veneer seams on the sides and top so that the grain appears to run up one side, across the top and down the other side.

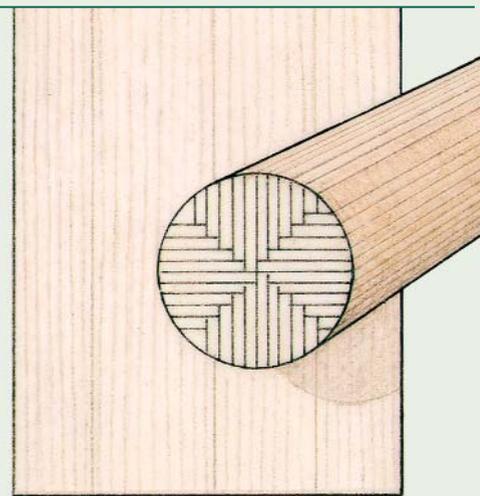
Also essential to the furniture look are the corner posts—in this case 1 in. square. Make the side panels $\frac{7}{8}$ in. thick, leaving a $\frac{1}{8}$ -in. shadow line on the outside and a flush surface on the inside. However, using solid posts with plywood panels creates a potential problem on the inside of the cabinet. Because the post is wider than the panel, a portion of it will be visible from inside, interrupting the smooth look of the maple interior. To correct this I made the back post 1 in. wide but only $\frac{1}{4}$ in. thick and glued it into a shallow rabbet. The edge-banding on the back edge of the side panel completed this faux post (see the detail drawing on p. 70), allow-



Rotary-sliced veneer plywood looks the least like solid lumber. The veneer is peeled off the perimeter of the log, producing a wavy pattern that doesn't exist in solid wood.



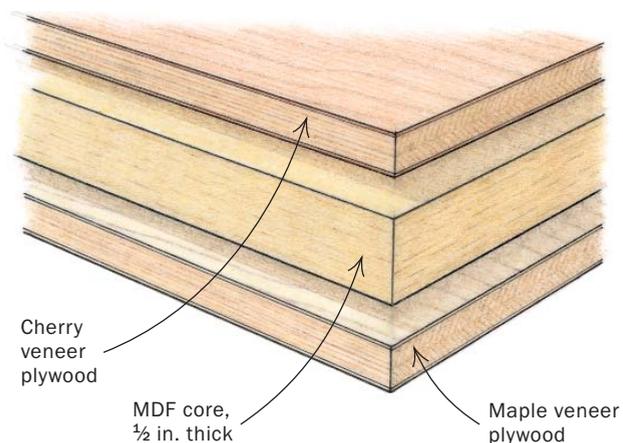
Plain-sliced veneer plywood is a better choice. The veneer is sliced as plainsawn lumber would be, giving the appearance of solid wood. It is often book-matched at its seams.



Quarter-sliced veneer looks like quarter-sawn lumber. Both are sliced parallel to the growth rings. Quartersawn oak plywood with book-matched ray flecks has added appeal.

CREATE CUSTOM PANELS

Build up thicknesses by gluing $\frac{1}{4}$ -in.-thick plywood sheets onto an MDF core. This technique puts the best faces of each sheet on display, allows the use of different species inside and outside the cabinet and creates thicknesses greater than the standard $\frac{3}{4}$ in. This sandwich combines cherry and maple plywoods in a 1-in.-thick panel for the top of the cabinet.



Spread glue evenly. Make a spreader by notching a thin piece of wood or plastic, which will regulate the amount of adhesive left behind. Only one surface needs glue. The pieces of blue tape keep everything in place during clamping.



Clamping cauls apply even pressure. Edmundson's setup includes 4x4 timbers on the bottom of the sandwich and 2x3 cauls on top, which are sprung (tapered) about $\frac{1}{16}$ in. on each end. He adds two sheets of melamine-coated particleboard above and below to help distribute the pressure. A couple of 2x4s below the setup create clearance for the clamp heads.

Selecting sheet goods (continued)



MDF- vs. veneer-core plywood. Veneer core tends to run a little undersized, while MDF core is usually right on.

core plywood tends to run a little under its stated size, usually by a light $\frac{1}{2}$ in., while MDF core is usually dead-on.

I make it a point to talk with a knowledgeable sales clerk and view everything the yard has to offer. You may find a few nice alternatives or surprises.

As you leaf through a stack of plywood, you'll notice that the sheets come in runs, that is, there will be several sheets with veneers from the same log, or flitch. This run might be two or five sheets long. If you ask politely, most places will let you go through the stack to find a run that suits your needs. If you're looking at plain-sliced veneer, it is likely that the veneers will be quite wide. A quarter-sliced stack will

most likely consist of narrower veneers. When considering which type of figure suits your piece, consider also where the veneer joints will end up. This means you need to know your panel dimensions before you head out to the lumber dealer. A best-case scenario for a top panel might be a face-grain panel, where two book-matched veneers are wide enough to cover the entire top, with the seam dead-center.

For the piece in this article, I used the top dimension as a rough guide because the sides were to be a bit narrower (due to the width of the corner post). I was able to line up the book-matched seam on the sides and the top. A second choice would have been to cover the top and the sides in

ing me to dado the back panel directly into the side panel for a seamless interior.

First, make the sandwiches

If your shop is big enough, lay out the sheets so that you can view them all at once. Examine each one and circle with a pencil anything that looks like a defect. Pay special attention to the ends, where the veneer seams are usually the worst. I try to avoid using the last few inches of a sheet. Measure the veneer widths and record any large changes that might fool you later. Determine whether the veneers run parallel to the edges. Most likely they won't, so plan on cutting them parallel before you crosscut.

The next step is to cut the face sheets and the cores. Because you'll be cutting oversized, there's no need to worry about tearout. I typically leave more on the length than on the width because crosscutting small amounts produces the worst tearout.

After you've made your oversized cuts in the sheet goods and cores, they are ready to be glued up. It's not as critical a procedure as it would be with thin veneers; the thickness of the plywood adds stiffness to the glue-up. I use a vacuum bag for clamping the plies, but I've had excellent results with clamps and sprung, or tapered, cauls, too (facing page). Yellow glue is fine as the adhesive.

After the carcass panels have been glued up, cut the sides to size. Wait to trim the top and bottom panels until you've glued the sides to the corner posts and have taken a final measurement.

How to avoid tearout while cutting plywood

Even if your sawblade is sharp, it's difficult to saw commercial plywood without tearout. When veneer is sliced at the mill, it comes

four veneers (two book-matches). When neither of these is possible, I try to find a veneer that will cover the sides with one book-match and hope that a suitable cut will present itself for the top.

Plywood veneers may not be totally consistent in width. It's usually a small variation but something to watch out for nonetheless. In deciding how many sheets I need, I play it safe. An extra sheet gives me more options when it comes to laying out the cuts.

Hardwood plywood is one of the more expensive items at the lumberyard, and most places try to take good care of it, but dings and scratches are still possible. Commercial veneer is paper thin and easy



Ripping cuts tend to be clean, but crosscuts are prone to tearout. Raise the blade well above the sheet and put the most important face up. Then wrap blue tape across the bottom and around the ends.

Clean crosscuts in plywood

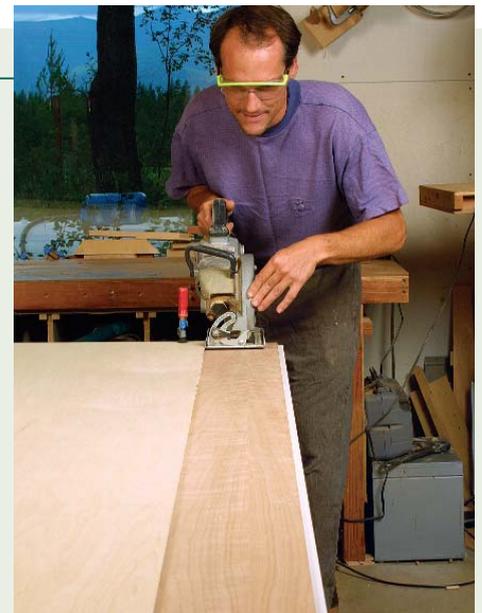


off the blade in a curve. This produces many tiny little splits on one side but leaves the other side smooth. If the veneers are book-matched, every other piece will be reversed and have the checks. These checked areas are especially prone to flaking and tearout on the tablesaw, especially when crosscutting.

Obviously, you want the important side of the panel facing up. However, you'll still find that the checked portions of book-matched veneers can flake off on the top. Raising the blade well above the work minimizes this but greatly increases tearout on the underside. Another problem spot is the end of a crosscut. If the cut isn't backed up, it can blow out. My solution to both problems is to run a strip of blue painter's tape where the kerf will be. Tape both under and on top of the plywood. After the cut, carefully peel away the tape from the sheet at a 90° angle. Of course, whenever

to sand through. A good rule of thumb is if there is a scratch in it now, there will be a scratch in it forever. So I choose pieces carefully and then accept minor dings as character traits. When I have found what I need, I ask for some of the 4x8 sheets of cardboard used for shipping to protect the material for the ride home and when storing it at my shop.

When picking out the interior stock, I'm not as particular. I like to use a light wood like maple. At all of the yards in my area, 3/4-in.-thick maple is available only in rotary-sliced veneer, which means there will be no seams to worry about. Also, I take whichever core is available because small voids won't be noticed on the inside.



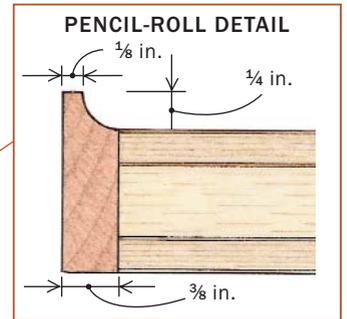
Cutting a plywood sheet. A second sheet of plywood (top) makes a serviceable edge guide for rough-cutting large sheets.

CASE TOP: A LESSON IN EDGE-BANDING

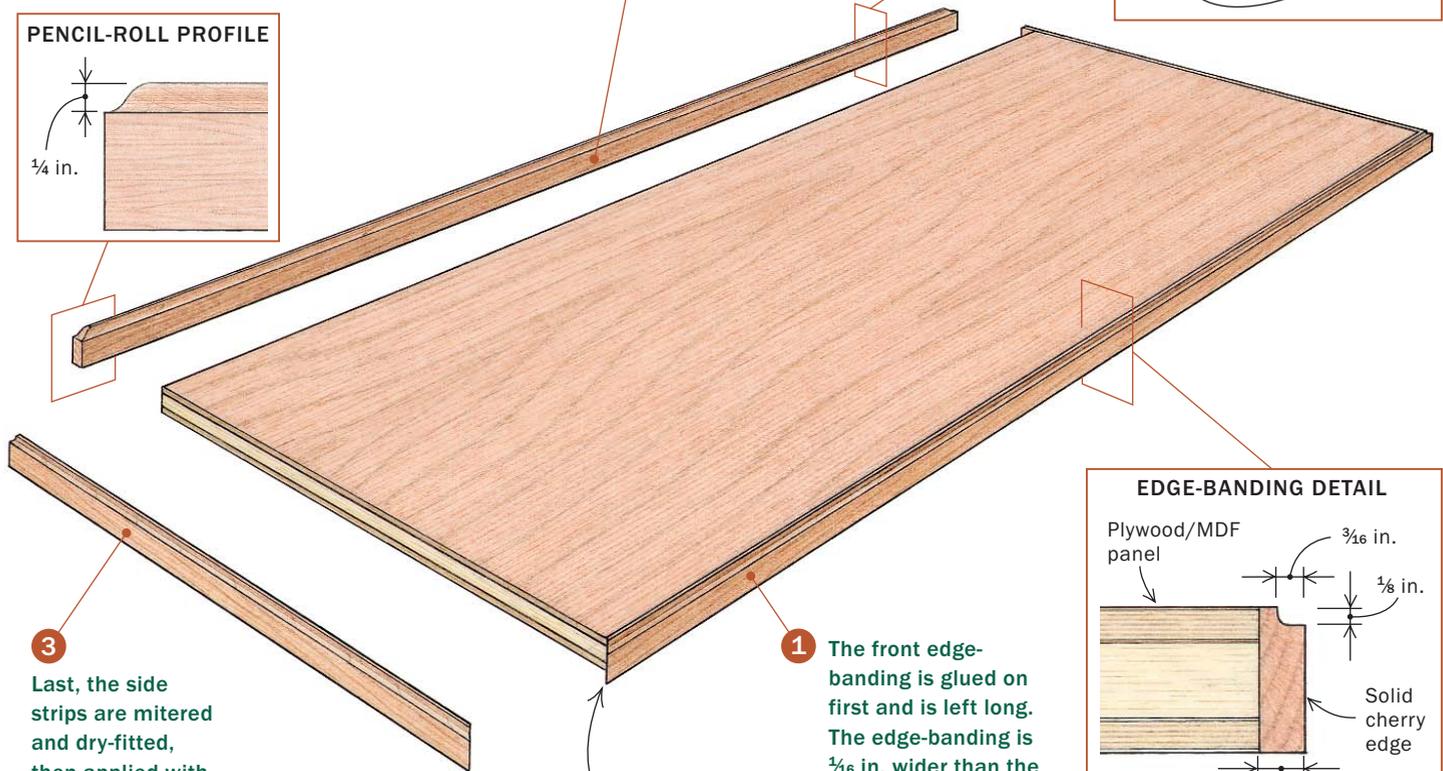
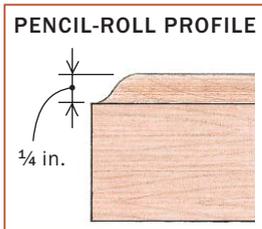
The edge-bandings on the top and bottom are mitered at their front edges for a better-looking corner. But they're not mitered at the back edges, which makes it much easier to apply the side edge-bandings.



Apply edge-banding. Edmundson uses Bessey K-Body clamps to hold everything square, and MDF cauls to distribute the pressure over the $\frac{3}{8}$ -in.-thick banding.



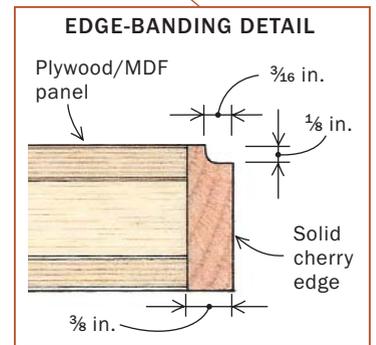
2 Next, the pencil-roll edge goes on the back—left long and then trimmed flush.



3 Last, the side strips are mitered and dry-fitted, then applied with the backs left long and trimmed flush.

Miter is cut after the edge-banding has been glued on.

1 The front edge-banding is glued on first and is left long. The edge-banding is $\frac{1}{16}$ in. wider than the panel thickness.



Plane and scrape the edge-banding flush. Don't go too far with the block plane before switching to a scraper. Use pencil squiggles to avoid the plywood.



Miter the front edge-banding after it has been applied. This sounds counterintuitive, but it's easier to glue a long strip on this large panel when you don't have to line up precut miters perfectly. Lay out the cuts, saw close to the line (left), then clamp on a guide block for the final paring (right). Miter the side edge-banding to fit.



Detail the pencil roll. The side edge-bandings are butted against the pencil roll at the back. Edmundson carves a gentle S-curve on the ends of the roll lip.

possible, make crosscuts first and ripping cuts second to get rid of any blowout at the back edge. It's worth practicing these cutting tips on scrap.

Thin edge-banding won't be noticed

Using the finished sides as a guide, measure and cut the top and bottom panels. After they have been cut to final size, apply the edge-banding. I don't like banding thicker than $\frac{3}{8}$ in.; after that it stands out too much, at least to my eye. I leave it about $\frac{1}{6}$ in. wider than the panel thickness and trim it flush after glue-up.

Attaching mitered edge-banding, especially on long pieces, takes practice and a little luck (see the drawings and photos on the facing page). It's difficult to line up the mitered ends exactly with the corners of the panel. To increase your chances of success, leave the edge-banding long and cut the miters after glue-up. Mark the 45° miter with a pencil and cut slightly proud of the line with a pull saw. Next, use a try square to place a chopping block at the miter angle. You'll get better results from thinner paring cuts, so reposition the block a few times as you approach the line. Practice this technique on the bottom first, where small mistakes will be less obvious.

Before gluing on the side pieces, apply the banding at the back edges of the panels. On the top, apply a pencil roll. This oversized banding features a small cove that protrudes above the top to stop things from rolling off the back. The edge of the cove is flush with the top.

Mill the cove on thicker stock, then rip away the thin strip. Glue it on long just like the front edge. The closer you can get the cove flush to the top, the less work you'll have to do afterward. Use a wet rag to clean up glue squeeze-out; you want to minimize aggressive sanding on the plywood. There is no miter on the pencil roll, so run it long, then cut it flush with the panel edge after the glue has dried. Last, glue on the side strips. These are mitered in front but left long in back and trimmed flush afterward.

Plane and scrape the edge-banding flush—To trim edge-banding flush with the plywood surface, start with a handplane and scraper and finish up with the sander. (Flush-trimming router bits may do a fine job, but I'm a little leery of them.) Caution is the key to success. Don't get too close with the handplane, and be very careful with the sander. Use pencil squiggles along the edge to keep track of how much wood you're removing.

The pencil roll is harder to clean up without going through the thin veneer on the panel. If the glue-up went well, you won't have much to do. A profile sanding block or a curved scraper is a good thing to have. Again, use hash marks to keep track of where you're removing wood and where you're not.

Sand and seal flat surfaces

Before attaching the corner posts, sand and seal the sides. The veneers will be pretty smooth right off the shelf. I usually start with 180 grit on my random-orbit sander, being careful to keep my hand moving continuously over the piece. There will be no warning before you've sanded too much in one spot. Before you know it, you will see the glue-line, and the panel will be ruined. If there is a scratch you think you can lessen, do so very lightly. Cabinet scrapers can be helpful, too, but never make more than a few passes. Do a test on that piece you practiced your crosscuts on to show

Sand and seal the panels



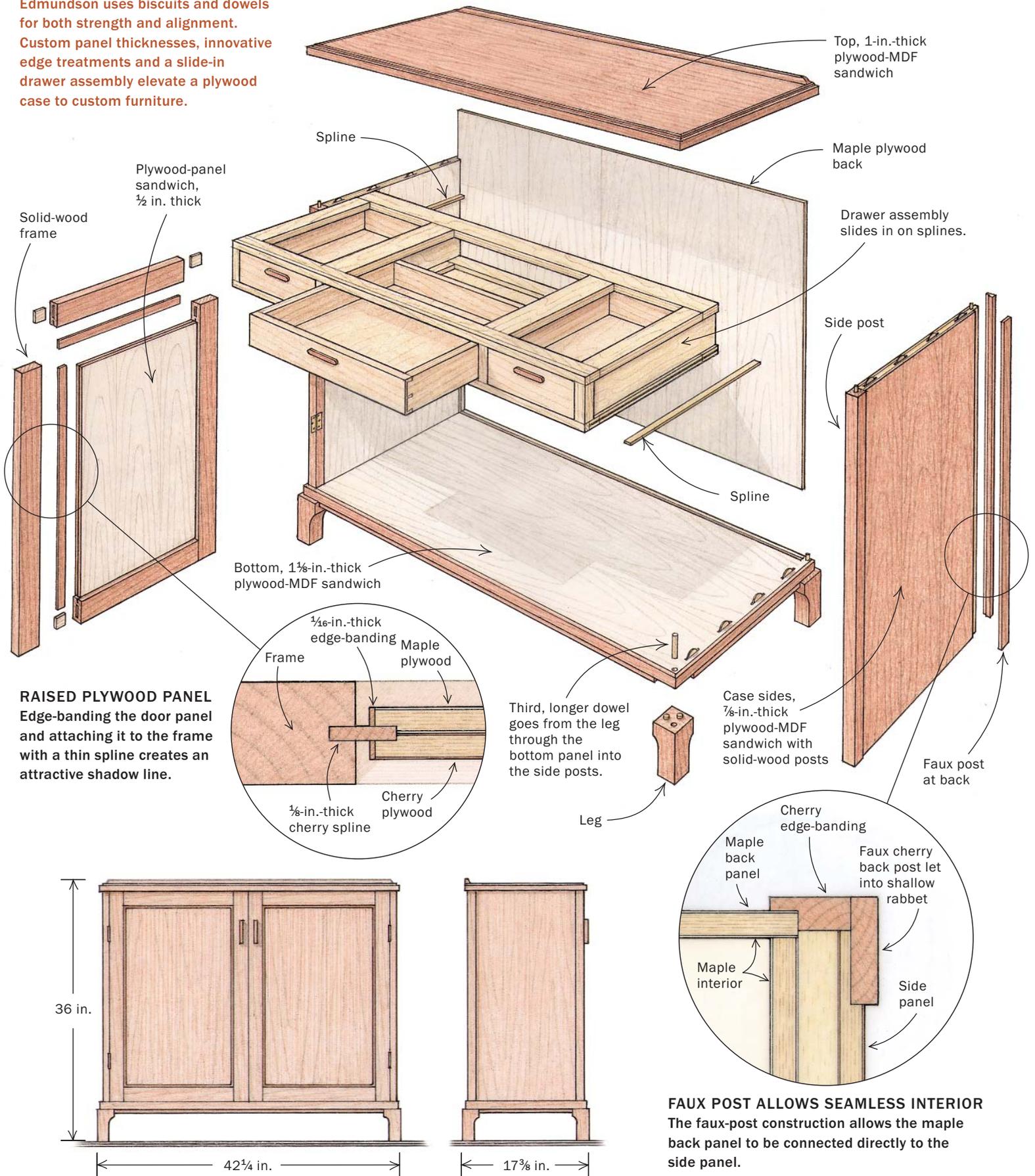
Sand the panels. Before applying an edging that stands proud of the surface, sand the side and top panels. Go easy—it doesn't take long to sand through the thin veneer.



Seal and level the surface with shellac. Pad on a 1-lb. cut of shellac, and then hand-sand with 320 grit. This prepares the thin veneers for a blotch-free oil finish.

ASSEMBLY STRATEGIES FOR PLYWOOD FURNITURE

Edmundson uses biscuits and dowels for both strength and alignment. Custom panel thicknesses, innovative edge treatments and a slide-in drawer assembly elevate a plywood case to custom furniture.



RAISED PLYWOOD PANEL
Edge-banding the door panel and attaching it to the frame with a thin spline creates an attractive shadow line.

Third, longer dowel goes from the leg through the bottom panel into the side posts.

FAUX POST ALLOWS SEAMLESS INTERIOR
The faux-post construction allows the maple back panel to be connected directly to the side panel.



Dowel centers ensure matching holes. Attach the legs to the bottom panel with two short dowels. Then drill a third hole through the bottom panel into the leg to accept a longer dowel that will extend up into the case side.



yourself just how easy it is to burn through the veneer. After you've finished with 180 grit, be careful wiping off the dust. The small checks in the veneer tend to catch cloth fibers. I prefer to use a shop brush or vacuum to clean off the piece. Next, use 220 grit, clean off the dust and then pad on a 1-lb. cut of shellac to fill the veneer. Last, sand with 320 grit using a sanding block. The shellac remains in the tiny checks and leaves a level surface.

Assembly of plywood furniture is straightforward

Glue the front posts to the side panels using a simple butt joint, then apply the faux posts at the back edges and set the panels aside to work on the base.

The legs go on next. They fit into shallow recesses in the bottom panel, positioned for a 1/4-in. reveal. Dowels are necessary to strengthen these applied feet. Use dowel locators to position two shallow pegs in the corners of the foot. Later, a third, longer dowel will be inserted from above, extending through the corners of the bottom panel and deep into the legs.

Cut stopped grooves in the top and bottom panels to accept the thin back panel. After dry-fitting the case sides to the bottom, use the groove in the bottom to line up the corresponding groove in the sides for a seamless fit.

The sides are attached to the bottom and top with biscuits and a dowel at each corner. I like a 1/8-in. reveal between the corner posts and the edges of the top and bottom. The biscuits strengthen the joint and align the pieces side to side. The dowels align the panels from front to back. As I said earlier, the dowels in the bottom corners are longer and extend down through the bottom panel and into the feet.

After assembling the case, you can add a drawer box to the interior, as I did, and adjustable shelves.

Dress up the doors with visible splines

Next, build and hang the doors. The door panels are glued up without an extra MDF core, so they end up 1/2 in. thick. To create a



Attach the top. Like the bottom, the top is located and attached with biscuits and dowels. The biscuits locate the panels side to side, and the dowels lock in the front-to-back alignment.

raised-panel variation, cut the glued panels approximately 3/8 in. smaller than the panel opening in the door. Glue on a 1/16-in.-thick solid edge, then cut a 1/8-in. slot into the panel and the door members. The panel is held in place by visible splines, creating a nice shadow line.

Finish with Sam Maloof's recipe

After sanding and sealing the rest of the piece, apply the finish. I used Sam Maloof's 1:1:1 finish, made up of one part satin polyurethane, one part linseed oil and one part tung oil. For the doors, I used mortised-in butt hinges and handmade handles. For adjustable shelves, I prefer brass pins with milled brass sleeves.

It's a shame not to utilize the wonderful veneers that end up on sheet goods. While the terms "commercial plywood" and "fine furniture" form an uncomfortable union for some purists, a little innovation yields a piece that truly feels custom. The key is using the strengths of commercial plywood to overcome its weaknesses. □

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