

# Installing Kitchen Cabinets

How to fit and fasten cabinets to wavy walls and floors

by Tom Law

**W**ell, there you are, just walking into a new kitchen with freshly painted drywall. Or maybe you're remodeling, and you've spent the last few days gutting the kitchen. But now you've got a clean slate to work with. The kitchen cabinets are in cardboard boxes, and all you have to do is unpack them and fasten them to the wall, right? Easy, tiger.

Kitchen cabinets are like carry-out food: A lot can go wrong with the order, and you don't want to be five miles down the road when you discover that something's missing. Before you begin installing cabinets, check all the boxes. Make sure you have everything you need and that the cabinets are what the customer ordered.

Take a close look at the walls and the floor—they're probably not as flat as they appear. You'll have to compensate for any imperfections because the cabinets take precedence. You don't distort a straight cabinet to fit a crooked wall.

Here, I'll discuss the methods I use to install cabinets when conditions are less than perfect, and believe me, they usually are.

**Know the room conditions**—Every installation begins with a check of the floor and the walls for the carpenter's guiding principles: plumb and level, straight and square. I use a straightedge and a level to see how the floor goes. The goal is to locate high and low spots because one of these spots will be the starting point for the cabinet layout, ultimately determining the height of the countertop.

I also use the straightedge to check the walls for straight and plumb. If there is a corner, I check it for square. Although serious flaws are uncommon, minor problems like crooked studs or spackle buildup often appear.

**Marking the wall and the floor**—To get over the fidgets of starting the job, I mark the cabinet layout on the wall. Marking the layout helps me visualize the finished job.

To begin with, I decide whether to use the high or low spot on the floor for my starting point. Choosing the high spot probably means that only one base cabinet will sit directly on the floor; all the others will be shimmed up. Using the low spot means that most of the cabinets will have to be scribed to fit the irregularities of the floor (more about scribing later). It's easier to use the high spot because it's easier to shim up than to cut off, but the determining factor is countertop height. Usually a countertop is 3 ft. from the floor.



**Marking the base-cabinet line.** Starting from the high or low spot on the floor, the height of the base cabinets is marked on the wall, then the mark is transferred around the room with a water level. The line is also a reference point for laying out the upper cabinets.

Countertops themselves are normally 1½ in. thick, so the base cabinets are 34½ in. high. I mark this height on the wall above either the high or the low spot on the floor, whichever I've chosen as the starting point. Then I transfer that mark around the walls using a water level (photo above). I use the water level to mark the cabinet height at each corner, then I strike a chalkline between the marks (for more on water levels, see pp. 58-60). If you don't have a water level, a conventional spirit level and a straightedge will do.

After the base-cabinet line is marked on the wall, I mark the location of the individual cabinets. I usually don't mark full plumb lines (the vertical lines) for each cabinet; I just make check marks along the base-cabinet line to indicate the width of each cabinet.

The face-frame stiles on most cabinets project beyond the sides ½ in. to ¼ in., which allows the

stiles of two cabinets to be joined tightly without the sides of the cabinets bumping together. I mark each cabinet's actual size (its width from stile to stile) on the wall and then subtract the amount the stiles protrude to locate the back of the cabinet accurately.

I also use the base-cabinet line as a reference for laying out the upper cabinets. The space between the upper cabinets and the countertop is usually between 16 in. and 18 in. When measuring up from the base-cabinet line, I add 1½ in. for the countertop. Then I mark the wall to indicate the bottom of the upper cabinets. I double check to see that the top of the upper cabinets is the same height as the top of any full-length cabinet, like a broom closet or a pantry unit. If it isn't, I adjust the layout of the upper cabinets.

Next, I mark the location of each upper cabinet, again with either check marks or full-length

lines. Most of the time the upper cabinets are the same width as the base cabinets below them, and their edges align vertically. Cabinets must line up where an appliance, such as a refrigerator, protrudes into the upper-cabinet space. And by the way, you shouldn't add anything to the space indicated on the plans for an appliance. A 30-in. stove or refrigerator as called out on the plan will fit a 30-in. opening.

Some cabinets, such as those over refrigerators and stoves, don't come down as low as the other upper cabinets. And some cabinets, such as desk units, sit lower than the other base cabinets. I measure these cabinets and mark their locations.

Next I find the studs and mark their locations on the wall because I'll be fastening the cabinets to the studs. I mark stud locations with straight lines. Studs can be sounded out (where you tap the wall and listen for the higher pitch that occurs when you strike a stud) and probed for with a hammer and a nail, or they can be located with an electronic stud finder. If you use the hammer-and-nail approach, be sure to punch the holes where they'll be covered by cabinets.

It's OK to fasten a base cabinet to only one stud. Upper cabinets, however, are better off attached to two studs. Sometimes a cabinet isn't wide enough to catch two studs. I either attach narrow cabinets to their neighbors, or I might add blocking in the wall where it will be covered by a cabinet. I use a reciprocating saw to cut a hole in the drywall, then I insert a glue-covered piece of 1x that will span the hole. This block is the backing that I'll attach the cabinet to, so I make sure the hole is in the right place behind the cabinet.

**Which cabinets come first?**—The most important consideration when deciding which cabinets to set first, the uppers or the bases, is comfort. Some manufacturers suggest hanging the upper ones first because you can stand closer to the wall when the base cabinets aren't in the way. If you hang the upper cabinets first, it's sometimes recommended that you nail a 1x2 ledger strip on the wall to support the upper cabinets while you fasten them to the wall. It's a good idea if the backsplash will later cover the nail holes. But you wouldn't want to nail a ledger strip on a finished wall.

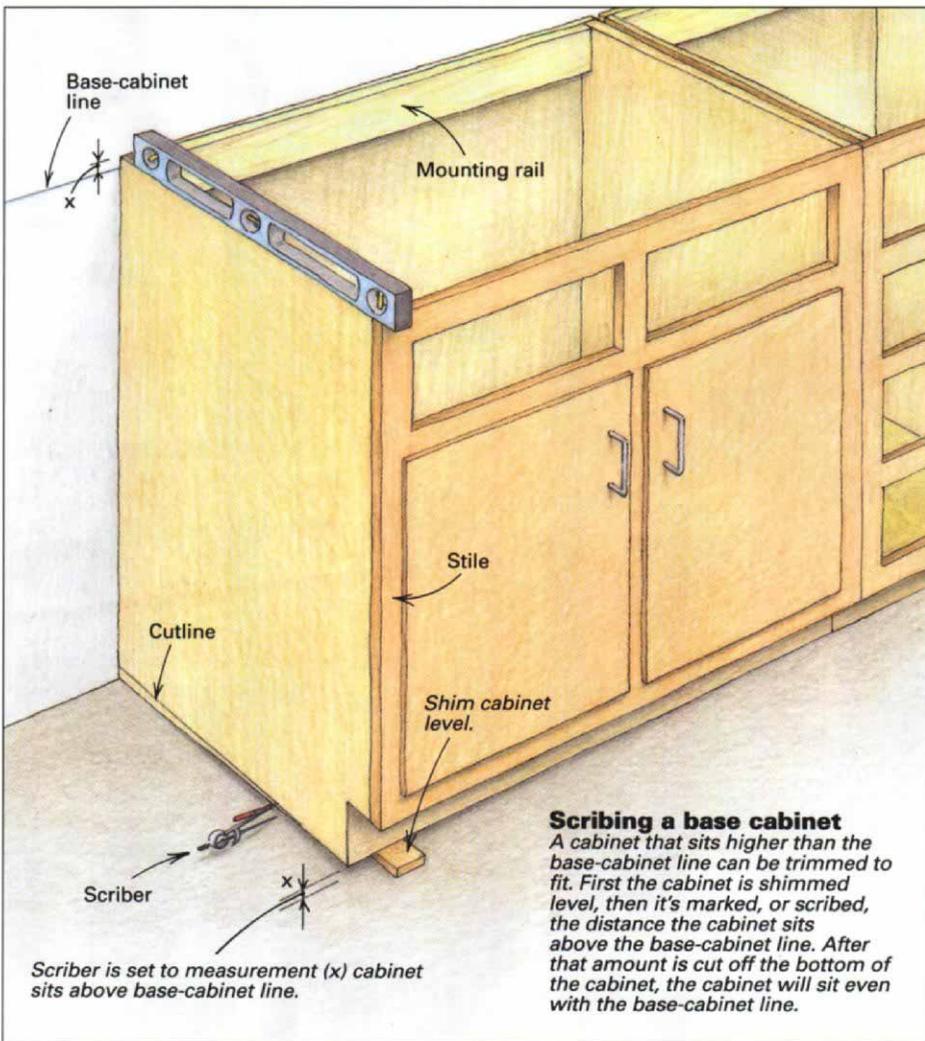
There are lots of ways to hold upper cabinets in place as you install them. You can buy or make various jacks and props, but it's been my experience that when hanging upper cabinets first, it's better to have two people doing the work—one holding, one fastening.

When I work alone, I find it awkward to hang upper cabinets first. By installing the base cabinets first, I can use them to support the upper cabinets (more on this method later). Plus the base cabinets are more complicated because they have to be fitted to both the wall and the floor, so I start with them.

**Start from a corner**—It's much easier to start in a corner and work out of it than to put yourself in one. Most corner cabinets have their backs cut on a 45° angle, so setting them into an out-of-square corner is easy. If the cabinet has a square



**Shimming a cabinet.** Shims are used to level a cabinet, but they also bring cabinets that sit in low spots of the floor up to the proper height. Here, the end cabinet of a peninsula is leveled.



**Scribing a base cabinet**  
A cabinet that sits higher than the base-cabinet line can be trimmed to fit. First the cabinet is shimmed level, then it's marked, or scribed, the distance the cabinet sits above the base-cabinet line. After that amount is cut off the bottom of the cabinet, the cabinet will sit even with the base-cabinet line.

Scriber is set to measurement (x) cabinet sits above base-cabinet line.



**Fitting an end panel.** Some cabinets have a separate end panel that should be scribed to fit tightly against the wall. With the panel clamped in place, the author uses a pocketknife to hold a strip of wood for scribing. The wood strip, like a scriber or compass, holds the pencil a set distance from the wall. The scribe mark is made on masking tape.



**Cutting the end panel.** The author uses a handsaw to get a clean cut along the scribe line. A slight back cut ensures that the face of the end panel will fit tight to the wall.

back, spackle buildup will probably have to be sanded down, but there are times when the only thing to do is cut away the drywall or plaster to get a square-back unit in place.

Because most corner cabinets have cutaway backs, they tend to shift around and are difficult to set in place. One way to shore up corner cabinets is to attach cabinets to each side and then push all three into place as a unit.

Another thing about corner cabinets with cutaway backs is that they often require a ledger strip along the wall to support the countertop. I nail a piece of 1x stock along the base-cabinet line to support the countertop in the corner.

**Scribing a cabinet**—When a base cabinet-corner or otherwise—is installed, it must be set level and plumb. If the floor isn't level, there are two ways to get that base cabinet level and plumb—shim it or scribe it. Shimming is much easier; I just slip shims under the cabinet until it's level and at the proper height (photo p. 49). When the top is level, I check all the sides; as long as the cabinet is square, the sides should be plumb no matter how I place the level. Exposed shims and gaps are often covered by a vinyl base; sometimes there's a separate toe-kick board that's scribed to fit the contours of the floor. If I'm installing base cabinets over a wood floor, I hide the shims and the gaps with shoe molding.

If the top of the cabinet is above the layout line even before I shim it, scribing is necessary. To scribe a cabinet to the floor, I bring the cabinet as close as I can to where it belongs in the kitchen, then shim it level. I set my scriber (or pencil compass) to the amount the cabinet extends above the line and scribe the cabinet at the floor (drawing p. 49). (For more on scribing, see *FHB* #77, p. 61.) I cut the bottom of the cabinet at the scribe line. When I replace the cabinet, it sits level with the base-cabinet line.

When the side of a cabinet is exposed, it must fit perfectly against the wall. The side panels of many cabinets project beyond the back panels. These cabinets are easy to scribe to a wall. First, I level the cabinet, then set the scriber to the widest space between the cabinet and the wall and scribe both sides. I remove the cabinet, cut the sides to the scribe lines, then reinstall it. In some kitchens a decorative end panel is used to dress up the exposed side of a cabinet. Such panels are usually slightly oversized so that they can be scribed to the wall (photos left). If the cabinet has a flush back, however, scribing is impossible, so straightening the wall or shimming the back and covering the gap with molding is the only choice.

**Installation information**—Now that I've talked about laying out and fitting cabinets to the floor and the wall, here's how I go about installing a kitchen. First I put the corner cabinet in place, shim it level with the base-cabinet line and, if necessary, scribe the cabinet to fit. Then I fasten the cabinet to the wall by driving screws through the mounting rail into the wall studs. The mounting rail is a horizontal piece of wood at the back of the cabinet.

Screws need to bite into studs at least  $\frac{3}{4}$  in., so I use  $2\frac{1}{2}$ -in. or 3-in. long drywall screws. But you may prefer to use wood screws, which have thicker shanks, or use the screws supplied by the manufacturer. If there's a gap between the mounting rail and the wall right where I want to run a screw, I slip a shim into the gap to keep the back of the cabinet from distorting when I put in the screw.

After the first cabinet is in place, I bring the second one to it, level it, get the face frames flush by lining up the top and the bottom of the cabinet's stiles, then I clamp the stiles together.

When the cabinets are flush and tight with each other, I fasten them with screws (top left photo, facing page). I always drill pilot holes and countersink the screws. Usually two screws in each stile are sufficient. When the doors are closed, the screws are hidden, but I still try to make them inconspicuous when the doors are open by putting the screws close to the hinges. Once the adjoining stiles are screwed together, I screw the cabinet to the wall.

I install each succeeding base cabinet the same way—level it, shim or scribe as required, fasten the stiles and then screw it to the wall. As the run of cabinets grows, I put a straightedge across the front of the cabinets to make sure they're in line (top middle photo, facing page). I make any adjustments at the wall by tightening or loosening screws and adding shims.

**Installing a sink base**—Sink base cabinets with back panels may be more difficult to install because they might have to be bored for plumbing and electrical lines. If the cabinets on each side of the sink base are in position—even temporarily—I use them as reference points from which to measure the locations of pipes and wires. If the surrounding cabinets aren't in place, I mark the sink base-cabinet layout full size on both the wall and the floor. Then I can measure the pipe and wire locations from the layout lines.

If I drill holes in the back of the cabinet from behind, I complete them from the finished side to avoid tearing out the veneer. A little tearout isn't a big deal because the plumber usually puts a finish plate around the opening that covers a rough cut.

Some sink base cabinets have no back panel; obviously it won't be necessary to drill holes if the pipes and the wires come through the wall. But sometimes they come up through the floor. And that's when the layout lines on the floor come in handy.

**Installing between walls**—When a run of base cabinets fits between walls, the dimensions may work out, and the cabinets will fit exactly. But more often than not, the cabinets will require some fitting.

If the total dimension of the cabinets is just slightly more than the space to be filled, I put all the cabinets in except the last one, and I leave the next-to-last cabinet unattached; that is, I don't screw it to the wall yet. I measure the space left for the last cabinet. Then I remove the next-to-last one and put the last one back in plumb and level. I scribe it to fit the return wall. The amount

of material to be scribed off the last cabinet's stile will be determined by the space required for the next-to-last cabinet when it's replaced.

Once all the scribing and trimming is complete, I put the last cabinet in place, then push the next-to-last cabinet in place with a pry bar. I use wax paper between the stiles to help the cabinet slide in without marring the finish.

**Installing filler and backer strips**—When a run of cabinets doesn't quite fill the space between walls, filler strips are used. A filler strip is simply a board of the same kind of wood and finish as the cabinets, and it gets screwed to a cabinet's stile to fill a gap. Sometimes cabinets can be ordered with wider stiles to make up the difference, but fillers are more common.

To scribe a filler strip, I first screw it onto the cabinet stile, move the cabinet as close as possible to its final position, then I scribe, using the widest gap as the amount to cut off. I almost al-

ways leave a filler strip on a cabinet and cut the strip in place.

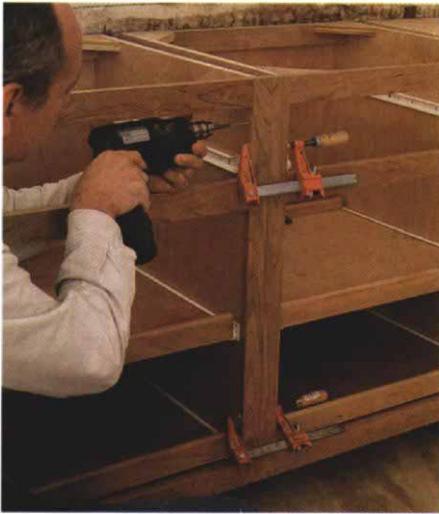
Backer strips are frequently installed at inside corners to keep cabinets as far enough apart so that drawers or drawer handles don't bump into each other. Because the cabinets have to be separated by the thickness of the drawer front and the hardware, fastening a backer strip to the abutting cabinet will increase the clearance (top right photo, below). We'll run into an inside corner later when I talk about peninsulas. But right now, I've still got to hang the upper cabinets.

**Installing upper cabinets**—Like the base cabinets, upper cabinets should be installed level and plumb, with sides parallel and stiles screwed together. All of the cabinets should be fastened to the wall using the same screws as those used for the base cabinets. I like to drive two screws in the top mounting rail and two into the bottom

mounting rail. I fill gaps between the wall and the cabinet with shims as needed.

When hanging big, heavy upper cabinets, I lighten the load by removing all doors and shelves, and I reinstall whatever I've removed when all the cabinets are set. Removing the doors before hanging the cabinets also makes it easier to clamp the stiles together before driving the screws.

Instead of holding the cabinets in place as I try to fasten them to the wall, I typically use some plywood props (drawing below) or adjustable cabinet jacks (bottom photo, below). I made two different-size props from 3/4-in. plywood; one prop is 17 1/4 in. high for a 16-in. spacing between upper and base cabinets; the other is 19 1/4 in. high for an 18-in. spacing (16 in. and 18 in. are the two most popular spacings between upper cabinets and base cabinets). The finish space between upper and base cabinets is 16 in. or 18 in.; the additional 1/4 in. on each prop



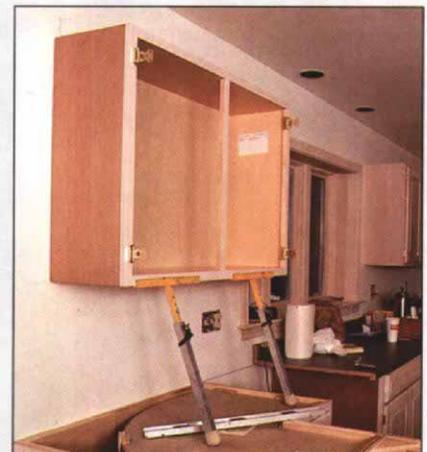
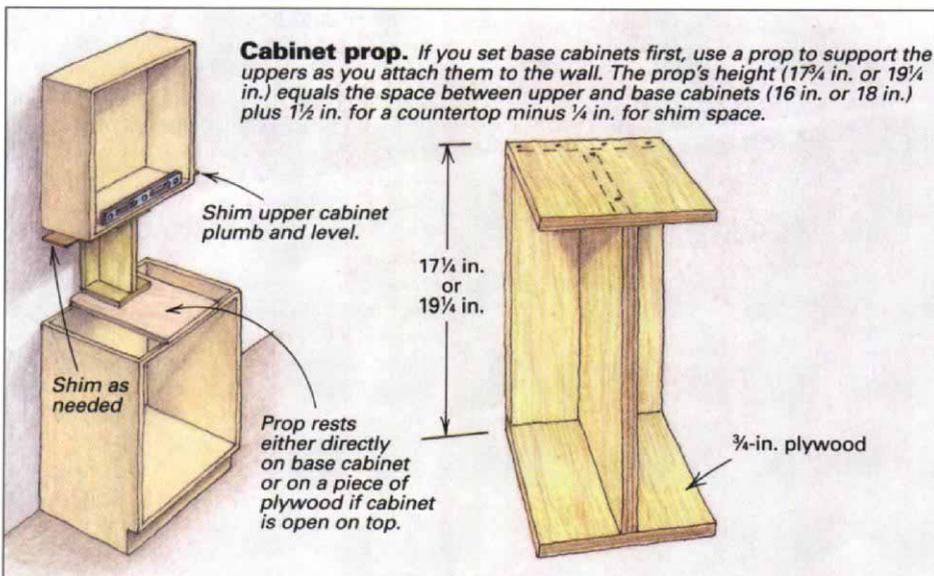
**Joining cabinets.** Cabinet stiles are clamped flush and joined with wood screws before the cabinets are installed. Two wood screws hold the cabinets together, one near each hinge.



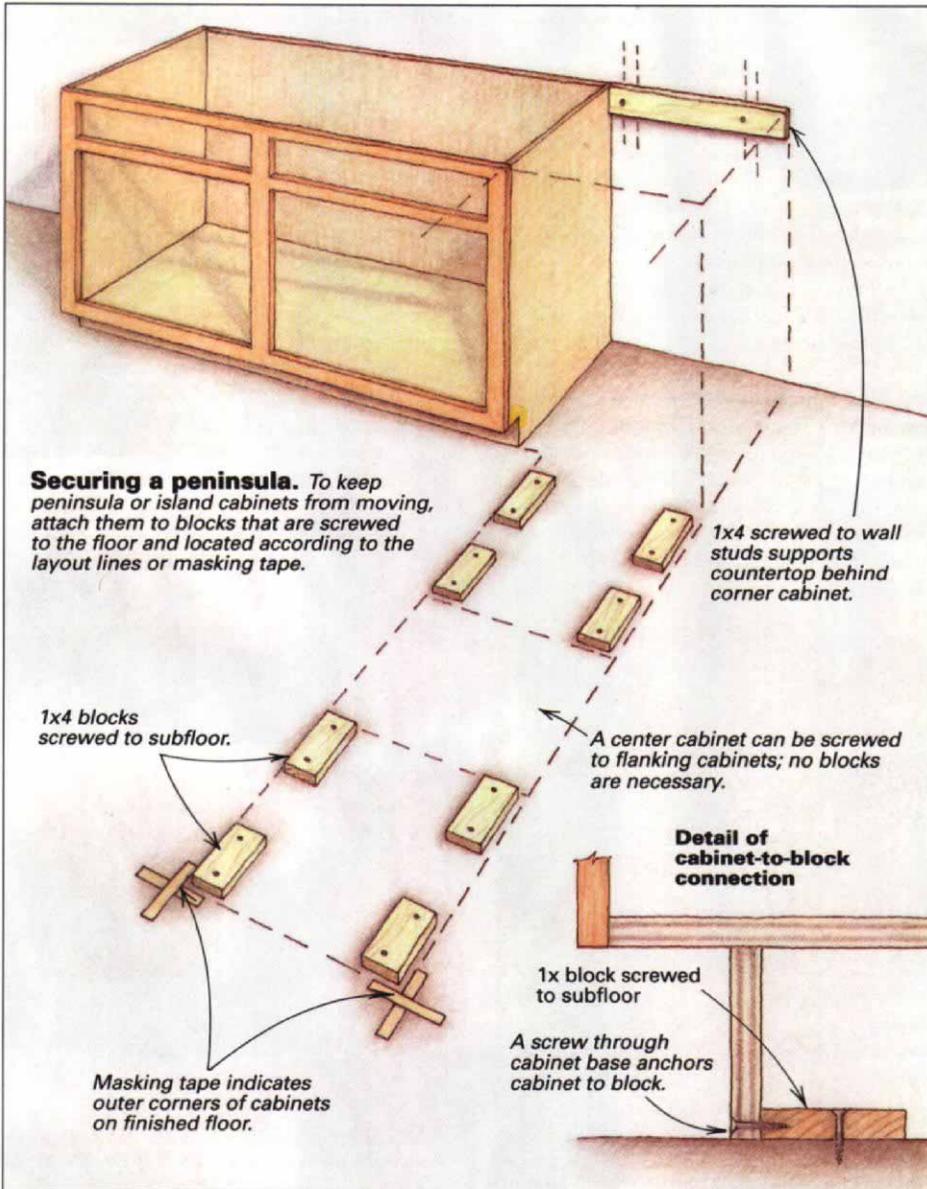
**Aligning cabinets.** A straightedge placed along a run of cabinets shows which cabinets must move in or out. Here, a cabinet is pried away from the wall and shimmed out.



**Fastening a backer strip.** This strip of wood acts as a spacer to hold the corner cabinets far enough apart so that their drawers don't bump into each other.



**Cabinetjacks** consist of square steel tubes that slide inside each other; a cabinet sits in cushioned angle iron (see *FHB* #52, p. 98).



makes up for the countertop that's not yet in place. The missing  $\frac{1}{4}$  in. is shim space. I put a prop on a base cabinet and rest an upper cabinet on the prop. I use long shims to adjust the height of the upper cabinet to the layout line. (Some base cabinets are open on top, so I lay a piece of plywood on top of these cabinets and use the shorter props.)

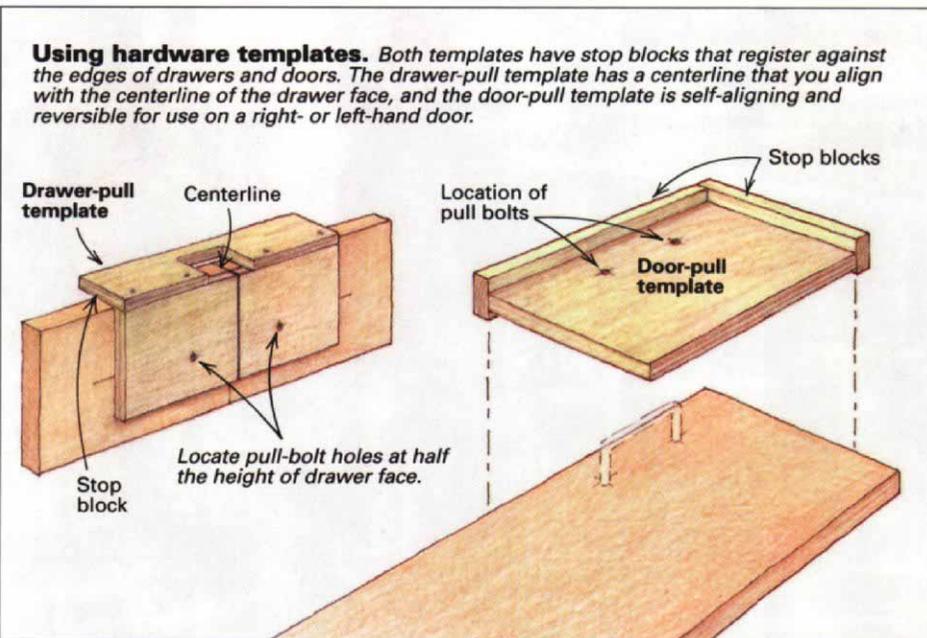
Just as I installed the base cabinets, I start with a corner cabinet and work my way out. Each succeeding cabinet is put into place on the plywood prop and shimmed level. Then I clamp and screw the stiles together. Finally I screw the cabinet to the wall and remove the prop.

The fronts of the upper cabinets should also be checked with a straightedge and adjusted at the wall line, again either by tightening screws or backing them out and adding shims.

**Islands and peninsulas**—When the kitchen plan includes an island or a peninsula, I make a full-size layout on the floor and check the squareness of the corner with the old 3-4-5 triangle. If the finish floor isn't down yet, I snap chalklines. But if the finish floor is in place, I don't want chalk everywhere, so I use masking tape to show where the cabinets go.

An island or a peninsula should be secured to the floor, and I do it by screwing 1x blocks to the floor, then placing the cabinets over the blocks and screwing the cabinets to the blocks (top drawing, left).

Using my layout lines, I measure in from the edge of the masking tape or chalkline (which represents the outside of the cabinet) and mark the thickness of the cabinet's base. The new marks indicate where to screw the blocks down. Usually I just use a 6-in. to 8-in. block of 1x4 in each corner. Before I screw the cabinet to the blocks, I shim or scribe the cabinet so that it's plumb, level and at the same height as the other cabinets. When an island or a peninsula cabinet is placed over the blocks, it can't be shifted side to side, and when the screws go through the cabinet into the blocks, it can't be lifted either.



**Hardware and handles**—After I've replaced all the doors and the drawers, I install the hardware. If the holes for the pulls have been pre-drilled, it's easy enough to screw the hardware on. But if I need to drill the holes myself, and there are a lot of holes to drill, it's best to make a template (bottom drawing, left). I use a piece of plywood and glue a stop block at its edge, which holds the template in place on the door or the drawer.

I sometimes use masking tape to mark the hole centers. Masking tape makes pencil marks more visible, but I double check the marks by holding the handle up to them. I use a sharp scratch awl or punch to mark the hole, then drill it through. The center punch keeps the drill bit from wandering. □

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# Installing European cabinets

by Tom Santarsiero

Cabinetry manufactured in Europe brought both a new look and a new installation system to the United States. European cabinets are frameless—they have no face frame—and the shelf pins, the hardware mounting screws and the dowels that join the carcasses are drilled on 32-mm centers. Although many American cabinet manufacturers have incorporated the European look and construction system into their lines, few have fully incorporated its installation system.

European cabinetry has its own suspension and support hardware that makes installing cabinets fast and efficient, even if you work alone. Upper cabinets are hung from a steel rail that you screw to the wall studs. Base cabinets stand on adjustable leveling legs. Thanks to this hardware, plumbing and leveling cabinets are much simpler.

When laying out a European kitchen, I snap three level lines on the walls. One line indicates the top of the base cabinet; one line indicates the bottom of the upper cabinets, and the third line is for the upper cabinets' hanging rail. The height of this rail varies from brand to brand.

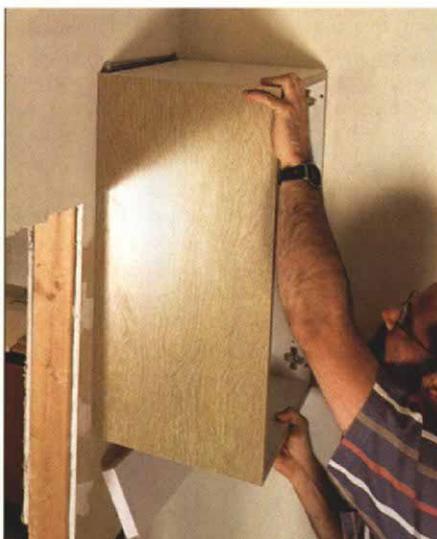
The hanging rail is a length of steel about 1¼ in. wide with an offset bend along the top edge. I predrill ¼-in. holes at 5 cm o. c. (about 2 in. o. c.; European cabinetry is all metric). I screw the rail to the wall through these holes with #14 2½-in. pan-head screws.

I install the upper cabinets first. They hang on the channel in the hanging rail via a pair of adjustable hooks (top two photos, right) that protrude from the back of each cabinet. Two set screws on each hook adjust the wall cabinets. One screw moves the cabinet in and out; the other moves the cabinet up and down. With this system, one person can easily hang and adjust wall cabinets.

When the hanging rail is above the cabinets, crown molding conceals it. If the hanging rail runs behind the cabinets, I notch the back of the cabinets to fit over the rail. However, end cabinets with visible side panels aren't notched; the hanging rail stops against the inside edge of a visible side panel.

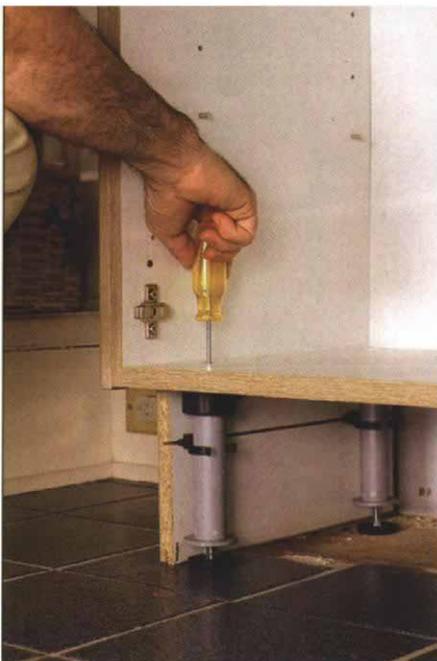
Once the upper cabinets are aligned, I bolt them together using joining bolts supplied by the manufacturer. Most European cabinets have partially bored holes inside along the front of the side panels. I damp the cabinets together, finish drilling the holes and then pass the bolts through. The bolts are similar to small carriage bolts with a threaded cap or socket. All of the European cabinets I've seen come with these bolts. If the cabinets you're installing come without bolts, you can use short drywall screws.

Base cabinets have leveling legs that slip into plastic sockets on the bottom of the cabinet. The legs usually come with each cabinet, along with caps that cover adjustment access holes in the cabinet floor. To level and plumb a cabinet, I either use the access holes to turn the legs with a screwdriver (bottom photo, right), or I turn the legs by hand.



**Hanging an upper cabinet.** A hanging rail screwed to the studs supports upper cabinets that have adjustable leveling hooks. This system allows one person to install cabinets.

**Adjusting the leg.** You don't have to shim or scribe European cabinets because they rest on legs that are adjusted up or down with a screwdriver. The toe kick clips onto the legs; the clips are also adjustable.



Europeans don't fasten base cabinets to the wall. The thinking is that because base cabinets are joined together and attached to countertops and appliances, the cabinets won't move. Also, Europeans take their cabinets with them when they move, so fewer screws going in during installation means fewer screws to take out on moving day.

I like to be sure that my cabinets will stay put, so I fasten them to the wall. How I fasten them depends on the brand of cabinet I'm installing. True European cabinets are a bit shallower than the typical 2-ft. deep face-frame cabinet. When I install European cabinets, I space them away from the wall slightly so that they'll be the right depth for a conventional countertop. Some manufacturers supply special particleboard blocks with their cabinets that are screwed to the wall and to the cabinet, serving as both a spacer block and a rigid means of attachment.

If the manufacturer doesn't supply blocking, I screw a 2x4 cleat to the wall at the level line and fasten the cabinets to the cleat. I use a length of predrilled metal angle inside each cabinet to keep the wall-mounting screws from pulling through the back panel.

Toe-kick material, usually particleboard covered with plastic laminate or veneer to match the cabinets, comes in long lengths about 7 in. wide. I rip it to the proper width. If the finish flooring is not in place, I rip the toe kick narrow enough to accommodate the flooring. Or better yet, I cut and install the toe kick after the flooring has been installed. A vinyl sealer strip (similar to weatherstripping) comes either attached or loose to seal the bottom edge of the toe kick to the floor.

After cutting the toe kick to length, I join inside and outside corners with plastic end caps. If corners join at angles other than 90°, I miter the toe kicks and glue the joints. The toe kick is grooved on the back to accept knock-in clips that grip the leveling legs. To install the clips, I lay the toe kick face down on the floor in front of and aligned with the cabinets, and then I mark the location of every other leg and pop in the clips. The clips consist of a T-shaped knock-in and a U-shaped clip that slides over the knock-in. This combination allows some side-to-side adjustment of the toe kick once it's pressed onto the legs. End caps then snap onto the kick ends.

Island and peninsula cabinets are freestanding and are likely to tip and sway. To anchor these cabinets to the floor, I make L-shaped plywood brackets. The vertical side of the L is about two-thirds the height of the toe kick. I use these brackets in pairs, usually two pairs per cabinet. I screw one bracket to the floor and the other to the bottom of the cabinet, installing them so that the vertical faces of the brackets ride against each other. Then I set the cabinets in place, level them, join them and screw the brackets together.

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