

This is an excerpt from the book

Chests of Drawers

by Bill Hylton

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DRAWER-BUILDING BASICS

DRAWERS ARE OBVIOUSLY central to a chest of drawers. Each is essentially an open-topped storage container. Just a box. Function doesn't require a drawer to be fancy or complicated. Typically, we make them of a secondary wood, with just the front made to match (or complement) the chest itself. But we want them to be sturdy and tight, probably not too heavy, and easy to open and close.

If you are a furniture maker, you want a drawer to be something you can construct quickly without sacrificing strength and durability or appearance. This is a bigger challenge than it might appear.

A drawer arguably receives more punishment than any other furniture component. You jerk it open. You slam it shut. Open. *Bang!* Shut. Open. *Bang!* Shut.

A strong, long-lasting drawer needs not only good joinery but also good support in the chest and a way to guide its movement. If it sticks in the case and you need to yank on it to get it to move, you put extra stress on the drawer's joints between the front and the sides. (And you stress the chest itself, too.) Then if you have to throw a hip against it to close it, you are once again stressing the drawer *and* chest.

Traditionally, drawers are constructed and fitted with a lot of handwork. But time is dear, and many a contemporary woodworker favors machine-cut joinery and easy fits. There is, it turns out, no one way to build a drawer.

PARTS OF A DRAWER

Every drawer has the same basic parts: front, back, sides, and bottom. But these parts can be assembled in a variety of ways to produce different types of drawers. Curiously, it's not so much the way the drawer is constructed as how the front of it relates to the case that gives the drawer type its name.

The front

The *flush drawer* is easily the most common type. The front of the drawer is recessed within the case so its face is flush with the case facade. To look right, with an even gap all around, the drawer has to *be* right. Moreover, in a chest of drawers, each drawer has to match its neighbors. All need to be flush, all need the same visual clearance around the edges. This makes it the least forgiving type of drawer to the craftsman. The flush drawer is used in the Contemporary Chest (p. 62), the Bow-Front Chest (p. 88), and the Triple Dresser (p. 138).

The *lipped drawer* has a rabbet cut on three edges and sometimes on all four. More often than not, the lip is profiled with a bead. The front nestles partway into the case, and the lip covers the gap between the drawer front and the case. This has the practical benefit of covering up a loose fit. Both the Queen Anne Chest on Frame (p. 166) and the Tall Chest (p. 188) have lipped drawers.



The flush drawer has a front that nestles into the chest, with its face flush with the edges of the chest sides and the drawer dividers.

The lipped drawer has rabbets around the inside face of the front, so it can fit partway into the chest. The lip overlaps the sides and dividers, giving the chest facade depth.



The overlay drawer is a modern contrivance, calculated to expedite production and facilitate the use of manufactured runners. A “show” front attached to the drawer box overhangs the box to conceal the runners and to overlay the edges of the case.

The third type is the *overlay drawer*, in which the front overlays the edges of the case, concealing it. Often—but not always—the front is an element distinct from the drawer box, one attached after the box is assembled. It may be attached with adjusters, which are eccentrics that allow the front to be shifted up and down, side to side, or even cocked slightly. With this style, the drawer builder can deal with alignment by adjusting just the front and not the entire box and its support system. The Double Dresser (p. 116) has this style of drawer.

Regardless of type, the drawer front is invariably made of the primary wood used in the chest. In any of the constructions, it can be an integral part of the drawer box or added on as a false front.

The sides and back

The drawer sides do a lot of work. Together with the front and back, the sides form the walls of the drawer box. Usually, the sides provide the main support for the bottom, either directly or through slips, which are glued to them.

In traditional drawer systems, the sides support the whole drawer as well, since its weight is transferred through the bottom edges to the runners that are built into the chest. And there's more. The drawer's movement depends on the sides. Those bottom edges are the bearing surfaces on which the drawer moves. The outer faces of the sides are the guides that rub against the chest walls, keeping the drawer on a straight course—you hope.

The back, in contrast, does little beyond linking the sides and enclosing the drawer box. In the typical traditional drawer, the bottom is secured to the back to keep it in place and to keep it from sagging in the middle.

But when the drawer moves, the back is just a passenger. Not only is it set on top of the drawer bottom so it doesn't drag on the runners but, in some designs, it is deliberately held below the top edges of the sides so it doesn't drag on the runners overhead either.

The bottom

As with drawer fronts, there are several types of drawer-bottom construction, which you use depends on the material, the style of the drawer and chest, and the size of the drawer and the strength needed.

Most common is the *open-back construction*, in which the bottom is fitted beneath the drawer back into grooves in the drawer sides and front. This construction is almost essential if you plan to use a solid-wood bottom.

The advent of effectively stable materials—plywood and hardboard, specifically—made the *fully enclosed construction* reasonable. Here, the bottom is housed in grooves in the back as well as in the sides and front.

A primitive, seldom seen type is the *overlay construction*. Here, the bottom is a panel that's laid over the edges of the sides, front, and back and nailed into place. The durability and wearability of this construction are questionable (although some very old pieces—now in museums—have drawers built this way).

An interesting, yet uncommon hybrid is the *NK construction*. This bottom is composed of two shoe plates and a bottom panel. It is then assembled and fitted to the chest; finally, the

drawer box is glued to it. This unfamiliar bottom construction is used on the Bow-Front Chest (p. 88).

The pull

Don't overlook the part that's used to open the drawer. It is a handle or a knob or a finger grip of some sort. It can be wood, metal, or plastic, purchased or shopmade. Collectively, these parts are called *pulls*. Seldom can you get away without at least one pull on each drawer; wide drawers usually have two.

WOOD CHOICES

Woodworkers are pretty acclimated to the idea of making drawers from an assortment of materials.

The front is the primary wood, of course. But rarely are the sides and back made from the primary wood. We *know* we can save a little money by using a less-spectacular, less-costly wood for the drawer sides and backs. We use this secondary wood for all the non-public parts in a chest. In some contemporary chests, the drawer sides and backs (and structural fronts) are cut from plywood.

Then there's the bottom. It's traditional to make drawer bottoms from thin pieces of the secondary stock. But these days, plywood is used for the drawer bottoms more often than not. It is inexpensive, strong, and lightweight. Plus you can transform a sheet of plywood into a stack of drawer bottoms in a matter of minutes.

What are the criteria for selecting materials for non-show parts of the drawers?

Strength and weight

The trick is finding the balance between weight and strength. Maple drawer sides are very strong, of course, but they will add considerably to the weight of the dresser. Pine drawer sides will make for a lighter case, but they will need to be somewhat thick. The thick sides may be an advantage, depending on the method of support. Side mounts, a system that requires grooves to be cut in the drawer sides for runners that are attached to

Without a knob or handle, a drawer can be near impossible to open. These pulls—some handcrafted, most manufactured—barely suggest the range of options available.



the case, demand that the drawer sides be on the thick side. This also means the drawer will be fairly heavy. A drawer that rests on top of the runner, on the other hand, can be slimmed down.

Aesthetics enters this picture too. You may not be fully conscious of it, but you do have notions about appropriate proportions for drawers. One that's too bulky or too slender for its dimensions does get your attention. A smaller drawer—one that's one-half or one-third the width of the case—is proportioned accordingly. The sides and back are thinner and so, sometimes, is the bottom. The thickness of these parts are bulked up proportionally in a deep, full-width drawer housed in the same case.

Stability and wearability

The traditional drawer opening—the one bounded by the case sides and the drawer dividers above and below—is, in effect, a frame that doesn't vary appreciably in dimension from season to season. A drawer made of solid wood *does* change appreciably in dimen-

sion from season to season. And if too little overhead clearance is allowed, the drawer will stick in humid summers.

The upshot: Select your secondary wood based on its stability and the way it is sawed. Certain woods move more and are more prone to various types of distortion with seasonal humidity changes than others. These you want to avoid, so you eschew the woods that move the most. In addition, quartersawn lumber is much more dimensionally stable than flatsawn lumber. If possible, take your drawer sides and backs from quartersawn stock.

Plywood, of course, isn't prone to any of these woes. It is stable, strong, and lightweight. But it conflicts with most people's aesthetic sense. The show of plies at the edges doesn't suit. If the aesthetics isn't a problem and if speedy production is a goal, plywood is great. The time spent making the sides and back is reduced—no jointing, no resawing, no planing. You won't want to dovetail the parts together; but speedy production and hand-cut dovetails are on different pages anyway. You'll use a machine-cut joint.

Wearability is a different measure. In a chest of traditional construction, the drawer rests on a frame composed of the drawer divider, runners, and perhaps a back rail. The bottom edges of the sides are the bearing surfaces. If you use a soft wood for the sides and/or the runners mounted in the chest, the drawer will wear quickly. The edges of the sides deteriorate, and grooves may be worn in the runners (and even into the drawer divider).

The goals here are to use a reasonably durable wood as your secondary and to use the same species for both the drawer sides and the runners. Good choices include poplar, soft maple, and alder.

It's worth mentioning too that in addition to wearing faster, soft woods slide more sluggishly. However, traditional cabinetmakers in the United States frequently used softwood drawer sides because of the ready availability.

Cost and labor

Cost is the main rationale behind the use of a secondary wood. The poplar used in the chests I built for the photos cost only 20 percent or 25 percent of what I spent for the cherry, walnut, and hard maple.

But the material expense is only part of your cost calculation. Here I'm thinking primarily about drawer bottoms. I pointed out that in just minutes, you can produce a stack of drawer bottoms from a sheet of plywood. How long will it take to make a matching stack of solid-wood drawer bottoms?

That job usually entails resawing as well as the usual labor for prepping the materials. Glue-ups typically are necessary to get panels 15 in. to 18 in. wide, which drawers in a large chest require. And joinery cuts will be required in the bottom itself, either a rabbet or some sort of panel-raising operation.

DRAWER CONSTRUCTION

Everybody likes to open drawers and see what's inside. But woodworkers usually look at the joints first and will probably slide the

drawer in and out a couple of times to gauge its fit in the case and the smoothness of its action. And *then* they'll look at the contents.

Such assessments reveal the aspects you need to keep in mind as you select the joints and constructions you'll use in building drawers for a particular chest. Looks are important.

All sorts of joints are used in drawers, from the traditional dovetail to the nailed butt. In my mind, the strongest joint needs to be between the front and sides. This is where the stress hits, every time a drawer is opened or closed. This is also the joint that needs to look good, because it is the one that's seen each time the drawer is opened.

The joint between the sides and back needs to be strong too, of course. But most of the stresses on it are secondhand, more inertial than direct. It's seldom seen since you have to completely remove the drawer from the case to look at it. Function is more important than looks here.

Front-to-side joinery

The front-to-side joints take the bulk of the strain on a drawer. If you try to open a badly built drawer, you may come away with just the drawer front in your hand (see the drawing on p. 30).

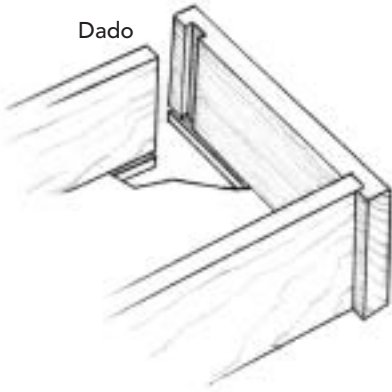
Dovetails generally indicate a well-made drawer. The half-blind dovetail is *the* traditional joint for this application. It's been the joint of choice for literally centuries. Two hundred years ago the hand-cut dovetail was just about the only joinery option for drawers. It was used on low-end furniture as well as high. Now that there are many other machine-cut joint options, half-blind dovetails are the seen primarily on high-end and custom-made drawers.

The half-blind dovetail doesn't show to the front, but when the drawer is opened, it makes a great impression. It can be used for any of the three types of drawers (lipped, flush, and overlay—remember?), though a false front is necessary for an overlay drawer.

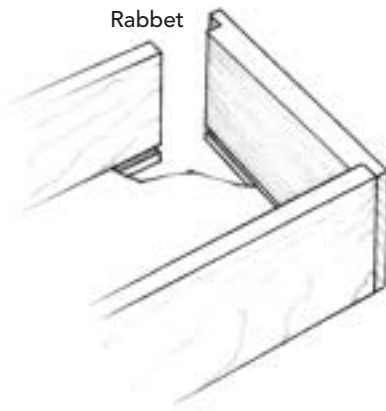
If the half-blind dovetail has drawbacks, they stem from the effort it takes to make them. They are time-consuming to cut by hand and finicky to fit. You can use a router

FRONT-TO-SIDE JOINERY

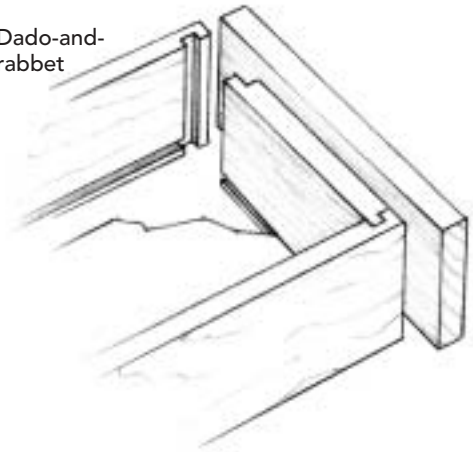
Dado



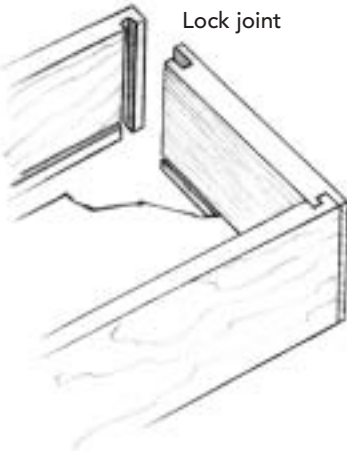
Rabbet



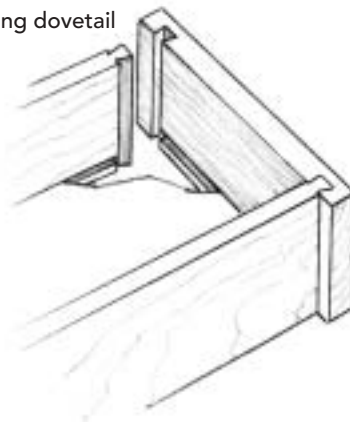
Dado-and-rabbet



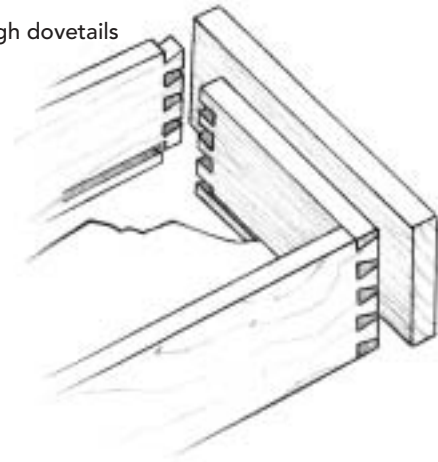
Lock joint



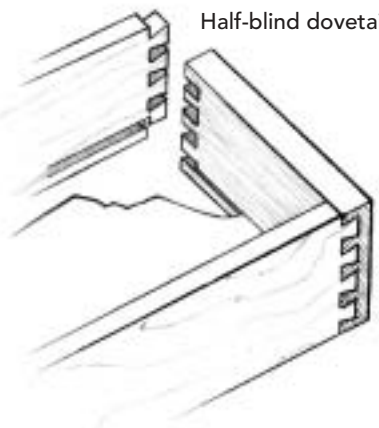
Sliding dovetail



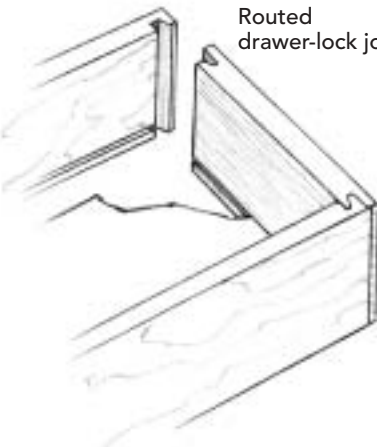
Through dovetails



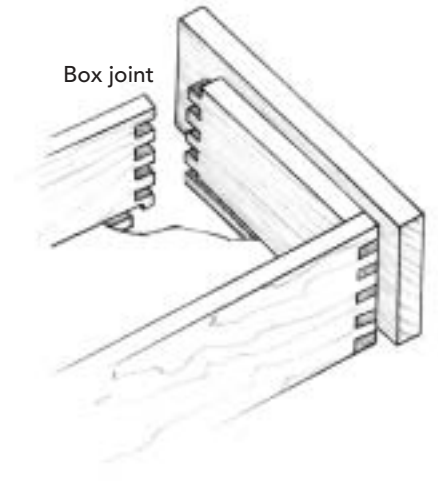
Half-blind dovetails



Routed drawer-lock joint



Box joint



and one of several jigs to machine them, but dialing in the proper settings for jig and router can take time. And even with the most adjustable of the jigs, the results are pretty clearly machine cut.

The other dovetail variants are not universally acceptable for front-to-side joinery. Through dovetails are strong, but they show to the front as well as the side. If exposed joinery is part of the design, then that's okay. Otherwise, a false front is needed to conceal them.

The sliding dovetail is strong and easy to make (once you have the setup), but you can't cut the dovetail slot close by an edge. Thus it will work only on an overlay drawer (or a flush drawer riding on commercial side-mounted slides). You can produce through and stopped joints; in the former, the dovetail slot is visible in the top edge of the drawer front, in the latter it is not.

A joint that *looks* akin to a dovetail is the box joint. It's strictly a machine-made joint (cut using a router or table saw), and it doesn't have as sophisticated an interlock as the dovetail. The many gluing surfaces make up for that and yield a joint that's plenty strong for drawers. You can even make a half-blind box joint, though it isn't used on any of the chests in this book. You can use the box joint in the same functional (but not aesthetic) applications you would the dovetail.

At the opposite end of the drawer joinery spectrum you'll find the rabbet and the dado joints. The advantage of a plain rabbet or dado for joining a drawer front to the sides is ease of construction. Neither joint has any interlock that's integral to the joint, and there's no good gluing surfaces, so you shouldn't expect the drawer to survive for generations.

A hybrid, the dado-and-rabbet joint, does lock the parts together and is easy to make. But it exposes the end-grain of the drawer side to the front of the drawer, so it needs a false front for all but the most utilitarian applications.

Where construction efficiency is paramount, the lock joints are worth serious considera-

tion, especially the routed drawer lock. These joints are strong and simple. The routed joint is cut with a special bit, which produces both parts of the joint. The lock joints work equally well on overlay and flush drawers and can be used to produce lipped drawers as well.

Side-to-back joinery

As noted previously, function is more significant in the side-to-back joinery than appearance. It is quite common to find one joint used at the front, and a very different one at the back (see the drawing on p. 32).

Historically, through dovetails were used at the back of a drawer. In custom work, they are still the joint of choice. But it's common these days to join the backs and sides with less fuss—a dado, dado-and-rabbet, even a nailed butt joint may be suitable.

If you're making the front joints with a particular machine setup—a routed lock joint, for example—it's practical to make the back joints the same way.

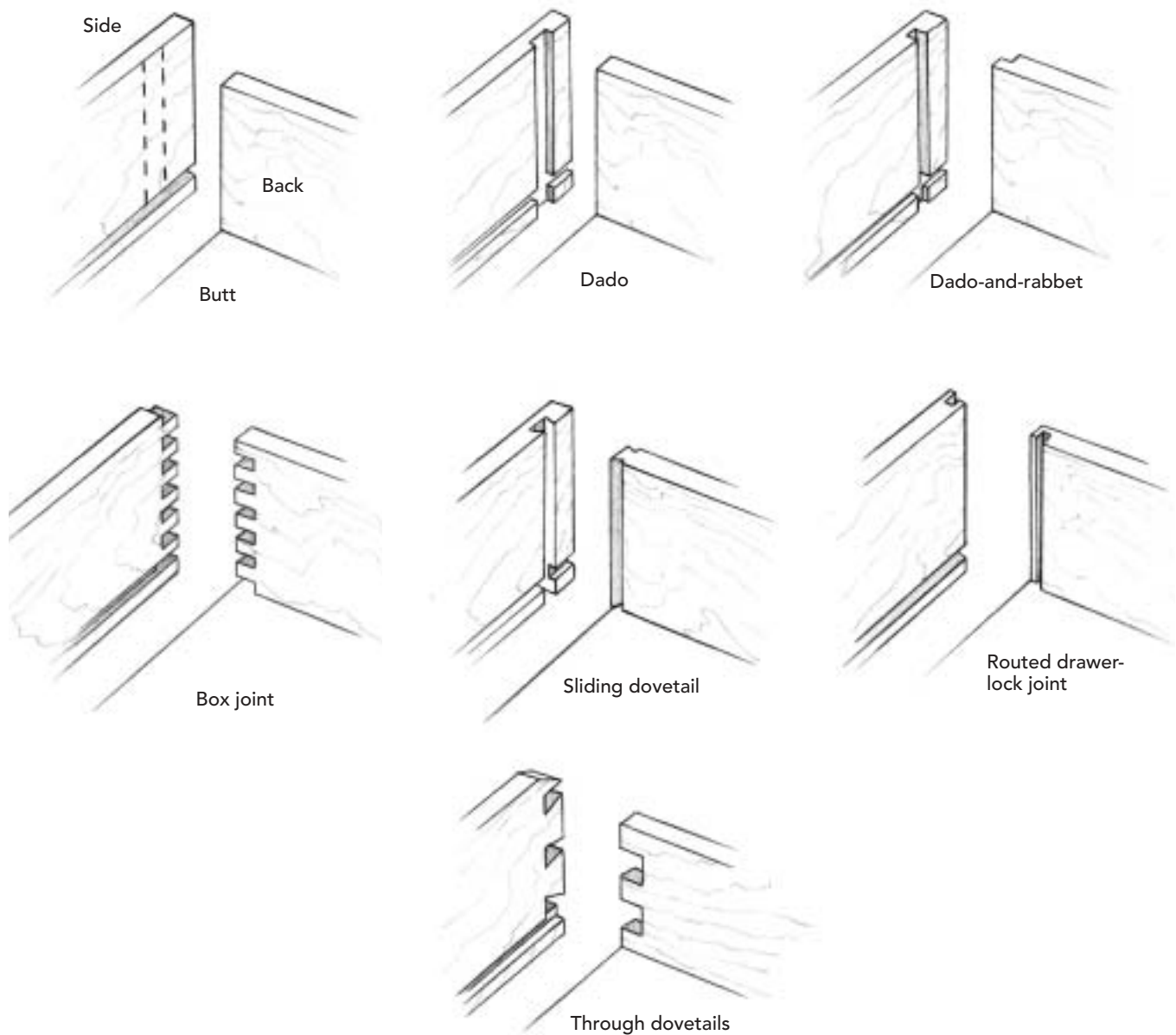
Bottom construction

The bottom keeps the drawer's contents from falling on through. So the bottom itself has to be strong enough to support whatever you put in the drawer. The joinery between the bottom and the walls of the drawer also must be strong (see the drawing on p. 33).

The first issue to settle when building the bottom is the joinery. Almost without exception, drawer bottoms are housed in grooves cut in the drawer's front and sides—and sometimes in the back as well. Just bear in mind that the groove compromises the strength of the side at the most critical location. A groove that's too wide or too deep carries—along with the bottom—the potential for failing. And a thin side simply sharpens the dilemma.

A traditional solution to the problem is the drawer slip. Drawer slips are basically square strips of wood glued to the sides at their bottom edges. The grooves for the bottom are cut in the slips. A reasonably sized groove isn't going to compromise the material.

SIDE-TO-BACK JOINERY



Slips have an additional benefit. Thin sides that slide on runners gradually wear down over the years, detracting from a good fit. Drawer slips increase the bearing surface and thereby extend the useful life of the drawer.

Once you've settled on a joinery technique, you'll need to decide between plywood and solid wood for the bottom. Plywood tends to be the choice for all but the traditional chest

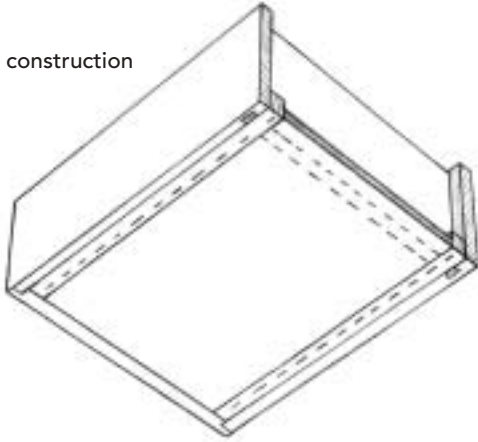
of drawers. At any given thickness, it is stronger than solid wood. It is stable, so movement isn't a problem. In fact, it can be glued in place, which helps stiffen the box. And the economics of plywood are excellent.

The primary drawback of plywood is the actual thickness. A $\frac{1}{4}$ -in. sheet is really about $\frac{7}{32}$ in., and even that is an average across the board. If you cut a $\frac{1}{4}$ -in. groove for the stuff,

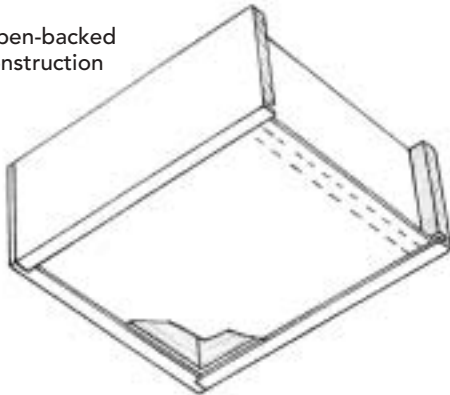
DRAWER BOTTOM CONSTRUCTION

CONSTRUCTION TYPES

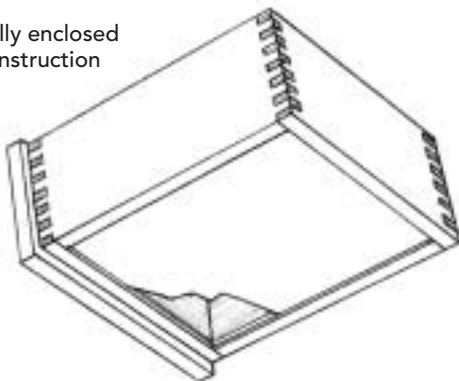
Slip construction



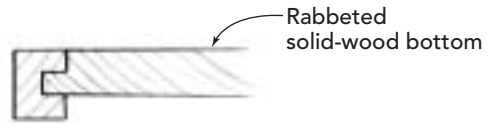
Open-backed construction



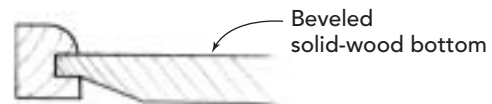
Fully enclosed construction



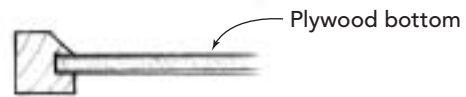
BOTTOM JOINERY



Square-edge slip



Rounded-over slip

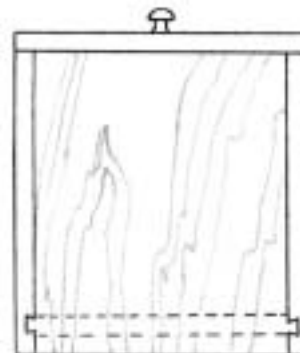


Chamfered-edge slip

BOTTOM MATERIALS



Solid-wood bottom



Plywood bottom



Two small drawer-bottom panels are stronger than one large one. A muntin divides the drawer box's bottom (just the way it divides a window) so two panels can be used instead of one.

it'll rattle. The solution usually is to use a cutter that's less than $\frac{1}{4}$ in. and to make two passes to match the groove width to the sheet thickness.

The alternative is the traditional solid-wood bottom. Unless the bottom is very small, it needs to be thicker than $\frac{1}{4}$ in. (thin wood is prone to crack). A typical solid-wood bottom thickness is $\frac{1}{2}$ in., though smaller drawers might have $\frac{3}{8}$ -in. bottoms. Some furniture makers favor $\frac{5}{8}$ -in. bottoms.

To reduce the width of the groove required, the solid-wood bottom needs a tongue or a rabbet. Use a panel-raising bit in a table-mounted router to mill the bottoms, and you'll get a nicely formed tongue to fit the grooves.

A solid bottom should be used only on open-back construction, so the bottom can expand and contract. Orient the bottom so its grain runs side to side, parallel to the back. To ensure that the bottom can expand and contract, use a screw (or a nail) in a slotted hole when securing the back edge of the bottom.

On a very wide drawer a large, one-piece bottom is likely to sag, and it may eventually break. You can deal with this before it becomes a problem by adding a center muntin. This frame piece, which extends from front to back, divides the bottom opening of the drawer box so two smaller panels can be used to form the bottom. The muntin must be grooved like the sides, and it must be securely anchored to the front and back. You can use a tongue or dovetail at the front. At the back, cut a rabbet across the muntin to form a simple lap joint between it and the drawer back.

FINISHING THE DRAWERS

Finishing is a topic largely left unexplored in this book. But a few words on finishing drawers are essential.

Drawers often are left unfinished. Oil-based finishes, which are favorites of furniture makers, give the insides of drawers a vaguely rancid smell. That's because the drawer boxes

are usually closed, inside the chest, where air circulation is negligible. This odor can persist for years and years. It can permeate clothes kept in the drawers. Some people don't notice it, others are extremely conscious of it.

Being wary of this problem, some furniture makers avoid using *any* varnish (not only oil-based ones) on the body of a drawer and even on the inside of a chest of drawers.

If you want to finish the drawers in your chest, try shellac. A couple of diluted coats will dry quickly and seal the wood. Then sand lightly with 220-grit paper to eliminate the nibs; finally, apply paste wax.

SUPPORTING THE DRAWERS

A drawer alone—just an open box—is an oddity. For it to work as intended, it has to be installed in a case in a way that allows it to be opened and closed. The movement must be smooth; and once open, the drawer has to be able to stay open without your help.

Drawer movement can be controlled in several ways. Some mounting systems are integral to the case, and others are add-ons. Regardless, the mounting system should be carefully planned along with the case and drawer design.

Runners, guides, and kickers

The most common approach to supporting a drawer is an arrangement of a drawer divider and runners (see the drawing on p. 36). The divider is a rail extending from side to side. It separates the drawers visually and physically. And it also supports the front end of the runners.

Attaching the runners directly to the case sides seems simple. But, of course, runners can't be glued to solid-wood sides, because they'll restrict the sides from expanding and contracting. Instead, the runners are set into dadoes and glued at one end only. Or they are attached with screws in slots. Or they're housed (unglued) in dovetail or dado slots. A long-standing practice is to capture the (slightly short) runners (unglued) between

the front divider and back rail, both of which are glued in place.

A frame-and-panel chest or a case with a face frame requires an additional element—the drawer guide—to limit side-to-side movement of the drawer.

Side-by-side drawers, often included in dressers and other chests, need support in the middle of the case, away from the sides. The usual approach here is to suspend a wide runner between the drawer divider in front and a rail in back. A vertical divider with a guide behind it separates the neighboring drawers.

An important element in most drawer-mounting systems is the kicker. A kicker prevents the drawer from tipping down as it is opened. It is just like a runner but, generally, is mounted above the drawer side. A single center kicker may be used for a top drawer.

Side mounts

Some furniture designs make it difficult to use runners. A case that has no dividers separating the drawers is an example. In this situation, you can use side-mounted slides. The slide is a strip of wood attached to the case side. Grooves for the slides must be cut in the drawer sides.

All the caveats about mounting a runner to a solid-wood case side apply here. This can be a drawback to the system. Another significant drawback is that the drawer sides need to be quite thick to be able to accommodate the slide.

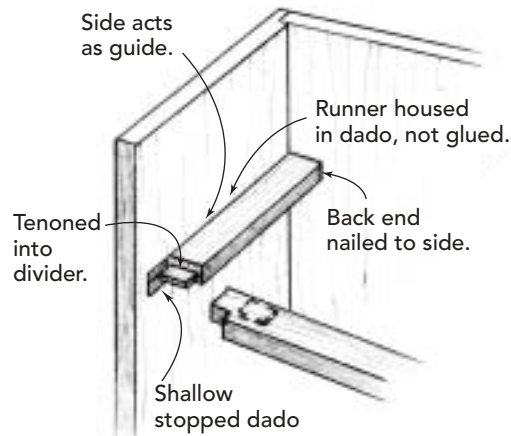
Center runners

Wide drawers supported by side runners have a tendency to cock slightly as they are moved and to bind. The wider the drawer, the more likely it is that this will happen.

A single center-mounted runner and guide is the solution. The runner, which is attached to the underside of the drawer, has a channel in it that rides over a guide that's attached to the apron or web frame (see the drawing on p. 36).

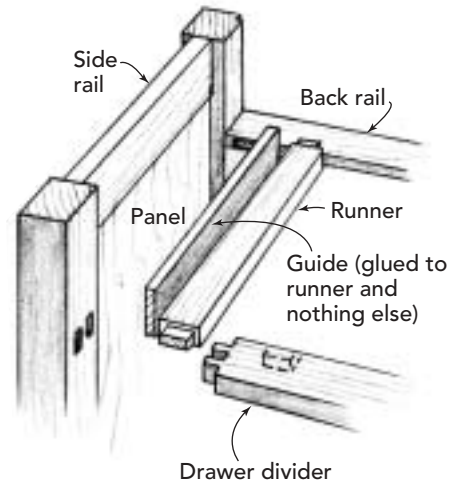
Runners and Guides

SOLID WOOD/PLYWOOD CASE CONSTRUCTION



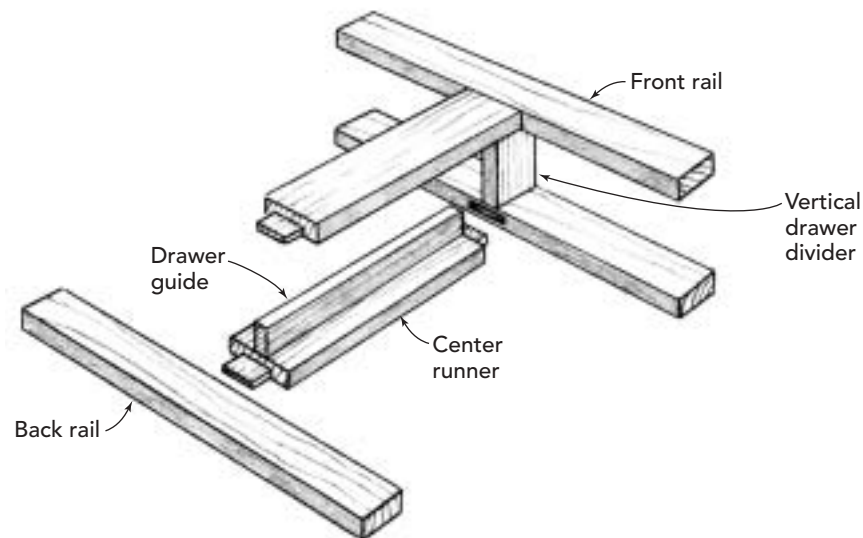
The runner is housed, unglued, in a dado cut into the chest side. The chest side serves as the drawer guide.

POST-AND-PANEL CONSTRUCTION



The runner tenons fit into mortises in the drawer divider and back rail. The drawer guide is glued to only the runner.

CENTER RUNNER AND GUIDE



The runner tenons fit into mortises in the front and back rails. The drawer guide is glued to the runner.



Manufactured runners

Metal slides with ball-bearing wheels are another drawer-mounting technique. The slides are mounted in pairs to the case and drawer or singly under the center of the drawer. They offer a smooth opening-and-closing action that's not affected by wood movement. They can be used in chests of drawers, just as they can in most furniture applications. Full-extension slides allow the full depth of the drawer to be exposed, something you can't get with the other drawer-mounting techniques.

Drawer stops

Drawer stops keep all styles of drawers from falling out of their cases (opening stops) and flush drawers from sliding too far into their cases (closing stops).

A turn button is the simplest opening stop. It can be mounted on the inside of the drawer back or on the back edge of the front rail. Pivoting it out of the way allows the drawer to be inserted or removed.

A small block of wood tacked or glued to the back of the runner is the easiest way to make a closing stop. With the back removed and each drawer inserted so it's perfectly flush with the cabinet face, apply the closing stops with a dab of glue. Then add a couple brads or a small screw. You can also mount the closing stops onto the front rail, so they will catch against the back of the drawer front. They're definitely harder to locate and attach here, but such a stop can work for both opening and closing.

Manufactured drawer runners range from sturdy side mounts to discrete concealed runners that hide beneath the drawer box. Low-cost runners mount to the bottom edges of the drawer sides.