

User's Guide to Plywood

For furniture makers, sheet goods offer strength, stability, and good looks

BY ROLAND JOHNSON

As much as I enjoy building furniture out of solid wood, there are times when it is not the best choice of material. When I make built-in cabinets or large tabletops, I turn to plywood. Its sandwich structure of thin veneer layers, with the grain oriented at right angles, makes plywood flat and stable. When faced with a high-grade hardwood veneer, plywood looks good and saves time and money.

Plywood also is structurally stronger than natural wood and has excellent screw-holding capabilities. It is also ideal for door panels, frame panels, drawer bottoms, and cabinet backs. As a shop resource, plywood makes strong and stable jigs and

fixtures that are inexpensive to build and easy to modify.

How plywood is graded

The best way to buy plywood is to select sheets individually from a dealer with a good inventory. If that is not possible, it helps to know what to ask for.

If you're ordering plywood sight unseen from a distributor, you'll want to specify several things, including the quality of the veneer on the sheet's face and back (the face is generally better looking) and the composition and quality of the plywood's inner core.

The Hardwood Plywood and Veneer Association (HPVA; www.hpva.org) sets standards for grading hardwood-veneer plywood based on how free the surfaces are of defects such as knots, patches, and

BALTIC BIRCH

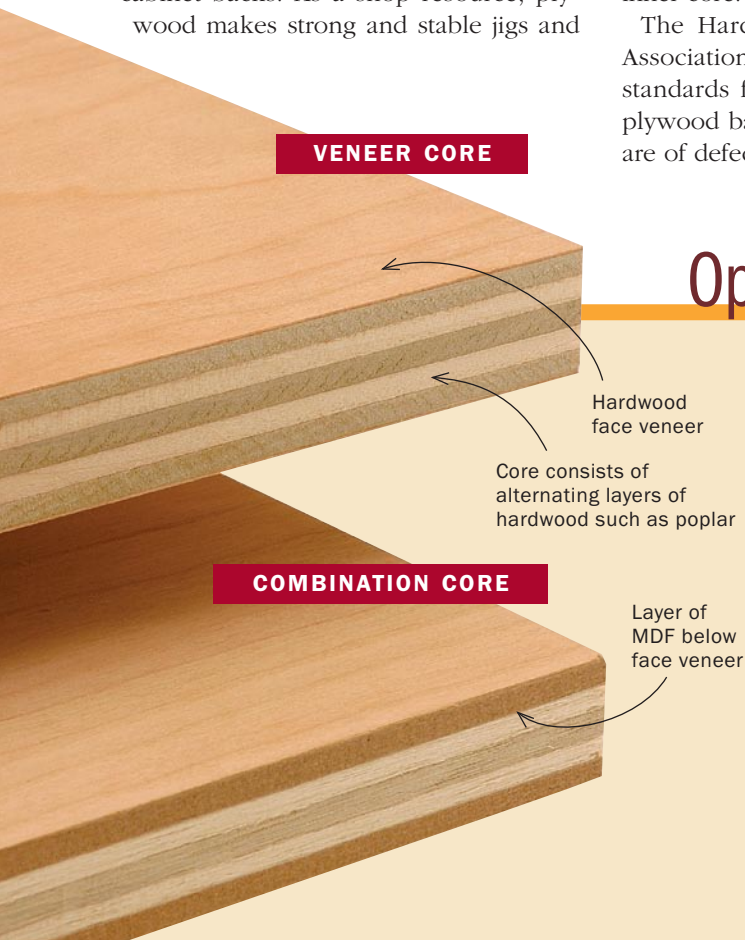
Numerous layers of birch, alder, or both yield exceptional stability, strength, and density. Baltic birch is especially suited for building drawers. Check sheet sizes before ordering; several manufacturers produce only 5x5 sheets. Similar products are known as ApplePly, Europly, Russian, or Polish birch.

color variations. Grades for face veneer begin with AA for the best quality and run down to grade E, which can include unlimited color variations and patches. The back veneer is number graded, with grade 1 being the best and grade 4 allowing knotholes, splits, and other defects.

You also should select plywood with a core that's as uniform and free of voids as possible. In the HPVA grading system, J signifies the best core material with no voids in the plies. Cores step down in quality to grade M.

This system occasionally changes, and other types of plywoods, such as Baltic birch, or ApplePly, use their own grading systems. When in doubt, ask your distributor how the product is graded.

When I order plywood, I prefer to let the lumber dealer determine the correct grade



VENEER CORE

Hardwood face veneer

Core consists of alternating layers of hardwood such as poplar

COMBINATION CORE

Layer of MDF below face veneer

Options for hardwood-veneer plywood

Furniture makers are most likely to use plywood made with a hardwood face veneer. Domestic hardwoods are the most readily available as face veneers, although exotic species may be special ordered.

VENEER-CORE PLYWOOD stays flat, holds a screw well, and is reasonably lightweight. This material is ideal for building cabinet cases. Panels, partitions, and cabinet floors can be cut to size quickly and assembled into strong, light boxes. Veneer-core plywood also can be used to make cabinet tops and tabletops, but they'll need solid-wood edging and a durable finish to protect the thin face layer.

COMBINATION-CORE PLYWOOD has an MDF layer between the inner plies and the hardwood face veneer, which eliminates voids and ensures that grain from underneath won't cause imperfections in the top layer. Combination core can be used anywhere veneer core is used. It's not much heavier than veneer core, with similar screw-holding ability and less tearout when sawing.



BENDING PLYWOOD



MEDIUM-DENSITY OVERLAY (MDO)

MDO combines a veneer core with a top layer of kraft paper impregnated with waterproof glue. This provides a flat, smooth surface favored by outdoor sign makers; it is absolutely waterproof. MDO is great for furniture panels that will be painted or that don't require the look of wood grain. It is ideal for painted outdoor furniture.

for my application. I tell him what I need, such as cherry veneer-core plywood with plain-sliced veneer, both sides good. Most likely the product will be A1, VC (veneer core) Cherry PS (plainsawn), but that may be simply how my sheet-goods distributor has it set up in the inventory system.

Tips on cutting big sheets safely and without tearout

Plywood sheets are awkward and heavy. It's always a good idea to work with a helper while making your first cuts in a full sheet. If help is not available, set up sawhorses with height extensions, movable workbenches, or whatever it takes to support the sheet both before and after the cut.

The worst kickback I have experienced occurred when I tried to rip an edge off a half sheet of plywood without adequate support. The tablesaw sent the half sheet

and me flying to the shop floor with damage to both me and the plywood. The floor survived intact.

For ripping or crosscutting plywood cleanly, use a triple-chip blade with a high tooth count (80 teeth on a 10-in. blade is not uncommon). Be aware of the rotation of the blade and the good veneer face of the plywood. When cutting on a table-saw, the good veneer should face up; with a circular saw, the good veneer should face down.

For especially delicate face veneers that are prone to tearout when crosscutting, I sometimes scribe the face veneer with a sharp utility knife before cutting. This procedure is very fussy, and absolute accuracy is a must, but it does work.

A handheld circular saw will quickly reduce full sheets of plywood into more manageable sizes. If possible, cut the pieces about $\frac{1}{8}$ in. to $\frac{1}{4}$ in. oversize and

Bending plywood can conform to a tight radius without splitting because the grain in all of the veneer layers runs in the same direction. This material is indispensable for making curved doors and panels. Once laminated or veneered (a vacuum bag is best), it will hold the intended shape. Thicknesses range from $\frac{1}{8}$ in. to $\frac{3}{8}$ in., and species include poplar, birch, okume, and lauau. It comes in 4x8 sheets with grain running either the length or width of the sheet.



Elegance in sheet goods. The back and door panels of this cherry cabinet were made from $\frac{1}{2}$ -in.-thick veneer-core plywood with a book-matched face.

Veneer can be taken off the log in several different ways, and each method yields its own distinctive look. The most common types of face veneer are rotary cut; plain, or flat sliced; and rift cut. There are also several methods for matching the veneer on a panel face: book matching, slip matching, and random matching.

CHOOSE FACE VENEERS BY CUT AND MATCH

BOOK MATCHING is accomplished by turning over every other sheet of veneer for a face that resembles the opened pages of a book, with opposite patterns identical.

SLIP MATCHING uses progressive veneer sheets joined side by side, with the same sides facing up. Book matching accentuates the grain, while slip matching tends to appear uniform, more like solid wood.

RANDOM MATCHING is as it sounds. Sheets are randomly assembled, with the chance of veneer from several logs on one face. This method can lend a very real laminated look, but it also can lead to multiple color and grain patterns in one face.

Building strong cabinets

CUTTING IT DOWN TO SIZE

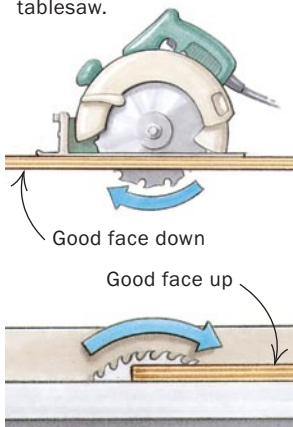


Ripping. Large sheets can be ripped safely on the table saw, but make sure you have plenty of room on the out-feed table.

Crosscutting. For longer pieces, use a circular saw with an edge guide clamped to the stock (right). Shorter stock can be cut on the table saw with a crosscut sled (below right).

WHICH SIDE UP?

To minimize tearout, orient the show face down when cutting with a circular saw and up when cutting with a table saw.



make the finish cuts on a table saw. I use a straightedge clamp (Tru-Grip) as a guide for the saw.

On the table saw, a zero-clearance throat plate will help control tearout, at least when the plate is new and the clearance is still close. If you have a large production run that justifies the expense, you might consider a scoring-blade attachment (a small-diameter blade that rotates opposite the main blade and precedes it during the cut) that helps minimize crosscut tearout. Modulus makes an attachment that fits most cabinet and contractor-style saws (Modulus SS-100, available from Woodworker's Supply for around \$450).

Best joints for plywood

Because plywood does not have continuous grain orientation throughout its thickness, it does not lend itself to all of the same construction techniques as solid wood. Plywood faces can be glued together with good results, but edge-to-edge or edge-to-face joinery must be mechanically or structurally secured.

For joining two edges or an edge to a face, biscuits provide moderate strength. However, because the joint is shallow, it can be pried apart by leverage (heavy books in the midspan of a biscuited shelf, for instance).

Dadoes add great strength in edge-to-face joints, so they are especially effective for use in shelving or cabinet partitions.

Butted corners and edge-to-face joinery without a dado or biscuits need to be mechanically fastened with screws or nails to provide a secure joint.

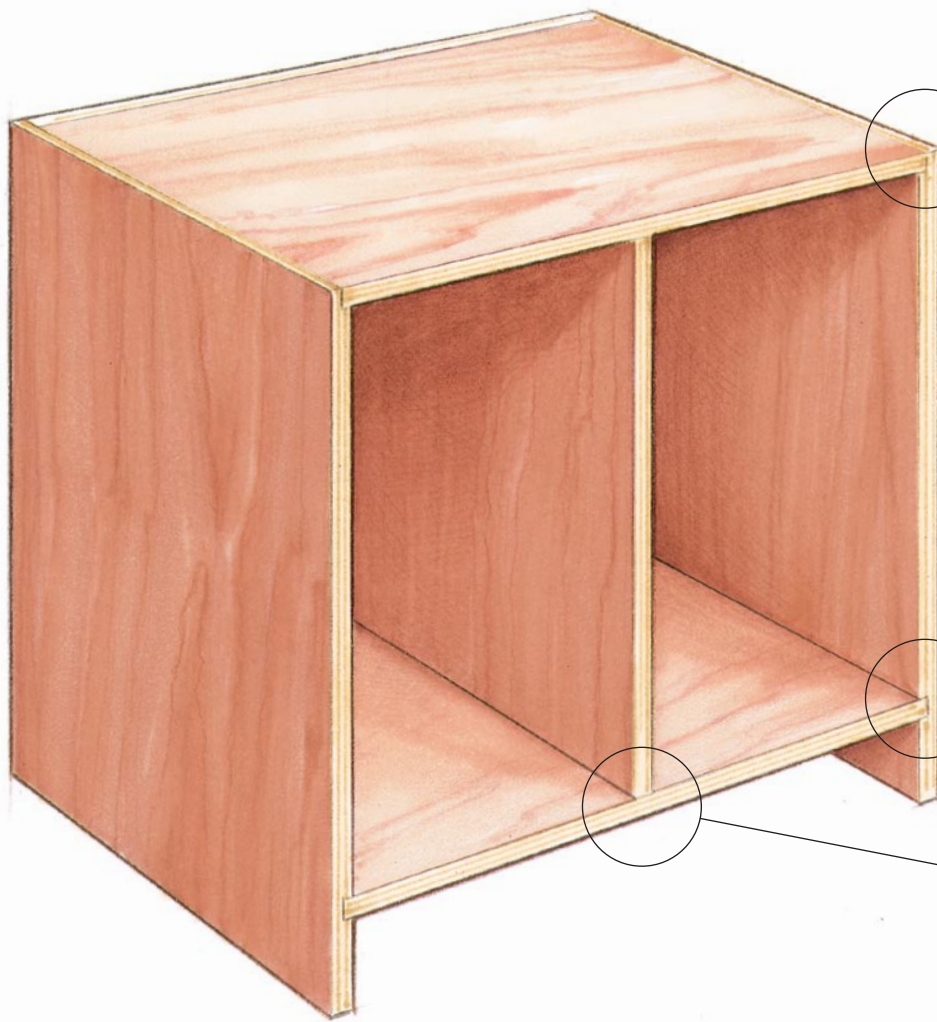
Half-lap or rabbet joints work reasonably well as long as there is not great twisting pressure applied to the joint, which could cause splits to develop in one or more of the cut veneer layers. This joint has good shear strength, meaning it won't tend to fail when loaded heavily at the point where the two pieces meet.

Edging hides the ugly layer lines

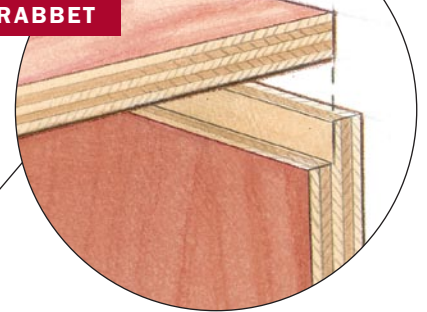
Because of the layered core, the edge of a sheet of plywood is not particularly attractive. Fortunately, there are several ways to conceal it. Cabinets typically are

JOINERY FOR PLYWOOD

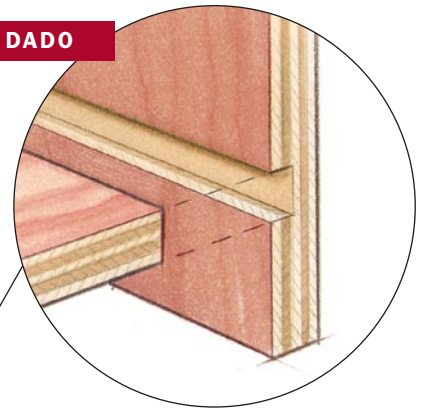
Plywood cases can be assembled using a variety of joinery techniques, including rabbets, dados, and biscuits. A rabbet joint's structure makes a stronger corner than a simple butt joint. Dados provide great strength in edge-to-face joinery. Biscuits work well for edge-to-edge or edge-to-face joints. They aren't as strong as dados or rabbets, but they're useful for keeping adjoining surfaces properly aligned.



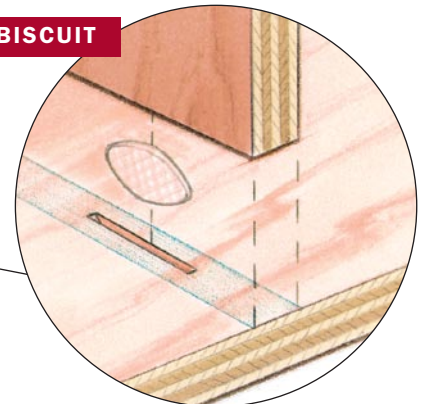
RABBET



DADO



BISCUIT



Cutting accurate dados

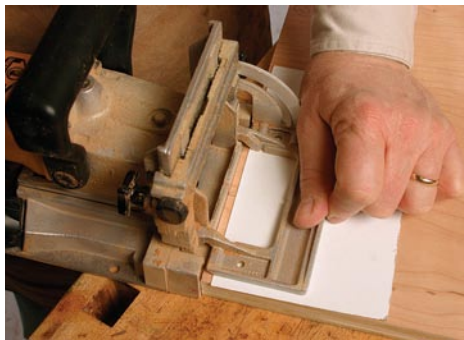
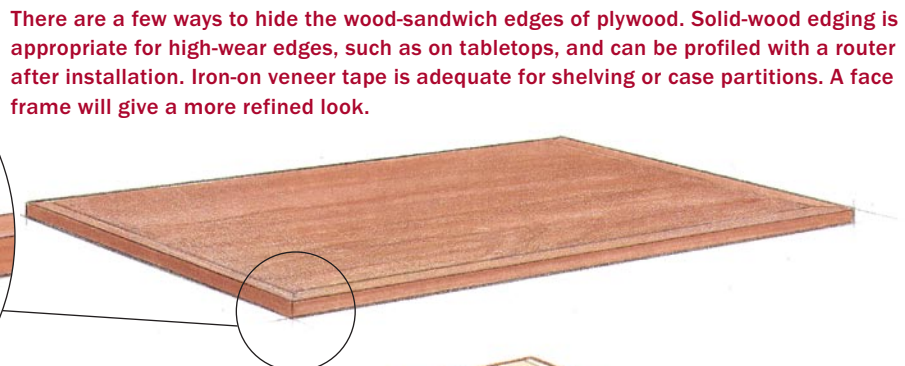
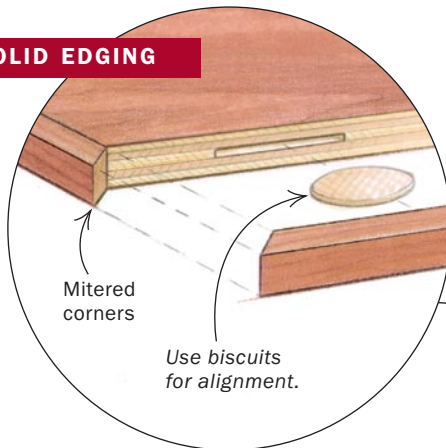
Plywood rarely measures up to its stated thickness, so standard dado-head widths can yield sloppy joints. For a snug dado, start by gauging the thickness of the shelf or partition. Then install enough chippers to get close to this mark, and use shims to fine-tune the width of the dado. Another option is to cut dados with a router, using a straight bit sized specifically for plywood. A number of manufacturers offer undersize bits to accommodate common plywood widths.



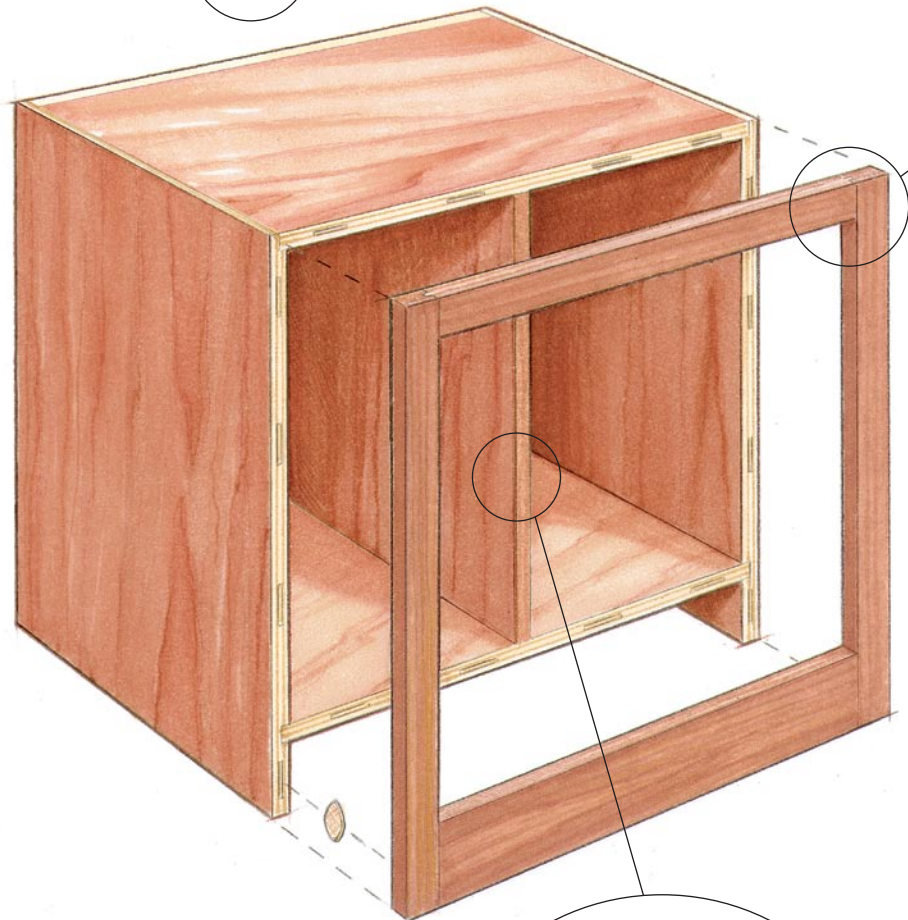
Shim for a perfect fit. Because plywood is often narrower than its stated size, shims are needed to create a dado of the correct width.

Hiding unattractive edges

SOLID EDGING



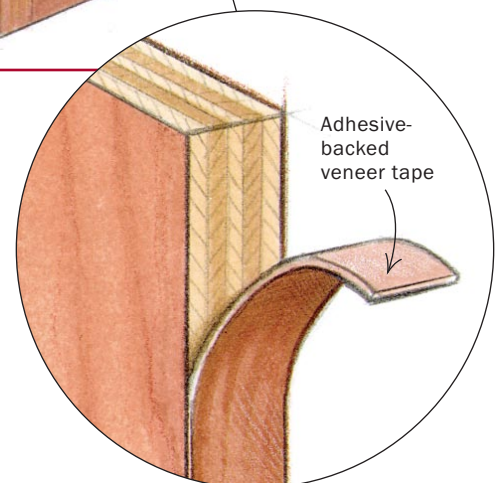
Biscuits align solid edging. Use card stock as a shim when slotting the plywood (above), but not on the edging. Milled slightly thicker, the edging will stand proud of the top. Plane each edge flush before gluing (right).



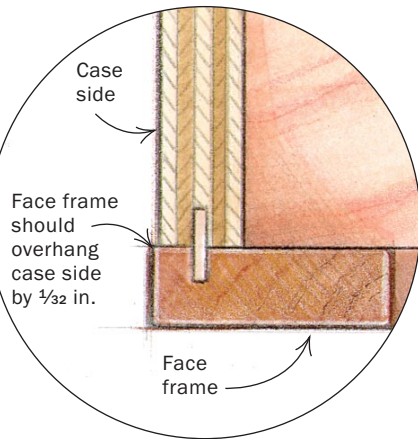
IRON-ON VENEER



Iron-on veneer edge-banding. The material may be bonded with the use of a household iron. Trim the edges flush with a handplane or specialty trimmer.



FACE FRAME



covered with face frames. Solid or veneer edge-banding usually is applied to shelves or tabletops.

Edge-banding with a heat-sensitive glue back can be purchased in most domestic and some exotic woods. Shopmade solid edge-banding usually is attached to plywood with yellow glue (aliphatic resin). When using thick edge-banding, apply glue to both the banding and the plywood because the end grain readily absorbs glue.

Edge-banding typically is wider than the plywood is thick, so it must be trimmed flush to the plywood's edge. Sounds easy enough, but the process is always a nail-biting experience because of the fear of damaging the plywood. Most often, I trim the edge-banding flush with a well-tuned block plane, working from the sheet out across the banding. With a little practice, it's relatively easy to trim the edge perfectly flush without gouging the face veneer. A router with a flush-trimming bit will work fine, but it's often not as handy to use as a block plane.

A clean surface is an important starting point if the cut edge will be banded. The edge of a sheet of plywood is often damaged or dirty. Try to cut away these damaged edges as you're cutting the plywood to size. Start by ripping a little wider than needed, and then trim the edges for a final cut.

I used to use a belt sander to level edge-banding with the plywood, a risky proce-



Build the face frame oversize.

To create an even overhang on each side, use a card-stock shim when biscuiting the case (above left). Glue and clamp the face frame to the case (above right). Use a block plane to bring the face frame flush with the case side (left).

dure because it's easy to ruin the plywood face with this aggressive machine. My technique was simple. I scribbled on the plywood with a graphite pencil, making lines that came up to the back edge of the banding and extended 5 in. or 6 in. into the plywood. These reference lines let me know whether the belt sander was staying flat or tipping into the plywood, and saved me lots of veneer sand-through.

Sand with care

Generally speaking, I'd stay away from sanding plywood with a belt sander. If

you're not careful, you could sand through the face before you know it. On the edges, the sander can tip over easily and erase the thin veneer there. I use a random-orbit sander instead.

Always follow the grits in order, and don't skip any. Start with P120 grit to clean up marks and small dings, work quickly up to P150, and finish with P180.

Sand with relatively slow, even strokes. Swirl marks are hard to remove from the thin veneer without doing damage. □

Roland Johnson is a contributing editor.