

Installing a Kitchen Sink

From cutting a hole in the counter to attaching the faucets and drain, a master plumber shows the way

by Peter Hemp

Installing a sink in a new kitchen can be one of the few enjoyable tasks a plumber performs—new kitchens smell so good. But if a sink is installed incorrectly, problems can haunt the homeowner for years to come and cause untold suffering for plumbers. I should know. I was once the victim of a bad kitchen-sink installation.

I had been trying to replace a faucet on an old cabinet-mounted basin. To get to the faucet connections, I had to remove the trap and scrunch up inside the cabinet on my back. I ended up with my shoulders not quite through the door and with my face just below the tailpiece of the drain.

I removed the old solid-brass watersupplies and, when I reached up and back to put my basin wrench on one of the faucet connections, the heavy, rim-mounted cast-iron bowl fell, jabbing the tailpiece into my face just below one eye. If I had been an inch or so more out of the cabinet, I probably would be either half-blind or dead today.

The installer had used caulk to glue a rim to the sink, evidently not knowing that there were punch-outs in the rim to hold the sink securely in place before installing sink clips. The sink was installed on plywood, and tile covered the counter and sink ledge, hiding the rim. No sink clips were used. The caulk long since had shrunk, cracked and dried out. I had been unaware of the danger I was in. So in this article I try to make the installation—and any future extraction—of a sink as simple, yet as complete and painless, as possible. Be aware that photos shown in this article were taken at different jobs, though all relate to installations discussed here.

Sink choices—There are three main types of sink: those in which the lip, or flange, of the bowl overhangs the counter surface (self-rimming)



Fitting it together. There's no doubt about it: Installing a kitchen sink can be difficult. There may be little room to maneuver under the cabinet, and because of the many different fittings, washers and fixtures available, a lot can go wrong. But if you follow directions and take your time, you can install a sink that gives years of trouble-free service.

(left drawing, facing page); those with the bowl hung from a mounting rim or from clips below the counter (rimless or underhung) (right drawing, facing page); and those with tile, marble or granite over the lip of the bowl (mudded-in or counter-over). I'll deal with rimless sinks in this article (photo above).

Cut the sink opening—You can make a template for a rimless sink, or use the mounting rim as a template. For the latter, center the rim right-side up on the counter and trace around the outside of the rim's central partition that will hang between the sink and the counter. If you're installing a self-rimming sink, you'll need a template that follows the contours of the sink yet that is 1½-in. smaller in diameter. The resulting rough opening will create a ledge that's ¾-in. wide for the self-rimming sink to bear on (left drawing, facing page).

To cut the opening, use a hole saw to bore through the counter anywhere on the inside of the scribed line. I like to drill through at each corner of the outline. Use a jigsaw with a blade made for plastics to cut the rough opening. Alternatively, use a small router. I hot-glue wood or cardboard strips across the corners on the bottom of the counter to support the offcut. The strips prevent the blade from binding and keep the laminate from chipping when the sawcut is complete.

Sometimes the sink opening is so close to the backsplash that you can't use a jigsaw along the back edge. In that case, put a metal-cutting blade in your reciprocating saw and go along the back wall from above (center photo, facing page). If you choose a fine-tooth blade and press masking tape firmly in place, you can complete the cut with minimal edge flaking.

When I'm happy with the fit of the bowl in the rough opening, I take it out one last time so that I can install the faucet.

Once the sink fits, attach the faucet—The first step in installing a faucet is to pack the underside of the faucet with plumber's putty (bottom photo, facing page). Make sure to push the putty well into the shallow recesses. With the sink upside down, set the faucet into the holes in the

sink. Drop the washers down the threaded connections and follow them with the lock-mounting nuts. I always use stainless-steel or brass washers and brass nuts. Tighten until the faucet is just barely movable by hand, then flip the bowl over and center the spout over the drain hole in the sink. Flip the bowl again and snug up the nuts. Keep checking the alignment.

Installing the sink in the counter—To install the sink permanently, lay the mounting rim flat-side down on a worktable and run a snake of plumber's putty about 1/4-in. dia. along the underside of the rim on the inside of the partition wall (top photo, p. 82). Next, set the sink upside down into the rim, and use a screwdriver or small punch and light hammer to tap in the punch-outs, trying to get the little tab arms as far out onto the edge of the sink as you can. The punch-outs in the partition usually are spaced at two different heights: Those closer to the flat rim are for enameled-steel sinks and non-self-rimming stainless-steel sinks; the punch-outs closer to the bottom are for thicker, non-self-rimming cast-iron and porcelain sinks.

Now run a continuous putty snake along the rim on the outside edge of the center partition, which is the surface that will rest against the countertop. Don't install basket strainers in the drain holes yet. You still want your hands to fit through. Now, pick up the sink, rim attached, flip it over and set it straight down into the rough opening. The rim overlaps onto the counter, and the sink hangs from the punch-outs.

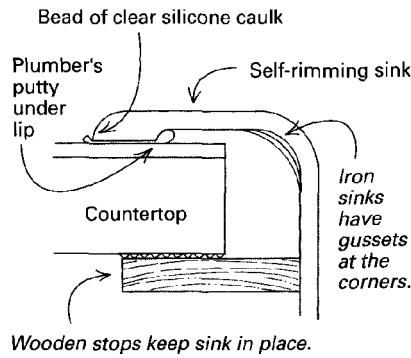
The next step is to attach the rim clips that secure the sink to the countertop. The rim usually comes with 12 clips, which I space equally. Working from underneath, hang the rim clips from the hooked edge and fasten them in place by tightening the hex-head machine screws. I use a tool called a "Rimster" (Chicago Specialty, 25300 Al Moen Drive, North Olmsted, Ohio 44070; 800-532-3377) for this because sometimes it's the only tool that will do the job (bottom photo, p. 82). As the screws are tightened, the rim is pulled downward, and the sink is driven upward to make firm contact. After making sure the sink is aligned and secure, make final adjustments to the position of any faucet you have installed and then carefully clean up the excess putty with a pocket knife.

Choice of supply depends on preference, water pressure—There is a variety of choices for tubing to supply water to your sink. For kitchen faucets, I prefer smooth, 3/8-in. chromed-brass supplies that have an acorn head rather than a flush-cut end (left tube, top left photo, p. 83). The acorn head seals to the beveled opening of the faucet connection without cone washers and friction rings. A slip nut holds it in place.

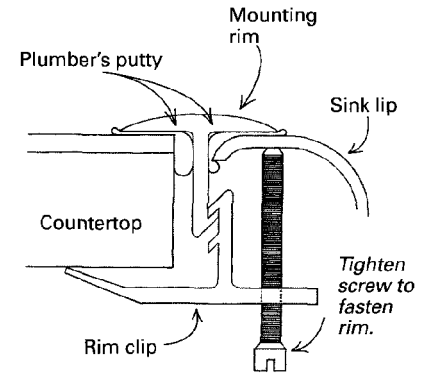
To begin installation of a 3/8-in. chromed-brass supply, slide the slip nut up the supply tube and hand-tighten the nut to the threaded faucet connection. Bend the supply tube so that it passes to the outside edge of the angle stops, which are the shut-off valves for the hot and cold supplies. Use a felt-tip pen to mark the supply tube about 1/4 in. below the bottom of the threaded sleeve for

Self-rimming sink installation.

A self-rimming sink rests on top of the counter. Caulk and putty keep water out of the cabinet below.



Rimless-sink installation. Rimless sinks fit into openings that are slightly larger than the outside diameter of the sink, which leaves room for the rim that holds the sink in place.



When a jigsaw won't fit.

If the backsplash is too close to the cutline to use a jigsaw, use a reciprocating saw with a metal-cutting blade.



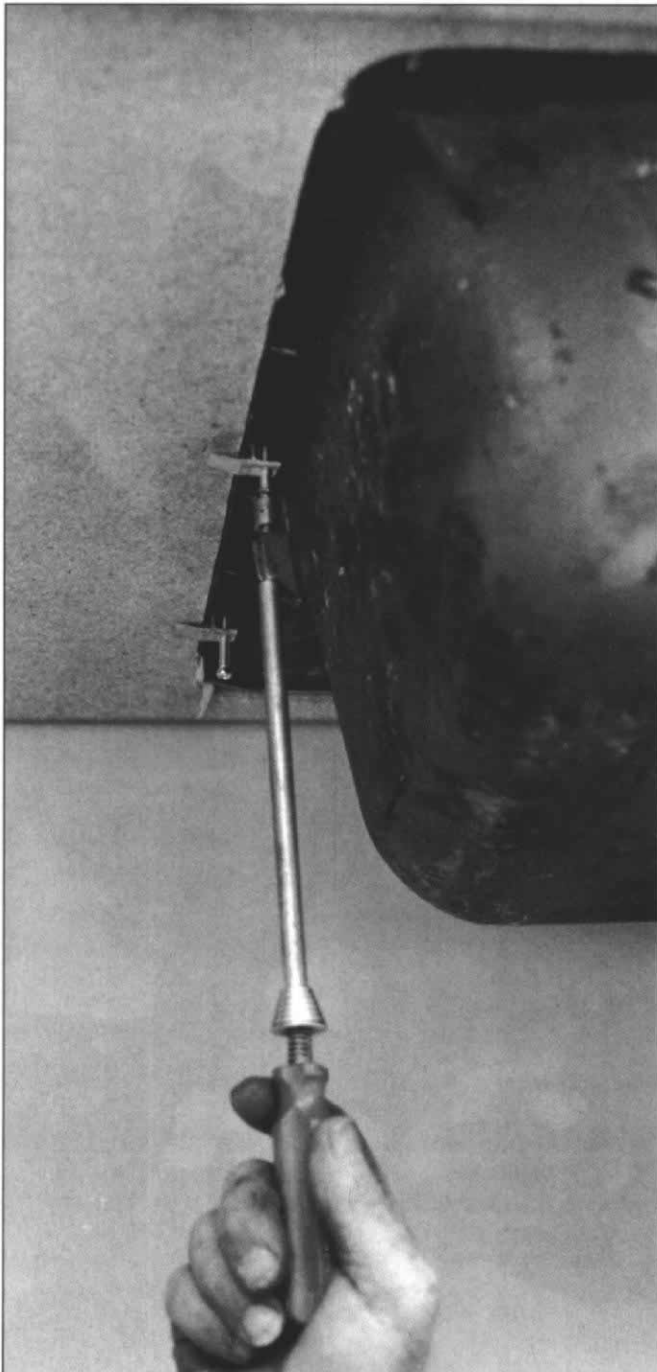
Pack faucets with putty.

Before installation of a faucet, pack the underside of the faucet-housing cavity with plumber's putty.

Putty the rim. Apply $\frac{1}{4}$ -in. dia. putty snakes to the underside of the rim before installing the sink.



Tighten mounting clips. Use this special tool called a "Rimster" to turn the hex-head machine screws that tighten the rim clips to the mounting rim. Most sinks come with 12 clips, which are best spaced equally.



the compression nut on the angle stop. Unthread the supply from the faucet connection, and use a tubing cutter to cut to length (top right photo, facing page). Now slide the brass compression nut and ferrule up the supply and insert the bottom of the supply tube into the threaded sleeve of the angle stop. Thread the compression nut onto the sleeve and insert the acorn head into the faucet connection as vertically as possible. Put pipe dope on the slip-nut threads and Teflon tape on the threaded connection, hand-tighten and then tighten with a wrench.

Braided stainless-steel supply tubes are also popular (right tube, top left photo, facing page). There are two brands I like to work with. Aquafllo has ground-metal seals (with no rubber) and can be used safely on high-pressure systems without a pressure regulator. Fluidmaster's "No-Burst" supplies have rubber seals, but I can use them only on systems regulated to 50 psi to 60 psi.

There are two types of plastic supply tubes. One is a $\frac{3}{8}$ -in. dia. polybutylene (PB) tube that has a head configuration similar to the acorn head. This type often is used with plastic-pipe systems and plastic angle stops and can be installed on the $\frac{3}{8}$ -in. compression connections of a brass angle stop. I recommend you avoid the reinforced PB supply that has swaged union nuts on each end that dig into the PB pipe as the compression nut is tightened. The joint where the swaged metal nut attaches to the plastic can fail.

You can use copper tubing to supply water to a faucet, but first you need to attach a $\frac{1}{2}$ -in. FIP (female iron pipe) to a $\frac{3}{8}$ -in. compression adapter at each faucet connection. First, wrap Teflon tape on the faucet connections and apply pipe dope to the adapters. Then, with the adapters attached to the faucet, slide the cut-to-length copper tubing into the faucet connection (sometimes several inches) and then lower the bottom of the tubing into the male-threaded connection of the angle stop.

The path from sink to drain line—The drainage system is made up of the *waste* and the *trap*. By waste I mean the strainer/stopper housing assembly at the bottom of the sink plus the tailpiece (drawing facing page). The tailpiece fits into the trap, the piping that carries wastewater to the drain line. The trap takes its name from the P-shaped fitting, called the P-trap, which prevents sewer gases from backing up into the house. Sink traps with 2-in. dia. pipe work much better than smaller diameter drains, so I'll discuss their installation.

Installing the waste and trap is fairly simple, but it helps to visualize the completed system, so I advise you always to dry-fit the components first. This way, you can take them apart and make necessary modifications until you see the path you should take to get to the wall.

Waste and trap systems are generally either of ABS or PVC plastic or, less frequently these days, chrome-plated tubular brass. I prefer to work with plastic piping because it is less prone to leaks. Schedule 40 ABS or PVC pipe and fittings, cut to length and cemented together, are a good, economical choice for kitchen-sink waste systems. Not all communities allow the use of ABS

or PVC piping for drainage systems, so always check your local code before installing a sink-waste system.

Start with the strainer—To install the basket strainer, wrap a 1/2-in. thick putty snake under the lip of the strainer housing and set the housing in the sink drain hole. Next, working beneath the sink, butter the bottom edge of the sink hole with pipe dope. Slide the rubber gasket over the housing, followed by the flat fiber or plastic washer, and thread the locknut up until it contacts the bottom of the sink. I hold the strainer steady with a special tool called a strainer wrench. To snug up the nut, I hold the strainer wrench with an adjustable wrench, and use a large pair of slide-jaw pliers on the nut.

Dry-fit the pipes to avoid problems—Because the 1/2-in. dia. tailpiece is smaller in diameter than the P-trap, you have to use adapters to connect to the larger pipe size. Therefore, the first piece off the tailpiece is a 1/2-in. trap adapter. Slide the slip nut from the trap adapter up the tailpiece almost to the top, followed by a slip-nut washer. The washer will hold the slip nut on the tailpiece so you can work with both hands.

Next, cut a piece of 1/2-in. dia. Schedule 40 pipe about 2-in. long and cement one end into the opening in the bottom of the trap adapter (drawing bottom right). Then cement the other end into the 1/2-in. side of a 1/2-in. by 2-in. ABS (or PVC) reducing adapter. Thread this two-adapter assembly to the slip nut at the top of the tailpiece, and you're ready to measure for the height of the 2-in. dia. riser that goes into the P-trap opening. (Installation of a 1/2-in. trap system is the same as for the 2-in. system, except that there is no need for the increasing adapter and the riser will be 1/2-in. pipe.)

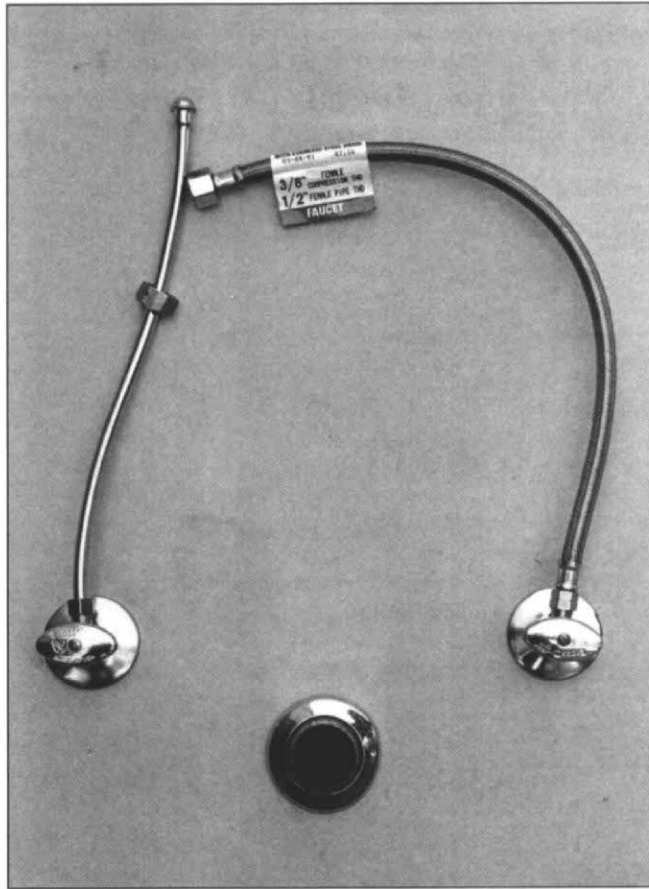
Hold the trap under the tailpiece at the correct height and as plumb as you can judge. Now measure the distance between the stop of the 2-in. side of the adapter and the bottom of the opening in the P-trap's J-bend (photo p. 84). Subtract about 1/4 in., cut a piece of 2-in. pipe this length and dry-fit the three parts.

The sink drain ties into the house's plumbing system by way of a short stub of 2-in. pipe protruding through the wall under the sink. Dry-fit a coupling to this stub and measure the distance from the inside of the coupling to the outlet of the P-trap (top photo, p. 85). As long as the tailpiece penetrates the trap at least 1 in., I'm comfortable. This distance (again, less about 1/4 in.) will give you the length of the trap arm. Cut a piece of pipe to length, and dry-fit the trap arm.

If the drain opening in the sink is offset significantly from the connection at the wall, use a 22 1/2°, 45° or 90° fitting on the trap arm so that the arm will enter the coupling on a straight line. When you're satisfied with the fit of the trap, do the final assembly.

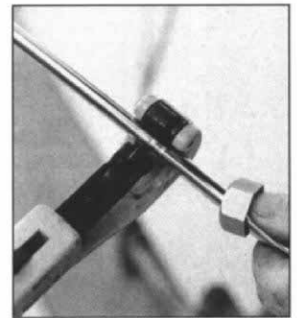
Plumbing a double-bowl sink—If you are installing a double-bowl sink, you can connect both bowls to a single trap.

To do so, you have to employ some fittings and a tee to connect the tailpieces to the P-trap. In

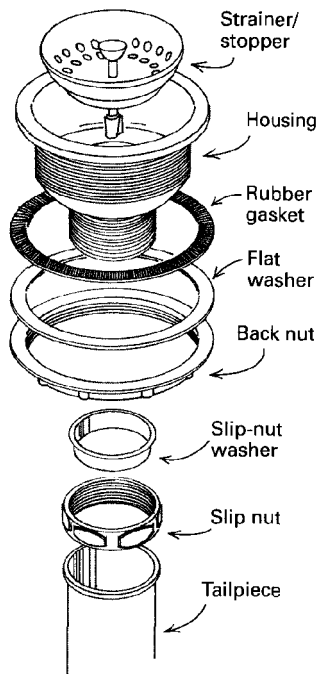


Two kinds of supply tubes. Chromed-brass supplies with an acorn head (left) and braided stainless-steel supplies (right) provide leak-proof connections between the faucet and the supply valves (angle stops).

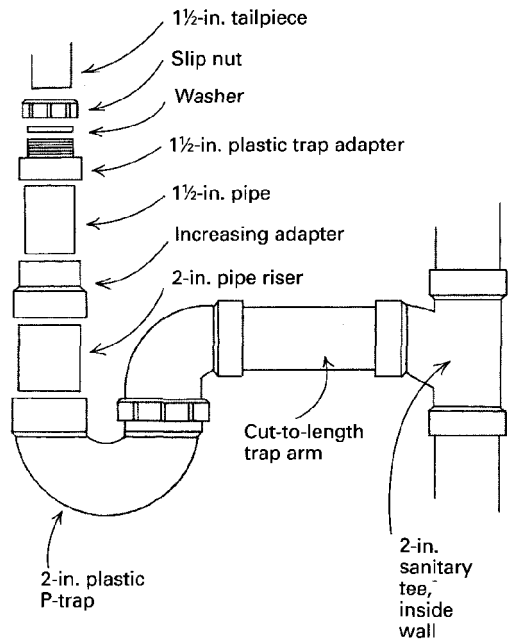
Cut the supply tube to fit. After marking the supply-tube length with a felt-tip pen, cut the tube to length with a tubing cutter.



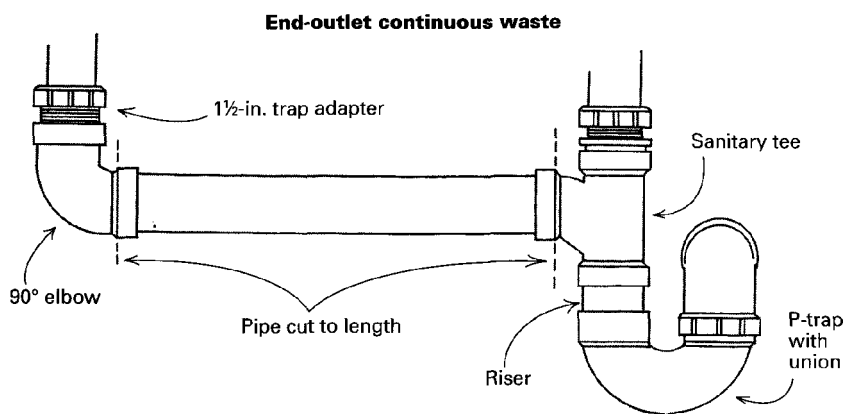
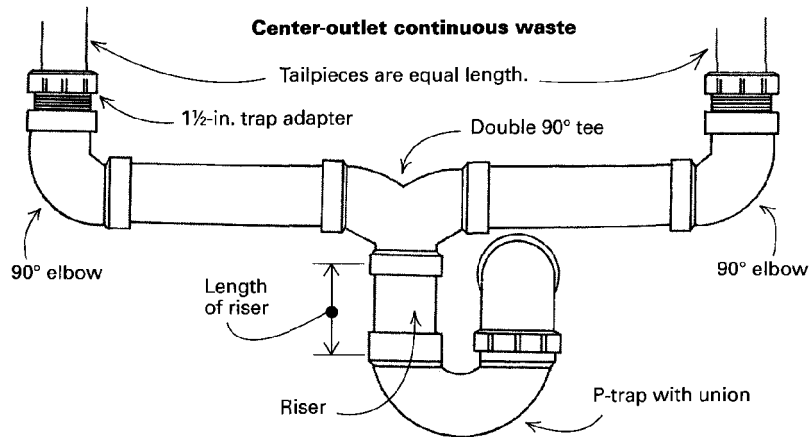
Waste assembly. These are the parts of a basket-strainer installation, from the strainer/stopper down to the tailpiece.



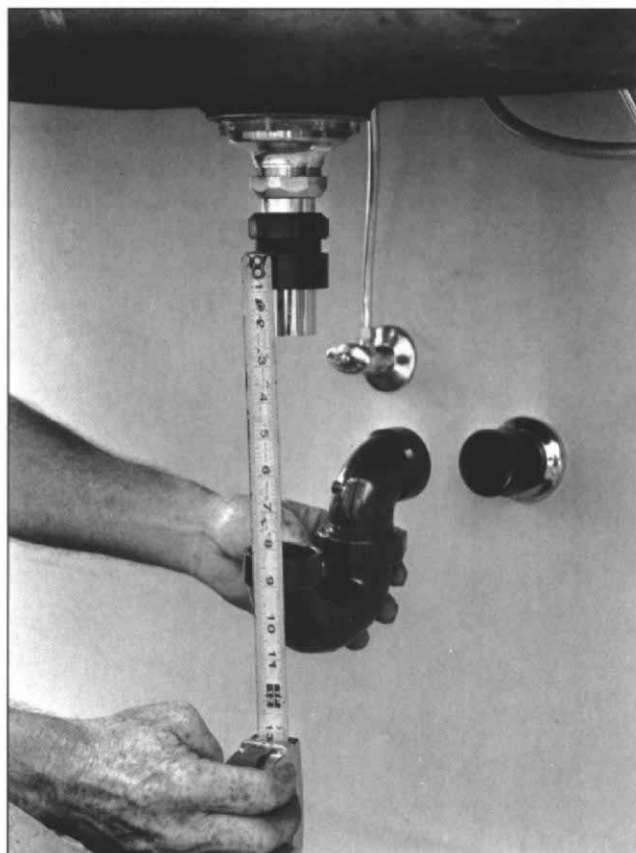
Trap assembly. The best way to drain a kitchen sink is with a 2-in. drain line. But the tailpiece is typically 1/2-in. dia. brass tubing. Use the trap adapter and the increasing adapter shown below to connect a brass tailpiece with a 2-in. plastic P-trap.



Trap assemblies for double-bowl sinks. Connect a sink with two bowls to a single P-trap by way of a tee fitting. If the drain is between the bowls, use the center-outlet continuous waste. If the drain is to the side, choose the end-outlet waste.



Measure distance from tailpiece to trap. To determine the length of the riser that will connect the P-trap to the tailpiece, hold the trap under the tailpiece plumb and at the correct height. Then measure the distance between the stop of the trap adapter on the tailpiece and the opening in the trap. This is a 1 1/2-in. drain line. If it were a 2-in. drain, the riser also would include an increasing adapter.



plastic pipe, there are double-90° tees, which are used in a horizontal plane, and sanitary tees, which are used vertically (drawings left). If the drain is roughly equidistant between the bowls, you should use a double-90° tee with two 90° elbows attached to the tailpieces of each basket strainer. Sections of plastic pipe, cut to fit, connect the elbows to the double 90°. If the drain is close to one of the bowls, you're better off using a sanitary tee on one tailpiece and a 90° elbow and section of plastic pipe to the tailpiece of the second sink. If you are installing a garbage disposal, your code may demand that the disposal discharge straight down into the inlet leg of the trap and not into the 90° elbow. In this case you would have to use a sanitary tee.

Hooking up the double-bowl drain—If you're installing a center-outlet continuous waste, both tailpieces will be connected to 90° elbows by way of trap adapters. Determine the location of the double-90° tee (it should be directly above the inlet leg of the P-trap), and hold the double-90° in that location as you measure the distance between the double 90° and the 90° elbows. Cut two pieces of pipe long enough to connect the two 90° elbows with the double 90°. The pipes should bottom into the sockets in the fittings, and the 90° elbows should end up directly beneath the trap adapters.

Next, determine the length of the riser that extends from the bottom of the double-90° tee to the inlet of the P-trap. Connect the assembly to the tailpieces temporarily. Measure the distance from the stop in the outlet of the bottom of the tee to the stop in the inlet leg of the P-trap. Cut a short piece of plastic pipe for the riser, which will span the gap between the double 90 and the trap, and then glue.

Now determine the trap-arm length (top photo, facing page). Dry-fit the trap to the riser, then measure the distance from the trap's outlet to the sanitary tee or stub-out that extends from the wall. Cut a length of plastic pipe to fit and glue.

The procedure for installing the plastic end-outlet continuous waste is similar to the center-outlet pattern, except you need to install only one quarter-bend fitting (drawing bottom left).

Begin by installing the inlet to the sanitary tee to the tailpiece on the bowl nearest the drain. Measure over to the tailpiece of the other sink to determine what length pipe you need. Install the pipe and quarter-bend with trap adapter to the far tailpiece and into the sanitary tee's branch on the near tailpiece, then measure for the length of the outlet riser. Fit the P-trap and trap arm as explained for the center-outlet pattern.

Installing brass is similar, but the parts are different—Not all communities allow the use of ABS or PVC piping for drainage systems, so you may have to use the more complicated tubular brass (center photo, facing page).

To construct a center-outlet continuous waste in brass, you should estimate the length of the two tube 90s (a length of pipe that has a 90° curve in one end with belled ends and slipnuts) that connect the tailpieces to the center-outlet tee. Measure the distance between each sink tail-

piece and the intended location of the center-outlet tee, and buy two 1 1/2-in. slip-nut tube 90s, the closest length to this measurement. They're generally available in lengths from 7 in. to 26 in.

Next, determine the length of the tailpiece that will extend from the bottom of the tee to the inlet of the P-trap. Hang the tube 90s on the basket-strainer tailpieces temporarily. Then tape them together if they are long enough to overlap (if they don't quite reach, use a pencil for a splint). Measure the distance from the bottom edge of the tube 90s to the bottom of the bell in the P-trap's inlet. This distance will determine whether you can use a center-outlet tee that has a short (usually no longer than 3 1/2 in. to 4 1/2 in.) factory-installed tailpiece or a tee with a separate tailpiece that you'll cut to length.

If you have to use a separate tailpiece extension, you can buy either a center outlet with a slip-nut connection at the tailpiece, which I prefer, or one with a threaded connection. The 1 1/2-in. dia. tailpiece has a flat lip on the top ("direct connect"), and once you thread the slip nut to the bottom outlet of the tee, you cannot pull the tailpiece back out. I use a flat, cord-reinforced rubber washer on top of the lip.

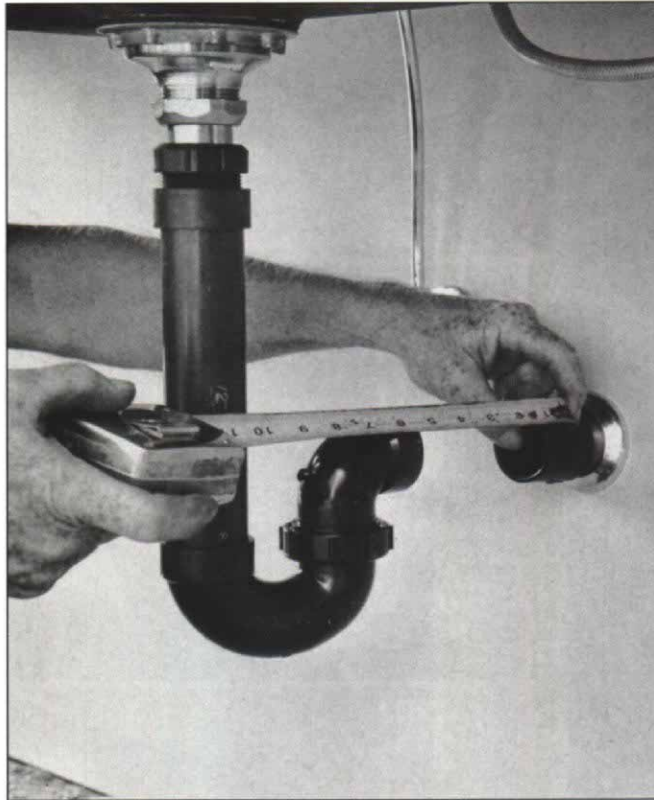
Now hold the center outlet and measure to the full depth of the branch sockets to determine the length of the tube 90s. Trim the tube 90s to final length, and connect them to the center outlet. Then measure and cut the tailpiece to length.

Now you can determine the trap-arm length. Hang the P-trap temporarily to the tailpiece, then attach the trap arm to the P-trap and hand-tighten. Does the trap arm reach the sanitary tee at the wall straight on, and if so, will it penetrate deeply enough for a good seal? Sometimes you can swing the P-trap and pivot the trap arm to help create an offset that allows a straight-on approach to the sanitary tee. If the trap arm is too short to reach the wall, you can purchase separate, one-piece, extralong trap-arm extensions that you can cut to length. Or you can buy a slip-nut tailpiece extension to add to the trap arm. Once you cut all pieces to length and dry-assemble them, reassemble using Teflon tape and pipe dope at the connections.

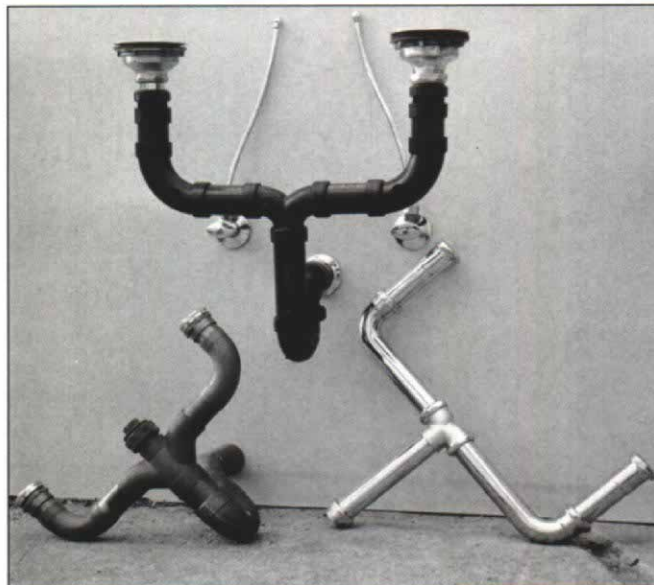
Installing the tubular brass end-outlet continuous waste is much the same as the center-outlet pattern, except you need only one tube 90. The end-outlet tee is available either with a factory-installed tailpiece, female threads for a threaded tailpiece or all-slip-nut connections.

Begin by installing the end-outlet tee to the tailpiece on the bowl nearest the drain. Measure over to the tailpiece of the other sink to determine what length tube 90 you need. Install the tube 90 on the far tailpiece and into the end-outlet tee on the near tailpiece, then measure for the length of the outlet tailpiece. Fit the P-trap and trap arm as for the center-outlet pattern. □

*Peter Hemp is a residential plumber based in Albany, Calif. He is author of *Plumbing A House, a basic plumbing manual*, and *Installing and Repairing Plumbing Fixtures*, from which this story was adapted. Both were published last fall by The Taunton Press. Photos by Jeff Beneke unless otherwise noted.*



Figuring the length of the trap arm. With the P-trap and riser dry-assembled, measure the length of the trap arm. The arm should reach to the bottom of the fittings' sockets, minus 1/4 in.



Materials for waste systems. Choices of material for the waste system include PVC and ABS plastic (top), copper (left) and tubular brass (right). The wastes and traps shown are for double-bowl, center-outlet continuous waste systems.



Ready for a workout. After all the work is done, this sink is ready to give its owner years of trouble-free service.