

Building Cabinets On Site

During the 13 years I was an active builder and remodeler in northern Pennsylvania, my company did a lot of jobs

by Joe Stoddard

that required custom cabinetry. Crooked

old farmhouses, tight project budgets, and long lead times often made using factory cabinets impractical, so we came up with a way to build quality cabinets and other casework on site using common tools and rookie carpenters. We used the same techniques to build everything from kitchen cabinets to built-in shelf units and even freestanding furniture pieces. By building the basic carcasses on site, then ordering the drawers and doors from a local shop, we were able to cut both costs and lead times, as well as gain flexibility for odd-ball sizes and configurations that factory cabinets can't provide.

For the price of lumberyard-grade cabinets, we produced something special for our clients: Instead of crumbly vinyl-coated chipboard sides and shelves, we gave our clients solid plywood shelves with hardwood fronts, solid hardwood toe-kicks, and other features that say "quality." In my own kitchen, I built the equivalent of \$6,000 worth of high-end stock cabinets for around \$2,500.

Hand-Picked Materials

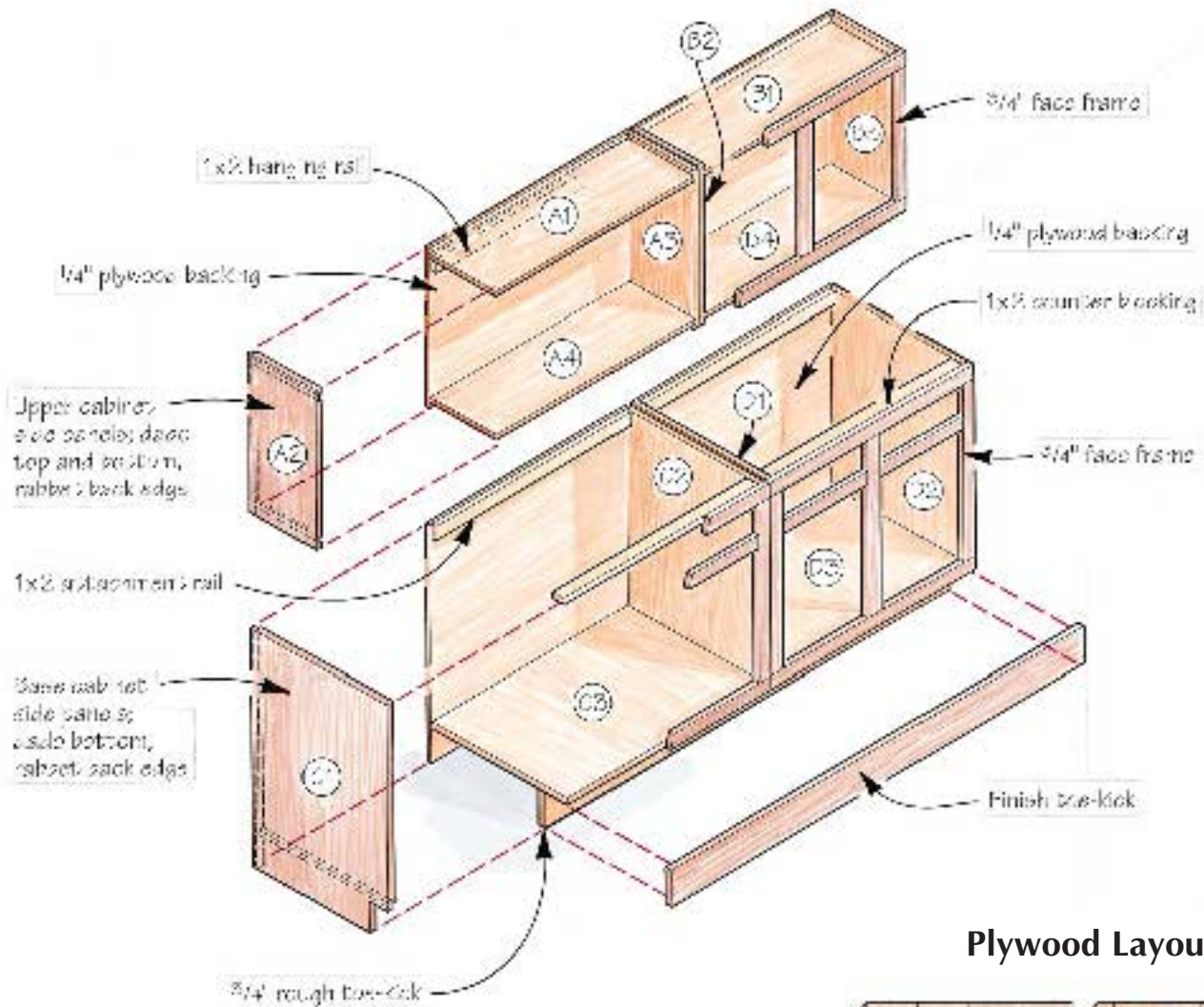
Getting good-quality solid-sawn stock will go a long way toward making the cabinets go together more easily. We buy S4S (surfaced 4 sides) hardwood or softwood for the face frames and toe-kicks, carefully selecting straight, blemish-free pieces. To avoid alignment problems, it's important that all of the wood is the same thickness. We either have the lumberyard run everything through its planer for us, or we resurface

You don't need fancy equipment to build professional cabinets



The author uses a "shooting board" and a circular saw to cut plywood on site. Scoring the cut line with a utility knife before cutting helps prevent tearout.

Typical Cabinet Construction



Plywood Layout

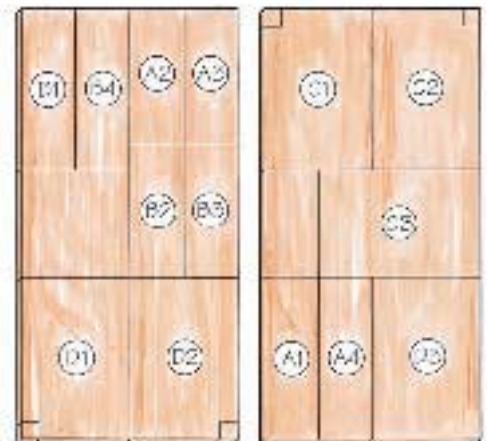


Figure 1. The author assembles the plywood carcasses first, then measures for the face frames. To make most efficient use of the plywood, he first lays out the cabinet parts on graph paper, then transfers the cut list to the plywood (right).

it all on site with a portable planer.

Cabinet sides, tops, and bottoms are made from $\frac{3}{4}$ -inch cabinet-grade plywood; backs, from $\frac{1}{4}$ -inch plywood. We use matching veneer plywood anywhere it shows, and standard birch and lauan where it won't.

Work area. I stack the plywood on two sawhorses across which I've laid some 8-foot 2x4s to form a sturdy table. Because all the cutting is done from the back side of the plywood, I stack it good-side down, being careful not to

damage the finish surface as I move the sheets around. I place four more straight 2x4s under the top sheet to support the sheet and prevent pieces from falling away while I'm cutting.

Boxes First

No matter how careful you are, the dimensions of cabinet parts cut on site will wander a bit. To reduce the chance of mismatches, I always start by building the plywood boxes, then fit the face frames to the assembled carcasses. I like

to cut all the plywood in one session, so my first step is to lay out all the parts on the plywood sheet stock.

Using graph paper, I work up scale drawings of a layout scheme beforehand that will make the best use of each sheet of plywood (see Figure 1). These drawings tell me how many sheets of plywood to order and also make quick work of parts layout when it's time to start making cuts.

Cutting guides. To keep the system simple, I use "shooting boards" to make straight cuts with a circular saw and router (see photo). The shooting boards allow me to work right on the sawhorses instead of wrestling big sheets onto a table saw. These cutting guides don't need to be fancy, but they do need to be straight.

My shooting boards are simple jigs made from rips taken out of a sheet of $\frac{1}{2}$ -inch lauan plywood. I glue a 2-inch strip on top of a 10-inch strip, holding it about 6 inches from the edge. After the glue dries, I move the saw or router base against the 2-inch strip and rip the shooting board to width.

Since the shooting boards leave no doubt where the saw kerf will fall, they reduce the chance of a cutting error. Layout marks are placed on the waste side of the cut, and the shooting board is clamped in place so the cut line just meets the lead edge of the shooting board.

Rips and crosscuts. I make rip cuts first, followed by crosscuts. Whenever possible, I lay out the parts by measuring from the plywood's factory edge (this helps keep the parts straight and square). To prevent tearout, I always score crosscuts with my utility knife. I cut out all the plywood panels, label them, and double-check dimensions by clamping matching pieces together. I try for a plus-or-minus $\frac{1}{16}$ -inch tolerance on all the plywood parts.

Dadoes and rabbets. To build a rugged plywood box, I cut dadoes in the side pieces to receive base cabinet bottoms and upper cabinet tops, and I also rout a rabbet in the back edges of the cabinet to receive the $\frac{1}{4}$ -inch plywood backs. These techniques not

Figure 2. Dadoes cut with a router receive cabinet bottoms (and tops on upper cabinets), while a $\frac{1}{4}$ -inch-deep rabbet accepts the plywood back panel.



Figure 3. Rather than drag a jointer to the job site, the author uses a low-angle block plane to joint face frame stock. Clamping a guide block on the base of the plane ensures square edges.



only make a stronger cabinet, but also help maintain proper alignment during assembly.

I use a 3/4-inch rabbeting bit in my router, and make these cuts using a shooting board as a guide. For wall cabinet sides, I clamp the matching pieces end to end and cut the dados in both pieces at the same time (Figure 2). When I route the dados, I make sure to leave 3/8-inch of material.

Assembling the Boxes

After all the routing is finished, I cut out the corners to accommodate the toekicks, starting the cuts with the circular saw and finishing with a hand-saw. Before starting assembly, I make sure I have the pine hanging rails, sub-toekicks, and other parts I need cut to rough length. I use either pine or culled face-frame stock for these parts.

I use a trim nailer and 4d nails to assemble the boxes. To stay on track, I lightly mark the nail line using a framing square. The boxes can be hand-nailed, but I'd recommend drilling pilot holes. I also apply a liberal coat of carpenter's glue at all the joints before assembling.

Starting with the base cabinets, I glue and nail the sides to the bottom, being careful to keep the front faces flush. Next, I install any partitions, then square everything up by fastening the 1/4-inch plywood back. I use pipe clamps for a "third hand" as I assemble the cabinet, checking for squareness by comparing diagonal corner measurements. After the back is fastened in place, I install the hanging rails, sub-toekicks, and countertop brackets.

Face Frames

After all the boxes are assembled, I prepare the solid stock for the cabinet face frames. First, I chop the material to rough length using a power miter saw, then I rip the pieces to width on an 8-inch portable table saw. Most rails and stiles are 1 1/2 inches wide, and center stiles and scribe wings are generally 3 inches wide. Rather than drag a jointer to the job site, I use a sharp low-angle block plane to joint the edges of the face

frame material. To keep the edges square, I clamp a guide block to the side of the block plane (Figure 3).

After all the pieces are ripped and planed, I organize them into groups of identical finish lengths, and "gang" chop them in the miter saw. This ensures that they will all be the same length. I typically build my face frames 1/2 inch wider than the cabinet box to provide a 1/4-inch reveal on both sides of the cabinet. The reveal will absorb slight inaccuracies in the box size and allow adjoining



Figure 4. Using a framing square to align the parts, the author glues and screws the face frames together on a flat sheet of plywood.

face frames to be drawn tightly together during cabinet installation.

Simple joinery. I developed my method with simplicity in mind. Whenever possible, I avoid the use of biscuits, dowels, or special joinery. With few exceptions, all face frame parts are fastened together using butt joints, dry-wall screws, and carpenter's glue. I assemble the face frames on a sheet of plywood, then fasten the finished frames to the plywood boxes. I start by gluing and clamping one rail and stile on the corner of the plywood benchtop, and fasten the joint with two drywall screws (Figure 4).

Using a countersink bit, I drill pilot holes completely through the edge grain of the stile, stopping when I reach the end grain of the rails. I use Fuller bits (W.L. Fuller Inc., P.O. Box 8767, Warwick, RI 02888; 401/467-2900) because they're inexpensive, accept standard twist drills, and can be quickly sharpened with a flat file.

I pull the joint tight with a pair of 2-inch screws. Following the same procedure, I assemble the remaining three corners. When the outside frame is completed, I assemble any inner rails or stiles. If the edge of a face frame will be exposed after the cabinets are installed, I countersink the face frame screws 3/8 inch and insert matching wooden plugs.

Occasionally, a face frame configuration will include a cross joint that has no exposed edge to run screws into — for

example, a 36-inch base cabinet with two doors and two drawers. In these situations, I cut a simple half-lap joint using my portable table saw and miter gauge or my circular saw and a tightly held speed square. I cut the outside edges of the half-lap, and then nibble out the center with multiple passes, finally cleaning up the joint with a sharp chisel. Paper shims and glue can sometimes be used to build up an over-cut half-lap joint.

Sanding. I sand the assembled face frames with a variable-speed random orbit sander (Figure 5). Since the random orbit action leaves few swirl marks, I can sand the frames as flush as possible using 80-grit paper, then fill any gaps or cracks with Zar quick setting latex wood filler (United Gilsonite Laboratories, P.O. Box 70, Scranton, PA 18501; 717/344-1202). Before the filler sets, I sand the entire frame twice, starting with 100-grit paper and finishing with 120 grit. The sanding dust will be packed into the still-wet wood filler,

Figure 5. Joints are sanded flush with a random orbit sander and 80-grit paper. After any filler is applied, frames are sanded twice more, with 100- and 120-grit paper.



Figure 6. Face frames are glued to the plywood boxes, then pinned in place with finish nails while the glue sets.



which will then take stain in the same manner as the rest of the frame.

Finishing. If the cabinets require stain, I use a lint-free cotton rag and apply stain to all the surfaces that will be exposed after the cabinets are assembled. After the stain is dry and before attaching the frames to the boxes, I coat the inside of all the boxes with a clear water-base urethane. I'm careful not to get any urethane finish on the plywood edges of the box where the face frames will be glued. I wait until the face frames

are attached before applying two coats of water-base urethane to the frames and outside of the boxes.


Interior hardware. I install shelf standards, drawer slides, and other hardware after the boxes are finished, but before attaching the face frames. I prefer to use surface-mounted adjustable metal shelf standards for base and upper cabinets. These standards are much easier to deal with than the hundreds of holes that must be drilled for individual shelf clips.

Attaching face frames. I glue and face-

nail the face frames to the cabinet boxes (Figure 6). To get the best bond possible, I butter the exposed plywood edge with one coat of glue, apply a coat to the face frame, and then double back and apply a second coat to the edge of the plywood. I apply two coats of glue to the plywood because the absorptive edges draw the first coat below the surface.

I use brown carpenter's glue (Borden, Inc., 180 E. Broad St., Columbus, OH 43215; 614-225-4000) for dark-stained cabinets and yellow carpenter's glue for lighter finishes. A compatible glue color is much more forgiving of accidental overruns. To clamp the face frame in place while the glue sets, I face-nail the frame to the box. A pneumatic finish nailer speeds the nailing process, but it's not essential. If I'm not using a nail gun, I predrill all the nail holes, and use 4d finish nails to attach the frames. Face-nailing may not be the most elegant method of attachment, but careful filling of the nail holes will make the fastener locations nearly invisible. When attaching the frames, I make sure the side reveals stay even and the tops stay flush. I hold a piece of 1/4-inch scrap material on the side of the cabinet to check the side reveals. This leaves a 1/2-inch overhang toward the inside, which hides any irregularities in the box.

Doors and drawers. It doesn't make sense to try and build cabinet doors and drawers on site, so I sub this portion of the job out to a local woodworking shop. When lead times permit, I wait until I've built the cabinets, and then order the doors and drawers. On larger projects, there is usually plenty of work to keep the crew occupied while the doors and drawers are being made.

Installation. I install the cabinets the same way I would any standard set of cabinets, using 2-inch screws to fasten adjoining units, and 3-inch screws and finishing washers to attach the base and upper cabinets to the wall. I install the 3/4-inch continuous toekick material after all the base cabinets are in place. 

Joe Stoddard is a Certified Professional Building Designer and former home builder in Elkland, Pa.