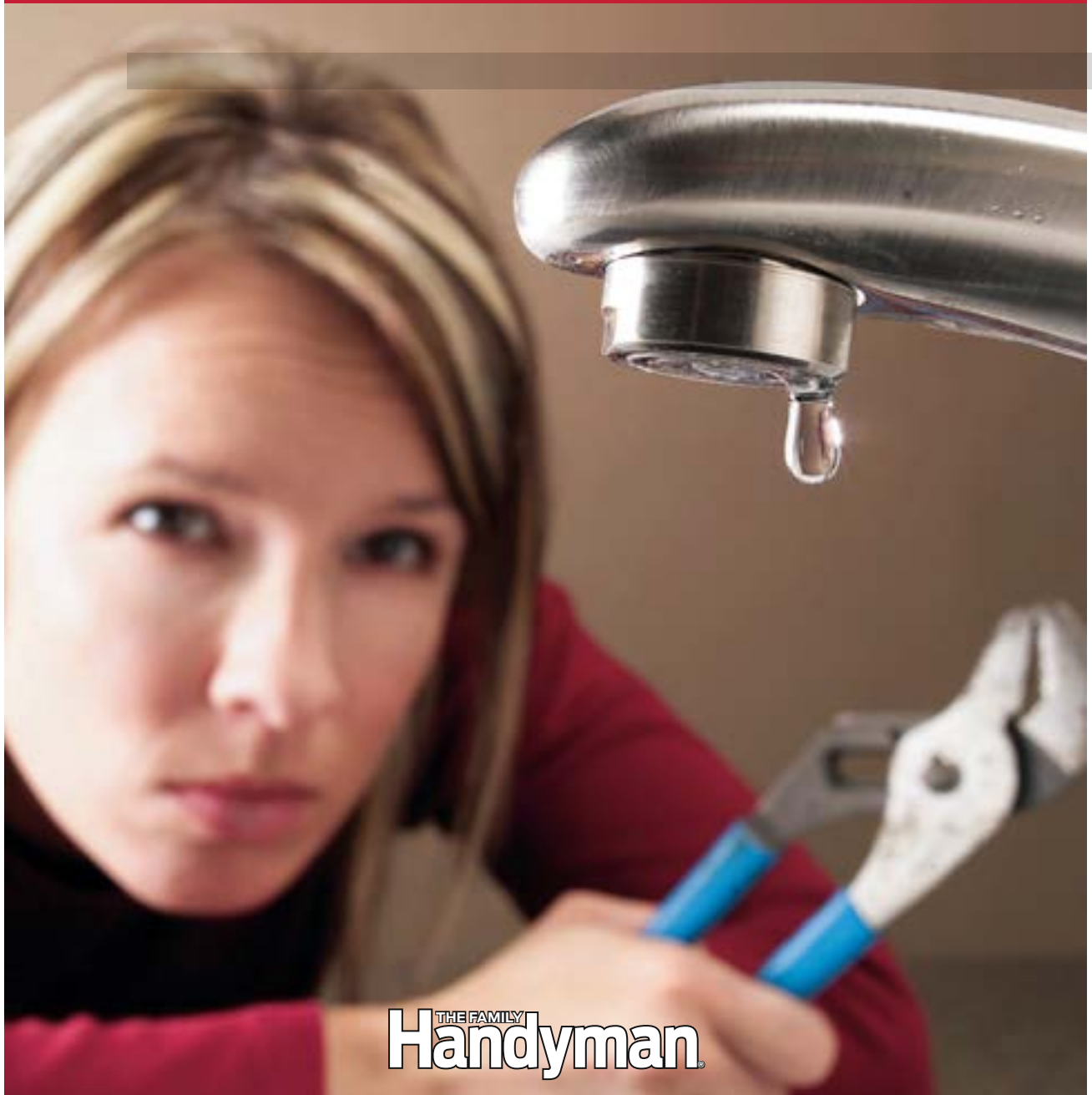


EASY PLUMBING REPAIRS



THE FAMILY
Handyman

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Repair a washer-type faucet

A leaky faucet has a torturous way of wearing on nerves and water resources. Even a slow drip can waste hundreds of gallons per month. Luckily, most dripping washer-type faucets can be cured in 30 minutes for less than a dollar.

To repair a washer-type faucet, you'll need to replace the washer on the bottom of the valve stem and sometimes replace the valve seat as well. Replace washers for both the hot and cold water while you're at it, not just the one that's leaking. Before you begin, turn off the water-supply valves and close the sink stopper so small parts won't disappear down the drain.

Most faucet handles are secured by a screw, which is sometimes covered by a snap-on cap or button. You may need to tap, wiggle or pry the handle a bit to remove it. The washer on the end of the valve stem may be flat or beveled. The new washer should be the same profile and fit snugly inside the circular lip without having to be forced.

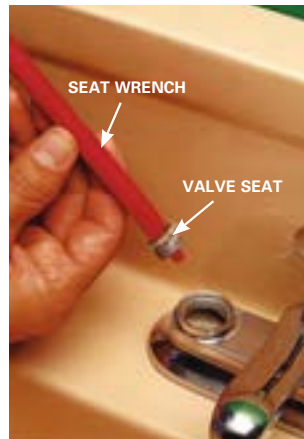
With your finger, feel down inside the area where the stem assembly enters the faucet to determine whether the valve seat is rough or grooved. If it is, replace it with a new valve seat that exactly matches the old in diameter, height and threads.



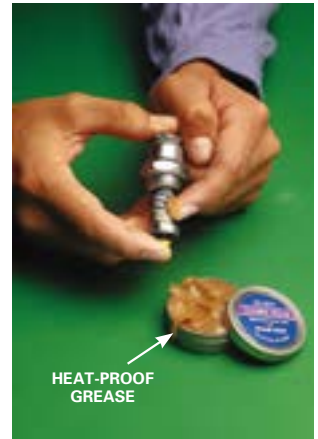
1 REMOVE screw holding handle, then loosen and remove packing nut. Remove stem assembly.



2 REMOVE worn washer and replace it with correct type: flat or beveled. New washer should fit snugly without being forced.



3 USE seat wrench to remove worn valve seat. New seat must match old one exactly in diameter, height and number of threads.



4 LUBRICATE working parts of stem assembly with heat-proof faucet grease. Reassemble faucet.

Repair an outdoor faucet

Most outdoor faucets, including the freeze-proof one shown, have a washer at the end of the long valve stem. Freeze-proof faucets are particularly prone to worn washers because, when the faucet is turned off, it continues to drain for a few seconds;

consequently, people tend to turn the faucet tighter, damaging the rubber washer. Before beginning your repair, turn off the faucet's water supply.



1 UNSCREW handle and remove packing nut. Hold faucet steady while loosening the nut to avoid twisting the interior pipe. Even hard copper pipe can be twisted.



2 PULL stem out of faucet. For removal, some stems have to be turned so a key lines up with a slot; reattach handle to turn and pull stem.



3 REMOVE and replace rubber washer on the stem end. If there are rubber O-rings on stem, replace these as well.

Repair a rotary ball faucet

Water flow and temperature in a rotary ball faucet are controlled by a hollow ball that rotates in a socket. Delta and Peerless are two of the major brands. Your faucet may have a brass or plastic ball. Both work well, although the long-lasting stainless steel ball comes with most repair kits. We recommend that you buy a repair kit that includes the ball, springs, seats and O-rings for the spout, as well as a small repair tool, for about \$15. With this kit, you'll be prepared for almost any repair.

If water is leaking out around the base of the handle, you may be able to fix the leak by removing the handle (Photo 1) and simply tightening the adjusting ring slightly. Turn it clockwise with the spanner tool included in the repair kit. If the faucet drips from the end of the spout, replace the seats and springs (Photo 4). To stop leaks from the base of the spout, see "Repair a leaky faucet spout," p. 8.

Reassembly is straightforward. Drop the springs in the recesses and press the rubber seats over the top with your fingertip. Then align the groove in the ball with the pin in the socket and drop in the ball. Align the lug on the plastic cam with the notch in the valve body and set it over the ball. Thread on the cap with the adjusting ring and tighten it with the slip-joint pliers. Now you can turn on the water to check for leaks. If water leaks from around the ball stem, use the spanner tool to tighten the adjusting ring until the leak stops. Replace the handle and you're done.





1 LIFT the handle and pry off the decorative cover to expose the Allen screw. Turn the screw counterclockwise until it's loose enough to lift the handle up from the stem.



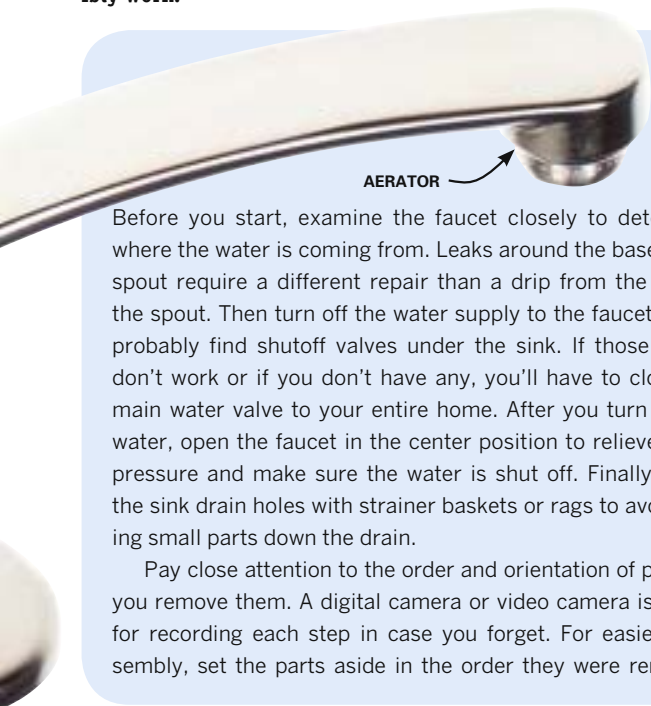
2 UNSCREW the cap by turning it counterclockwise with a slip-joint pliers.



3 LIFT off the plastic cam and packing. Lift out the ball and inspect it. Replace the ball if it's scratched, cracked or visibly worn.



4 LIFT out the two rubber seats and springs with a screwdriver. Make note of the orientation of the tapered spring and install the new springs and seats the same way. Reassemble the faucet.



Follow these basics for all faucet repairs

Before you start, examine the faucet closely to determine where the water is coming from. Leaks around the base of the spout require a different repair than a drip from the end of the spout. Then turn off the water supply to the faucet. You'll probably find shutoff valves under the sink. If those valves don't work or if you don't have any, you'll have to close the main water valve to your entire home. After you turn off the water, open the faucet in the center position to relieve water pressure and make sure the water is shut off. Finally, cover the sink drain holes with strainer baskets or rags to avoid losing small parts down the drain.

Pay close attention to the order and orientation of parts as you remove them. A digital camera or video camera is handy for recording each step in case you forget. For easier reassembly, set the parts aside in the order they were removed.

When all the parts are out, inspect the interior of the valve for bits of deteriorated gaskets or mineral deposits. Use a cloth or fine nylon abrasive pad to clean the surface. Loosen mineral deposits by soaking them in vinegar. Slow water flow can be caused by plugged holes in the faucet body. Use a small screwdriver or penknife to clean them out. Before you replace worn parts and reassemble the faucet, hold a rag over the faucet and open the water shutoff valve slightly to flush out debris that may have been loosened during the cleaning and inspection.

After the faucet is reassembled, open the faucet to the middle position and gradually open the shutoff valves to turn on the water. Leave the faucet open until water flows freely and all the air is out of the pipes. If the water flow through the faucet is slow, the aerator may be plugged. Unscrew the aerator and clean it out.

Repair a cartridge-style faucet

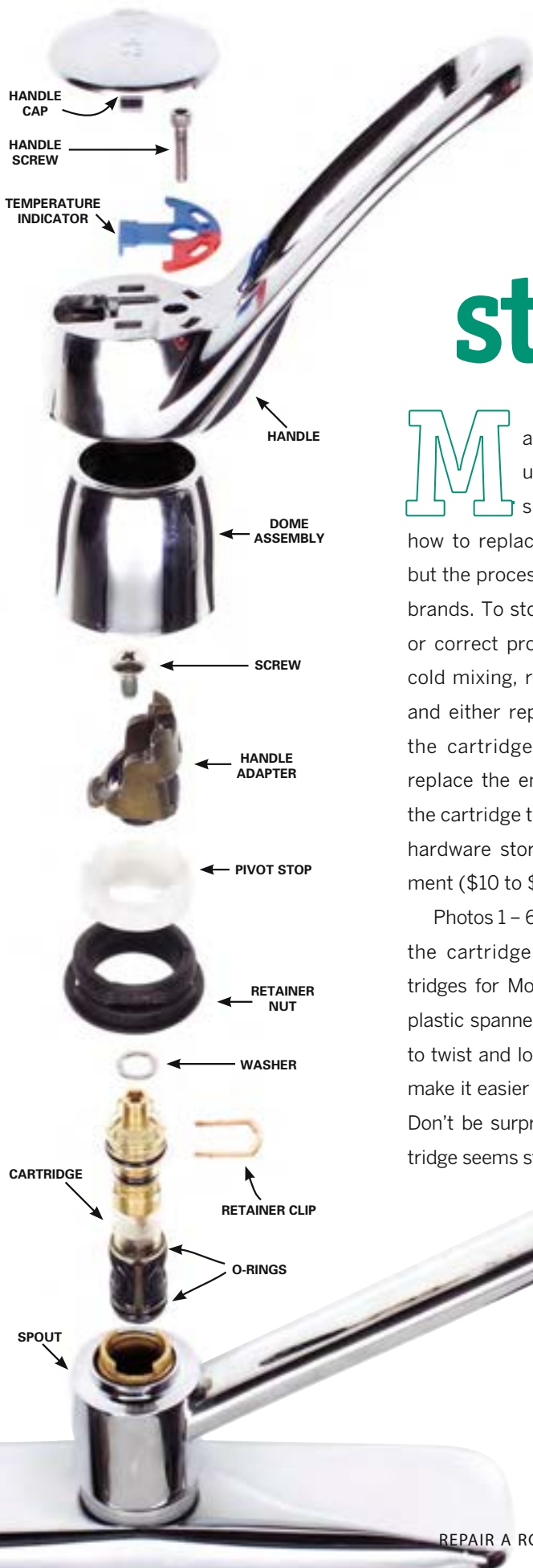
It may take considerable force to pull it out. Really stubborn cartridges may require the use of a special cartridge-pulling tool. Moen's version costs about \$15 and is available at most home centers.

Many faucet brands use a cartridge of some type. We show how to replace a Moen cartridge, but the process is similar for other brands. To stop drips at the spout or correct problems with hot and cold mixing, remove the cartridge and either replace the O-rings on the cartridge if they're worn or replace the entire cartridge. Take the cartridge to the home center or hardware store to find a replacement (\$10 to \$15).

Photos 1 - 6 show how to remove the cartridge. Replacement cartridges for Moen faucets include a plastic spanner cap that allows you to twist and loosen the cartridge to make it easier to pull out (Photo 5). Don't be surprised if the cartridge seems stuck.

Reassemble the faucet in the reverse order. Pull the stem up before inserting the cartridge. You may have to twist the cartridge slightly to line it up for the brass retainer clip. Use the plastic spanner cap or the tips of a needle-nose pliers to rotate the cartridge. Slide the brass clip into the slots in the valve body to hold the cartridge in place. Look for the small notch on top of the stem and rotate the stem until the notch faces you (Photo 4). Install the remaining parts and

reattach the handle. The directions that come with the stem will help orient you here. Then test the faucet. If the hot and cold water are reversed, simply remove the handle, dome assembly and handle adapter and rotate the stem 180 degrees.





1 PRY off the handle cap (gently) with a knife. Turn the Allen screw counterclockwise to remove it and lift off the handle.



2 UNSCREW the dome assembly under the handle. Then unscrew the metal handle adapter and lift it off. Lift off the plastic pivot stop.



3 REMOVE the retainer nut by turning it counterclockwise with a large slip-joint pliers.



4 PRY out the brass retainer clip with the tip of a screwdriver. Grab the clip with a pliers and pull it the rest of the way out to avoid losing it.



5 LOOSEN the cartridge by slipping the plastic spanner cap (included with the new cartridge) over the cartridge and twisting it back and forth.



6 GRAB the cartridge stem with a pliers and pull it straight up and out. Replace worn parts and reassemble the faucet in the reverse order.

Find the right replacement parts

You'll often find the brand name stamped on the faucet. And this information will help when it comes time to find repair parts. But in most cases, the safest bet is to take the worn parts to the store with you.

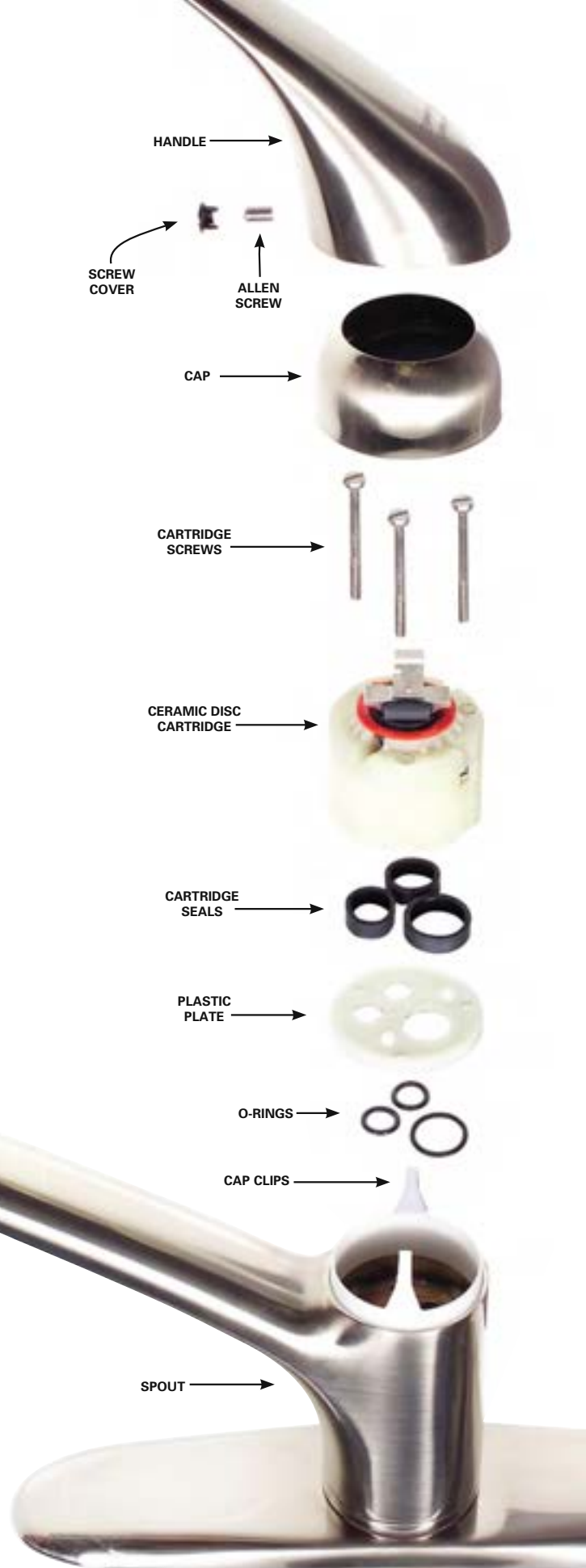
If you have a Delta or other rotary ball faucet, you're in luck because you'll find repair kits in most hardware stores and home centers. Cartridges and repair kits for Moen "cartridge-type" faucets are also readily available. But if you have another

brand or a disc-type faucet, you may have to order parts, since there are too many variations for most stores to keep in stock. It helps to know the faucet's model name or number when searching for a replacement cartridge. Otherwise, take the cartridge with you to the store so you can match it to a photo in the parts catalog. Plumbing supply specialists are also a good source of repair parts. If you're having trouble finding parts, call the manufacturer of your faucet for help.

Repair a ceramic disc faucet

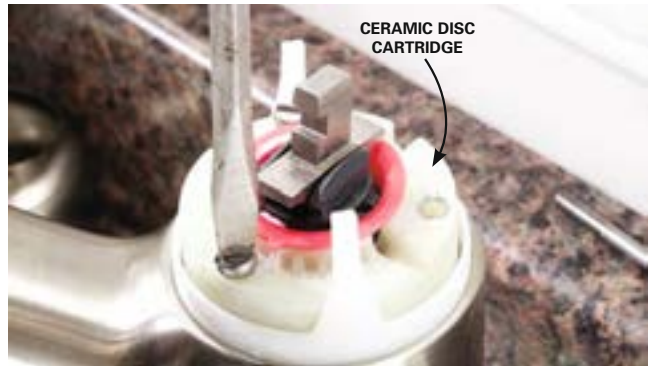
Ceramic disc valves are simply another type of cartridge. Discs inside the cartridge control the water flow. This type of valve is sturdy and reliable and rarely needs fixing. In fact, many manufacturers offer a lifetime guarantee on the cartridge. If yours is damaged, check with the manufacturer to see if it's covered by a warranty. Leaks can result from faulty rubber seals or a cracked disc inside the cartridge. Since it's difficult to spot a cracked disc, and disc cartridge replacements are very expensive (\$20 to \$50), it's best to start by replacing the seals and reassembling the faucet. Then if the faucet still leaks, remove the disc cartridge and take it to the store to order a replacement.

Early versions of ceramic disc faucets may be more fragile and can crack if subjected to a blast of pressurized air. That's why it's important to leave the faucet open as you turn the water back on. This allows air trapped in the lines to escape. When the water runs smoothly, it's safe to turn the faucet off. Manufacturers have improved the strength of ceramic discs on newer faucets to withstand air blasts, as well as abrasive debris that may get dislodged from the inside of pipes.





1 PRY off the decorative screw cover with your fingernail or the tip of a knife. Unscrew the handle screw by turning it counterclockwise with an Allen wrench. Lift off the handle. Unscrew or unclip the cap.



2 REMOVE the screws that hold the disc cartridge to the faucet body and lift out the cartridge.



3 INSPECT the cartridge for mineral buildup and carefully clean it out. Then replace the rubber seals on the underside.



4 LIFT out the plastic plate (on some faucets) and replace the O-rings under it. Inspect the holes in the faucet body and clean them out if they're clogged.

Repair a leaky faucet spout

Leaks around the base of the spout are caused by worn O-rings located under the spout. All that's usually required to access these O-rings for replacement is to wiggle and pull up on the spout to remove it (Photo 1). Depending on your faucet, you'll also have to remove the handle and other parts to access the spout. Be persistent. The spout may be a little stubborn. Spout O-ring kits are available for many faucets, or you can take the old O-rings to the hardware store or plumbing supply store and match them up with new ones. Remember to pick up a small toothpaste-type tube of plumber's grease while you're there.

In Photo 1, you can see the diverter valve, which controls water to the sprayer. Their appearance varies considerably among brands, but you'll usually find them under the spout. If your

sprayer isn't working properly, first clean it in vinegar or simply replace it (\$5 - \$22). If this doesn't work, the diverter valve may be clogged. If it

doesn't simply pull out, contact the manufacturer or ask a knowledgeable salesperson for help with cleaning it.



1 REMOVE the handle and cartridge. Twist and pull up on the spout to remove it and expose the O-ring seals.



2 SLIP the tip of a screwdriver under the O-rings to slide them out of the groove. Install the new O-rings, lubricate them with plumber's grease and reinstall the spout.

Replace the drain assembly for a kitchen sink



Some leaks can't be stopped with straightening or tightening. Stripped nuts won't tighten and old washers won't seal because they're stiff and distorted. You could get new nuts, washers or drain parts. Since plastic pipe is so inexpensive and easy to install, the smart, reliable fix is a whole new drain assembly. You can buy everything you need at home centers for \$10 to \$15. Kits for side outlet assemblies (like the one shown

here) or center outlet assemblies (where the trap is beneath the center of the sink) contain most of the essential parts. But you might also need:

- Long tailpieces (Photo 1). The tailpieces that come with kits are often only a couple of inches long.
- A trap arm extender (Photo 2). The arm that comes with the kit may not reach the drainpipe that protrudes from the wall.
- A dishwasher wye that has a connection for your dishwasher hose.



1 ATTACH the tailpiece to the basket strainer, but don't fully tighten it yet; you'll have to remove and cut it later.



2 SLIDE the trap arm into the adapter. Then attach the trap and slide the arm in or out to position the trap directly under the tailpiece. You may need to cut the arm or add an extender.

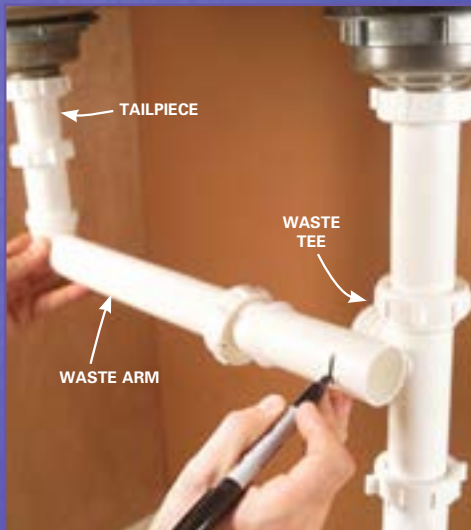


3 HOLD the waste tee alongside the tailpiece about 1-1/2 in. below the top of the trap. Mark the tailpiece 1/2 in. below the top of the tee. Cut both tailpieces to the same length and install them.



- A disposer kit that allows the waste arm to connect to a garbage disposer.
- PHOTOS 1 - 5** detail the whole replacement process. Here are some pointers for a smooth project:
- You'll have to cut a few pipes: both tailpieces, the waste arm and maybe the trap arm. A fine-tooth hacksaw works best.
 - When in doubt, mark and cut pipes a bit long. Better to cut twice than cut too short and make an extra trip to the hardware store.

- Don't forget to insert tailpiece washers (Photo 1). Other joints require cone washers. The only joint without a washer is the ground joint at the trap.
- Assemble everything loosely until the whole assembly is complete. Then tighten all the slip nuts.
- Hand-tighten the slip nuts. If any joints leak when you test the new assembly, tighten them slightly with slip-joint pliers.
- When you're all done, test the assembly for leaks.



4 SLIP the waste arm onto the second tail-piece, make it extend about 3/4 in. into the tee and mark it. Cut and install it.



5 LOOSEN the slip nuts and slide the tee up or down so the waste arm slopes slightly down toward the tee. Tighten all the nuts.



Tip:
Brush a little Teflon pipe thread sealant on male threads. It lubricates the threads and makes slip nuts much easier to tighten. Check the label to make sure the sealant is safe for plastic.

Install a new sink and faucet

Ready to replace your worn-out sink and faucet? Here you'll learn how to do just that. This stainless steel sink has an extra-large bowl to accommodate big pots and is made of heavy 18-gauge stainless steel with a well-engineered clamping system. This deluxe sink cost \$600, but top-quality sinks with fewer features are available for as little as \$200.

While the sink is out, it's an easy job to replace the faucet. The faucet shown here cost about \$150. Similar faucets range from \$130 to \$300.

Installing a new sink and faucet is easier than ever thanks to the simple-to-cut-and-assemble white plastic (PVC) drain parts (Photo 7) and nearly foolproof flexible water supply tubes (Photo 6). Some plumbing experience would be helpful, but even without it you can replace your sink and faucet in less than a day using a few basic tools that you probably already own. You'll need large groove-joint pliers for the drain fittings (Photo 1), a fine-tooth saw to cut the plastic pipe, a set of open-end wrenches or two adjustable wrenches to loosen and tighten the supply tubes, and hex head nut drivers for the sink clips and the clamp on the dishwasher drain. If you have a plastic laminate countertop and need to enlarge the hole for the new sink, you'll also need a jigsaw.

Buy a new sink the same size as the old

Measure your old sink. The standard size is 33 x 22 in. and about 7 in. deep. If yours is this size, you'll have no problem finding a new one to fit the same hole. If you want to install a sink that's larger or deeper than your current one, first check the cabinet width below to make sure it'll fit. Then decide how to enlarge the hole. If your countertop is stone, tile, solid surface (Corian, for example) or metal, you may have to hire a pro to enlarge the hole. If it's wood or plastic laminate, enlarge the hole yourself with a jigsaw.

Tips for removing the old sink

Getting the old sink out is usually harder than putting the new one in. Old plumbing parts are likely to be corroded, and the sink may be glued to the counter with caulk or caked-on gunk. Sinks are mounted in several ways, but here are a few general tips for removing yours:

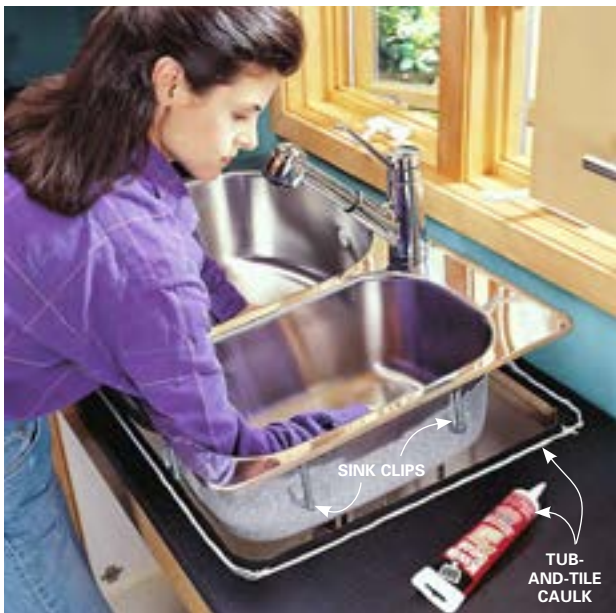
- Place a bucket under the trap to catch wastewater while you loosen the slip-joint nuts.



- 1** Remove the trap and other drain parts by loosening the slip-joint nuts with large groove-joint pliers or a pipe wrench. Disconnect the disposer from the sink by sticking a large screwdriver or disposer wrench into the ring near the drain and twisting it counterclockwise. Close the water valves and disconnect the tubes leading to the faucet. Hold the shutoff valve steady with one wrench while you loosen the supply tube nut with a second wrench. Remove any clips holding the sink in and lift the sink out.



2 Mount the new faucet to the new sink. Follow the instructions provided with your faucet. Protect your countertop with cardboard.



3 Set your new sink in the countertop to check the fit, then trace around it with a pencil. Enlarge the hole if necessary. Remove the sink and apply a bead of mildew-resistant tub-and-tile caulk just to the inside of the pencil line. Set the sink back in the hole and use a nut driver to tighten the clips that hold the sink down. Tighten the clips just enough to close the gap between the sink and countertop. Don't overtighten. Clean up the excess caulk with a damp cloth.

Parts and supplies

- Plumber's putty (\$2)
- Tub-and-tile caulk (\$3)
- Two basket strainer assemblies (only one if you're installing a disposer; \$13 each)

You'll need the following 1-1/2-in. PVC drain parts:

- One P-trap assembly (\$5)
- One end or center outlet waste kit (\$5)
- Two sink tailpieces (\$2 each)—only one if you're installing a disposer. If you have a dishwasher and no disposer, get a special "dishwasher" tailpiece (\$3) that has a tube to connect the dishwasher drain hose.
- One special "disposer" waste arm (\$3.50), if you have a disposer.
- Two flexible water supply tubes for kitchen sinks (\$4 each). Match the nuts on the ends to the threads on your faucet and shutoff valves. Also measure to determine the right length. Buy everything at a home center, hardware store or plumbing supplier.



4 Roll plumber's putty into a 1/2-in.-diameter rope and place it around each drain opening. Press the top half of the basket strainer assembly down into the plumber's putty on one side. On the other, press the disposer drain down into the putty.



5 Assemble the undersink half of the basket strainer assembly and tighten the large nut with groove-joint pliers. Hold the basket with your hand to keep it from spinning. Reassemble the disposer drain and tighten the three screws. Clean the excess plumber's putty from around the drain openings and polish the sink with a dry cloth.



6 Connect the water supply valves to the new faucet with flexible braided stainless steel sink connectors. Hand-tighten the connections. Then turn them an additional quarter turn with a wrench.



7 Loosely assemble the new PVC drain fittings. Hold up and mark parts needing to be cut. Then saw them with a fine-tooth wood saw or hacksaw. Slope the horizontal pipes down slightly toward the drain in the wall. Hand-tighten all the fittings and turn the nuts an additional quarter turn with large groove-joint pliers.

- Remove the disposer (Photo 1). Place paint cans and boards under the disposer to support it as it comes loose.
- Use a pair of pipe wrenches to separate drain parts that won't yield to large groove-joint pliers. Don't worry about damaging the pipes; you'll be replacing them with new plastic parts anyway.
- Add shutoff valves if your hot and cold water supply pipes don't have them.
- Working carefully, slice the caulk around the sink with a utility knife, then slip a stiff putty knife under the sink's lip and gently pry up to loosen it. On some old sinks, you must remove the mounting clips from under the sink before you lift it out.
- Get help lifting out a cast iron sink.

Tips for installing the new sink

Follow the steps in Photos 2 – 7 to assemble, install and connect your new sink and faucet. Some sinks, like the stainless steel sink shown here, require clips tightened from below to hold them in place (Photo 3). Most cast iron sinks are held in place by their own weight and a bead of caulk. Follow the mounting instructions provided with your sink.

When you're finished with the installation, turn on the shutoff valves and check for leaks. Then run water in both bowls and check the drains for leaks. Most leaks can be fixed by tightening the connection. If this doesn't work, you'll have to take the leaky joint apart and inspect it for missing or misaligned parts.

Fix a drippy sink sprayer

If you find mysterious puddles under your kitchen sink, the most likely suspects are the water supply lines, the drain lines or the seal between the sink and the countertop. But don't forget about the pullout sprayer. Sprayer leaks can fool you because they usually occur only when the faucet is running. There are only two fixes: Either replace the spray head or both the spray head and the hose.

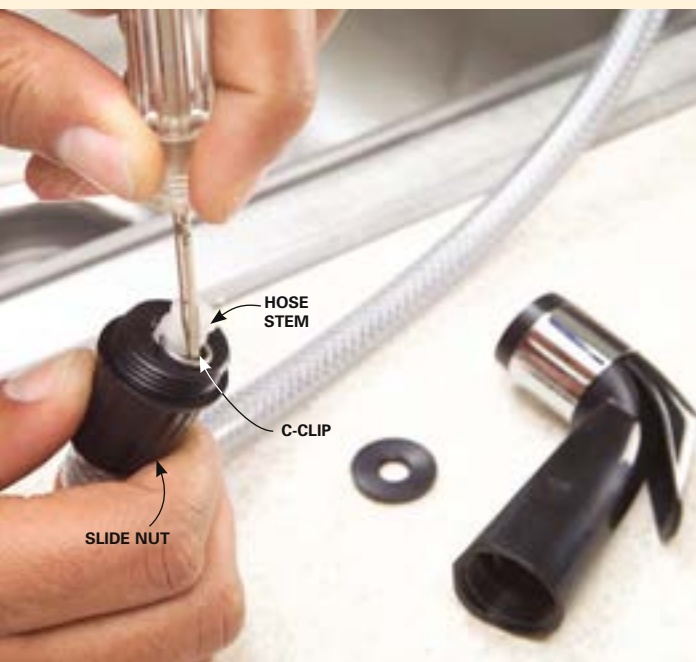
First, check the spray head for leaks. Turn on the faucet and pull out the spray head. Make sure the slide nut is tightly screwed into the spray head (see opposite page). Check for leaks, then push the trigger and check again. If water leaks out from under the slide nut, remove the spray head and slide nut. Turn on the faucet and look for leaks around the crimp sleeve. If you find leaks around the crimp, you'll have to replace the hose and the head. If the crimp doesn't leak, simply replace the head (Photo 1). A replacement costs \$7 to \$20 at home centers and hardware stores.

If the spray head doesn't leak, grab a flashlight, turn on the faucet and check under the sink. Give the hose a quick inspection, then examine the connection under the faucet. If you find a leak at the crimp, replace the hose. If the leak is coming from the

stem connection, try to tighten it. You might be able to tighten it with small pliers, but it's tight quarters under there. The best tool for this job is a basin wrench (\$16 at home centers and hardware stores). If tightening doesn't solve the problem, replace the hose (Photo 2).

Hoses usually aren't sold separately, so you'll get a new spray head, too. Some hoses have a female fitting that fits over the faucet stem. Others screw into the faucet stem. Many spray head/hose kits include an adapter so the hose can connect to male or female threads. Also pick up a roll of pipe-thread tape (\$2) and wrap the male threads before you connect the new hose. You don't have to turn off the water supply to replace the hose, but make sure no one turns on the faucet while the hose is disconnected! Once the new hose is installed, turn on the faucet and check for leaks.

Most spray heads and hoses are interchangeable. But some spray heads and hoses connect differently. Home centers and hardware stores usually carry only the standard type shown here. If you have a different type, call a plumbing supplier or go to any online search engine and type in the manufacturer of your faucet followed by "replacement parts."



1 Replace the spray head only by unscrewing the spray head from the slide nut. Remove the washer and pry off the C-clip with a small screwdriver or pocketknife. To install the new head, reverse these steps.



2 Replace the spray head and hose by unscrewing the hose with a basin wrench (opposite page). Feed the new hose through the holder. Wrap male threads with pipe thread tape. Screw the hose to the faucet stem by hand. Then tighten the connection with the basin wrench.



Figure A
Aerator parts

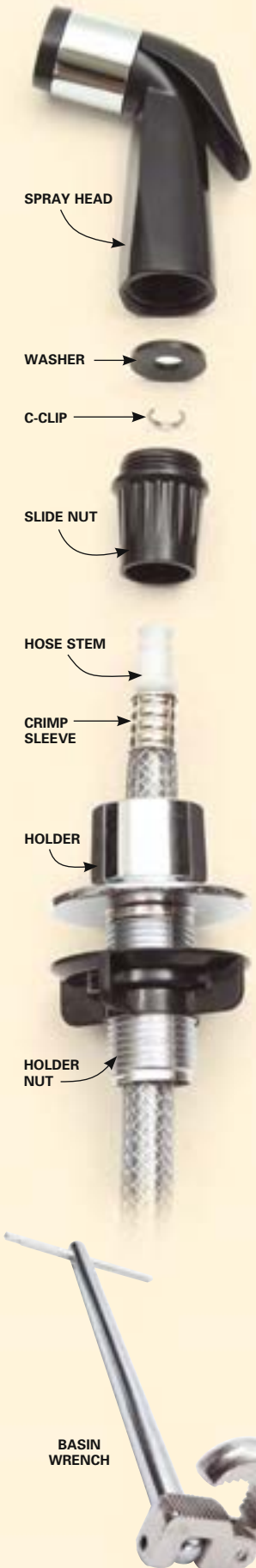
Dirt usually collects on the mixer and the screen.

Unclog a kitchen faucet aerator

If you get weak water flow when you turn on the faucet, don't assume your water pressure has suddenly gone bad. You could simply have a filter screen, or aerator, that's clogged. Remove the aerator as shown in the photo, rinse it out and reinstall it. If it's corroded or worn, take it to a home center and pick up a new one (\$3 to \$5). Most stores have a slick gauge you can screw your old aerator onto to determine which replacement to buy. If you can't find a replacement for your aerator, soak the parts in vinegar overnight, scrub them with an old toothbrush and reinsert into the faucet (make sure to reassemble the parts in the same order you removed them).



Wrap the jaws of pliers with tape to keep them from scratching the aerator. Unscrew the aerator body from the faucet and remove all the internal components. Clean and reassemble.



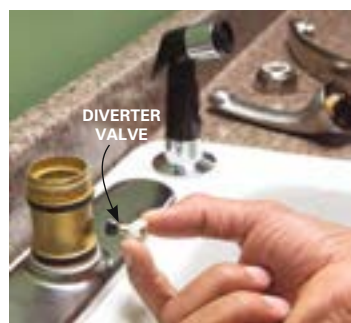
Fix an erratic sink sprayer

Inside your faucet, there's a "diverter" valve, which stops the water flow to the spout and sends it to the sprayer when you press the spray head's trigger. Here are the symptoms of diverter trouble:

- Very little water, or none at all, comes out of the sprayer when you press the trigger. A bad sprayer head can cause this, but more often the diverter is the culprit. To check this, remove the spray head and turn on the faucet. If the water flow out of the hose is weak, the diverter is to blame.
- The sprayer pulsates like a machine gun.
- Water continues to flow out of the faucet spout when you're using the sprayer.

Often, a misbehaving diverter needs only light scrubbing with a toothbrush and a good rinse. But since removing a diverter usually requires major faucet disassembly, it's best to simply replace the diverter rather than risk taking it apart again.

Diverter styles and removal procedures differ widely. Some are small valves like the one shown here. Others are larger cylinders that don't look like valves at all. Some newer diverters aren't inside the faucet, but are instead connected to the sprayer hose below. So the first step in diverter repair is finding a diagram of your faucet. If you can't find your owner's manual, do an online search. Type in the manufacturer of your faucet followed by "faucet parts diagram." With a little searching, you'll find an illustration showing your faucet's internal parts. You'll also find several sources for replacement parts online. Diverters cost from \$7 to \$20.



Disassemble the faucet to access the diverter. Clean or replace the diverter and reassemble the faucet.

Prevent kitchen drains from clogging

Keep kitchen drains grease-free by pouring in a few spoonfuls of baking soda every few weeks. Then fill the sink with hot water, remove the plug and let it



drain freely to flush debris. The best way to prevent clogs is to limit the amount of grease and other solids going down the drain in the first place.



Clean a stinky disposer

If your disposer has developed an odor, it may contain bits of rotted food. Here's how to clean them out:



1. With the water running at about half throttle, drop in orange or lemon peels. Run the disposer for five seconds. Citric acid from the peels softens crusty waste and attacks smelly bacteria. Give the acid about 15 minutes to do its work.
2. Turn on the water and the disposer and drop in a few ice cubes. Flying shards of ice work like a sandblaster inside the disposer.
3. Run the water until the bowl is about half full. Then pull the stopper and turn on the disposer to flush it out.

Repair chipped porcelain

Bugged by the chips in the porcelain finish of your sink, washer or refrigerator? Porcelain touch-up glaze will hide those blemishes on most every surface except cooktops. For a sink (or bathtub), let the repair dry 24 hours before use. Most appliance parts stores stock a \$5 repair kit in white but you may need to order colors.



Touch up chips and scratches in the porcelain finish of appliances using a special color-matched repair kit. Start by cleaning the surface, then use the enclosed fine-grit sandpaper to roughen the finish. Apply thin coats of repair fluid, letting them dry completely between coats.

How to clear clogged sink drains

With two simple tools
—a plunger and a snake—
you can clear 95 percent of your
stopped-up drain problems

A clogged kitchen sink can wreck a perfectly good evening. Instead of settling in to catch up on the news, you'll find yourself staring at a sink full of dirty, backed-up water and wondering whether to call in a plumber (\$80 to \$120!). However, with two inexpensive tools and a little practice, you can fix this mess in less than an hour.

Here you'll learn how to use a plunger and snake to clear up all but the most stubborn drain clogs. Plungers cost \$4 to \$10 at any hardware store or home center. Those with larger rubber bells deliver more thrust, but

most any style will work for kitchen drains. Be sure it has a stout handle so you can apply plenty of force. A snake (sometimes called a hand auger) costs \$5 to \$20, depending on the size, length and turning mechanism. For all-around use, we recommend a 3/8-in. model that's about 20 ft. long, like the one in Photo 6, p. 20 (\$15 at hardware stores and home centers). It's easy to turn down into the drain. But shorter, 1/4-in. types will work for most clogs too. In addition, keep several other items handy—a bucket or a plastic bin that fits under your drain, rubber gloves and a reliable flashlight.

First things first



If you have a garbage disposer, turn it on. If it hums but doesn't spin, switch it off and unplug the unit. Then rotate the disposer blades manually by inserting an Allen wrench into the hole on the bottom of many disposers. If you have a dishwasher, tighten



a clamp over the flexible part of the drain line before plunging the drain. This prevents dirty water from flowing back into the dishwasher cabinet.



1 Hold a wet cloth tightly over one sink drain to seal it and set the plunger over the other drain. Plunge up and down vigorously for about 20 seconds.



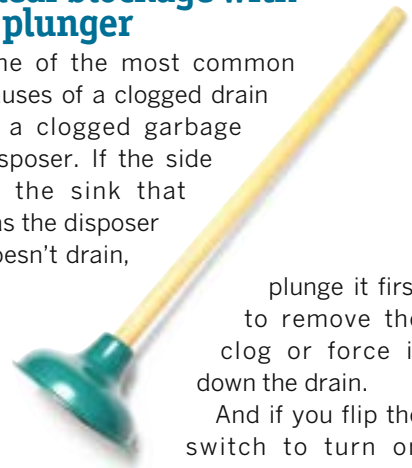
2 Pop the plunger off the drain on your last pull stroke in a final attempt to break the clog free.

You can avoid most clogs by not abusing your kitchen drain line. Don't overload your disposer with meat; foods high in starch, like pasta, potatoes and rice; or foods high in fiber, like celery and corn husks. Also, run plenty of cold water down the drain and let the disposer catch up after every cup of food you push into it. Never dump bacon grease or coffee grounds into the drain. If allowed to settle and cool, they solidify in the drain.

If you follow the steps outlined here and still can't clear the blockage, don't hesitate to call in a plumber. You may have a clog far down the drain line beyond your reach, or stuck objects in the pipes.

Clear blockage with a plunger

One of the most common causes of a clogged drain is a clogged garbage disposer. If the side of the sink that has the disposer doesn't drain,



plunge it first to remove the clog or force it down the drain.

And if you flip the switch to turn on your garbage disposer and all you hear is a low humming sound, your disposer is probably jammed. You can usually free it by turning the blades manually. (If the disposer doesn't make any sound when you turn it on, an internal breaker on the motor probably has tripped. Give the disposer a minute to cool off. Then press the reset button located on the bottom of the unit, and turn it on again.)

Caution:

Don't plunge or snake a drain if you've poured drain cleaners into the sink. The chemicals can cause serious burns if they splash on your skin. Use drain cleaners only if the sink is draining slowly and not completely clogged.



3 Loosen the slip nut on the trap arm assembly and the continuous waste tee and wiggle the trap free. Check the waste tee and remove and clean it if it's clogged.



4 Clean out any debris from the P-trap. Inspect both it and the trap arm for cracks or weak walls. If it's worn, replace it to avoid problems in the future.



5 Loosen the slip nut and slide the trap arm from the drain line stub-out. You will likely need a pliers to remove the nut.

If the problem isn't in the disposer, plunge the drain. If you have a dishwasher, first clamp the drain hose (photo, p. 17). Then fill the sink with 3 to 4 in. of water to ensure that the plunger seals around the drain. Hold a wet rag tightly over the other drain opening in double sinks or use the basket strainer to seal it (Photo 1). Then plunge away. Roll the head of the plunger into the water so you force water, not air, into the drain. Pump vigorously. On your last upstroke, pop the plunger off the mouth of the drain for extra pressure (Photo 2). If the water doesn't swirl straight down the drain, continue plunging for several minutes. Plunging can be quick and easy or it could be a wet mess. Keep towels handy to soak up spills.

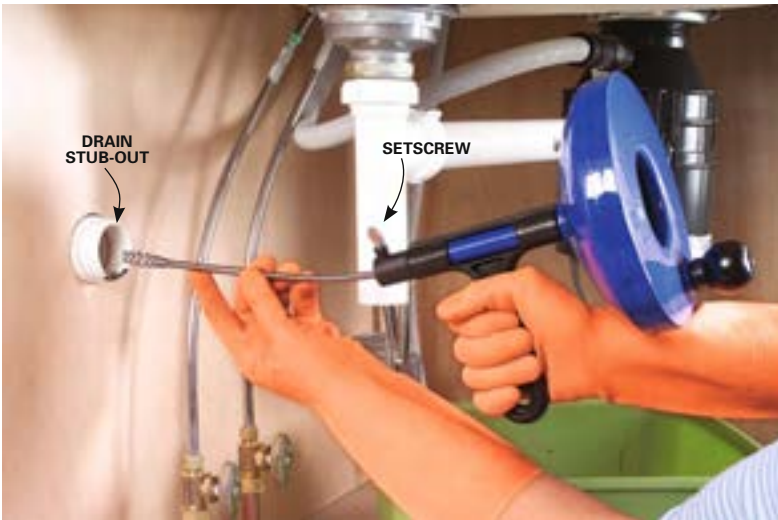
Clean the P-trap

Clogs that occur in the P-trap and trap arm of the drain (Photo 3) most often occur when grease or coffee grounds stick. If intensive plunging doesn't remove it, disassemble and clean out the P-trap (10 to 15 minutes; Photos 3 – 5).

Begin by sponging the water from the sink to reduce the flow under the sink when you pull off the trap (Photo 3). Keep your pan or bucket underneath; dirty water will flow out. We show plastic drain lines, but many older kitchen sinks have metal traps and pipes. Metal slip nuts are usually more difficult to loosen than plastic, but either will probably require the use of slip-joint pliers to break them free. Loosen them gently to avoid cracking or bending the trap assembly.

Unscrew the slip nut between the P-trap and the trap arm first, then the nut at the bottom of the waste tee. If the trap is clogged, clean it (Photo 4), reinstall it and test the line with warm water. Don't overtighten the slip nuts. Hand tight plus a quarter turn with a pliers should be enough.

If the P-trap isn't clogged, move on and remove the trap arm and clean it (Photo 5). Run a screwdriver around the inside of the pipe stub-out and pull out any debris that may have collected in the opening. If you still haven't found the clog, reach for the snake!



6 Thread the tip of the snake into the drain stub-out. Tighten the setscrew and turn the crank clockwise to feed it into the drainpipe.



7 Continue to turn the snake when you encounter resistance. The snake tip is designed to corkscrew through clogs and around corners.



8 Pull the snake back out, cleaning the cable with a rag as you retrieve it. Reinstall the P-trap and run water to test the drain.



Snake the line

Begin by loosening the setscrew at the tip of the snake and pulling out 6 to 10 in. of cable. Then tighten the setscrew and spin the snake down into the drain line (Photos 6 and 7). Initially you may feel an obstruction, but it's likely that the tip of the snake is just turning a corner. Loosen the setscrew, pull out another 6 to 10 in. of cable and continue to feed the snake into the line. If you feel the cable hit an obstruction, continue cranking and pushing the cable through the clog until you feel the tip bite through. This should be obvious because the tension in the cable will drop. When you are through the clog, turn the crank counterclockwise and pull out the cable. Clean the cable as you pull; it'll probably be covered with incredibly dirty gunk (Photo 8). You may get a large plug of material at the end of the snake, so keep that bucket handy. Repeat the process until you no longer feel blockage, then reassemble the trap and run plenty of warm water to flush the line.



After the drain is open, pour 1/2 cup of baking soda and 1/2 cup of white vinegar into the drain. Cover both openings and let it sit for a few minutes. Then run another gallon or so of warm water behind it to flush out the mixture. The combination of baking soda and vinegar can break down any leftover fat deposits and will leave your drain smelling fresh.



Stop a running toilet

A toilet that won't stop running can drive you crazy, especially when you're trying to fall asleep. But you can put an end to this water torture yourself, even if you have no plumbing know-how. You may be able to solve the problem in just a few minutes without spending a dime. At worst, this fix will cost a few hours and \$20 in toilet parts.

Finding the problem is usually simple

A toilet runs constantly because the fill valve that lets water into the tank isn't closing completely. A toilet runs intermittently because the valve opens slightly for a few minutes. In either case, you have to figure out why that valve isn't stopping the incoming water flow.

First, look for leaks. A leak in the tank can make a toilet run constantly or intermittently. If your toilet is leaking, you've probably noticed it already. But take a look just to be sure. If you find leaks coming from the tank bolts or flush valve, you'll most likely have to remove the tank from the bowl so you can replace the tank bolts, the rubber washers and the gaskets on the flush valve. If there are leaks around the fill valve, tighten the locknut (see

Photo 6, p. 24). Leaks can come from cracks in the tank, too. In that case, the only reliable solution is a new toilet.

If you don't find any leaks, lift off the tank cover. At first glance, the parts inside may look intimidating. But don't worry. There are really only two main parts: the flush valve, which lets water gush into the bowl during the flush; and the fill valve, which lets water refill the tank after the flush. When a toilet runs constantly or intermittently, one of these valves is usually at fault.

To determine which valve is causing the trouble, look at the overflow tube. If water is overflowing into the tube, there's a problem with the fill valve. Fill valve fixes are shown on p. 22. If the water level is below the top of the tube, the flush valve is leaking, allowing water to trickle into the bowl. That slow, constant outflow of water prevents the fill valve from closing completely. To fix a flush valve, see p. 25.

Your toilet won't look so pristine inside as the ones shown here. You'll find scummy surfaces, water stains and corrosion. But don't be squeamish—the water is as clean as the stuff that comes out of your faucets.

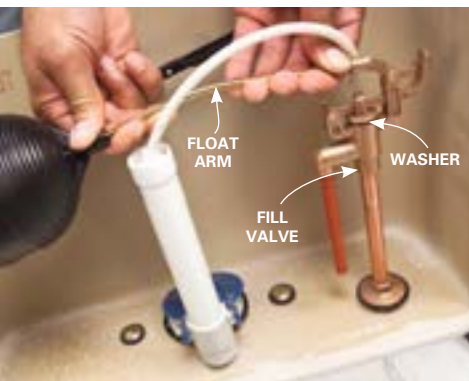
Solution 1:

Repair the fill valve

You may have to replace the fill valve, but these three fixes are worth a try first:

Fix 1: Adjust the float

If your valve has a ball that floats at the end of a rod, gently lift the rod and listen. If the water shuts off, you may be able to stop the running by adjusting the float. Some fill valves have a float adjustment screw on top (see Figure A). If there is no adjustment screw, bend the float arm (photo below). If you have a Fluidmaster-style fill valve, make sure it's adjusted properly (Photo 8, p. 24.) You don't have to empty the tank to make these adjustments.



Gently bend the float arm down to put extra pressure on the valve. (To adjust a float that doesn't have an arm, see Photo 8, p. 24.) Then flush the toilet to see if it works.

Fix 2: Flush the valve

Hard water, debris from old pipes or particles from a break in a city water line can prevent a flush valve from closing completely. Running water through it from the supply line will clear the debris. Photos 1 and 2 show you how to do this on one common type of valve. Even though other valves will look different, the clearing process is similar. However, you may have to remove a few screws on top of the fill valve to remove the cap.



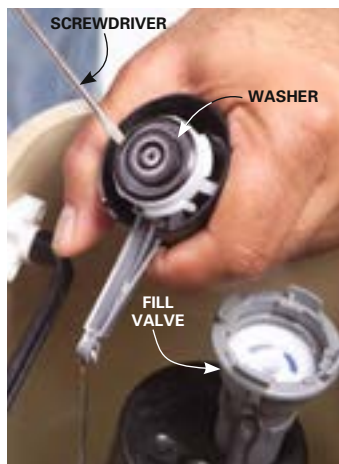
1 Remove the fill valve cap. On this type of valve, press down and turn counterclockwise. Remove screws on other types of valves.



2 Cover the valve with your hand. Turn on the water (cautiously, so you don't get a cold shower!) and let it flush out the valve for a few seconds.

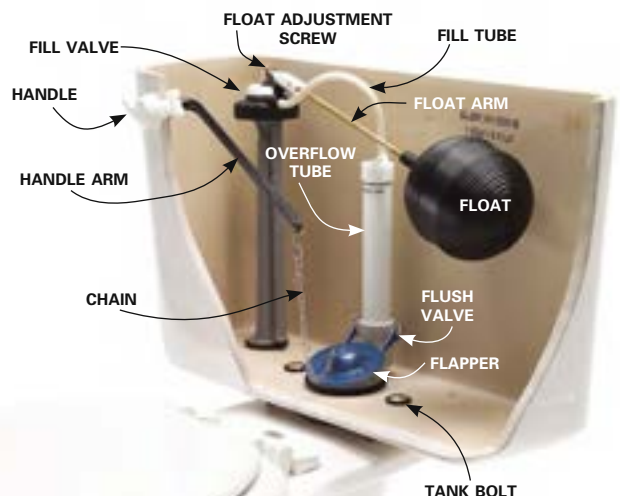
Fix 3: Replace the washer

When you remove the cap to flush out the valve, inspect the washer for wear or cracks. Replacing a bad washer is cheap (\$1) and easy (photo right). But finding the right washer may not be. The most common washers are often available at home centers and hardware stores. Other styles can be hard to find. If you decide to hunt for a washer, remove it and take it to the store to find a match. Plumbers usually replace the whole fill valve rather than hunt for a replacement washer.



Replace a worn, cracked valve washer by prying the old washer out of the cap with a small screwdriver. Press the new one into place.

Figure A: Toilet cutaway



Fix 4: If you can't fix the fill valve, replace it

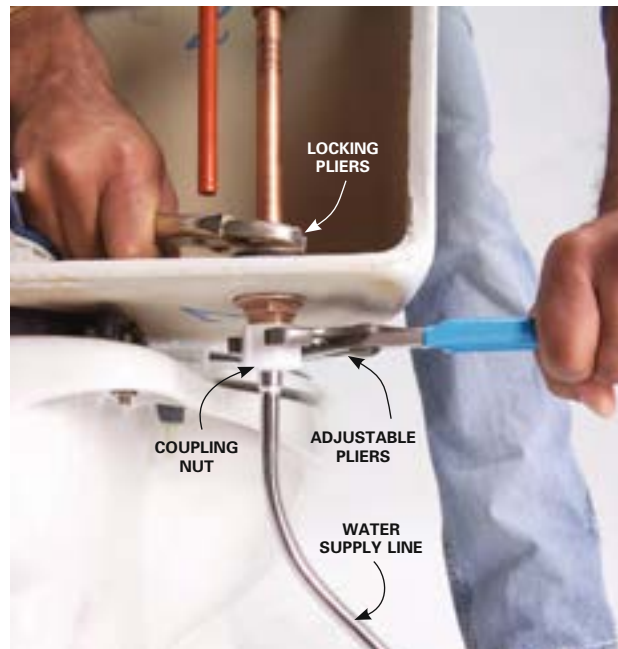
Replacing a fill valve requires only a few basic tools (adjustable pliers and a pair of scissors) and an hour of your time. A kit containing the type of valve shown here and everything else you need costs about \$12 at home centers and hardware stores.

Your first step is to shut off the water. In most cases, you'll have a shutoff valve right next to the toilet coming either

through the floor or out of the wall. If you don't have a shutoff, turn off the water supply at the main shutoff valve, where water enters your home. This is a good time to add a shutoff valve next to the toilet or replace one that leaks. This is also a good time to replace the supply line that feeds your toilet (Photo 2). A flexible supply line reinforced with a metal sleeve costs about \$7 at home



1 Replace the fill valve. Turn off the water at the shutoff valve. Flush the toilet and hold the flush valve open to drain the tank. Sponge out the remaining water or vacuum it up with a wet/dry vacuum.



2 Unscrew the coupling nut that connects the supply line. If the valve turns inside the tank, hold its base with locking pliers. Tip: Throw a towel on the floor underneath to catch water that will drain from the line.



3 Remove the locknut that holds the valve to the tank. Push down gently on the valve as you unscrew the nut. Pull out the old valve.

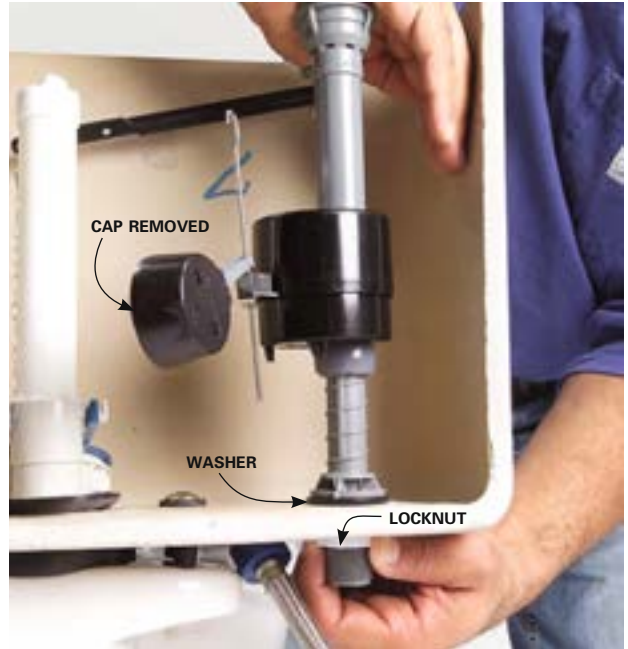


4 Measure the height of the overflow tube. Measure to the top of the tube, not to any water level label on the tube.

centers and hardware stores. Photos 1 – 8 show how to replace the valve. If the height of your valve is adjustable, set the height before you install the valve (Photo 5). If your valve is a different style from the one shown, check the directions. After mounting the valve (Photo 6), connect the fill tube (Photo 7). The fill tube squirts water into the overflow tube to refill the toilet bowl.



5 Adjust the height of the new fill valve by holding the base and twisting the top. The height from the base to the CL (critical level) mark should be the height of the overflow tube plus 1 in.



6 Remove the cap, press down to compress the washer and screw on the locknut. Connect the supply line and flush the valve. Reset the cap and check for leaks.



7 Slip the fill tube onto the fill valve. Clip the angle adapter onto the overflow tube. Then cut the tube to fit and slip it onto the angle adapter.



8 Turn on the water to fill the tank. Pinch the spring clip and slide the float up or down to set the water level 1 in. below the top of the overflow tube or to the water line marked on the tank.

Solution 2:

Fix the flush valve

When a flush valve causes a toilet to run, a worn flapper is usually the culprit. But not always. First, look at the chain that raises the flapper. If there's too much slack in the chain, it can tangle up and prevent the flapper from closing firmly. A chain with too little slack can cause trouble too. Photo 3 on p. 26 shows how to set the slack just right.

Next, test the flapper as shown in Photo 1. If extra pressure on the flapper doesn't stop the running noise, water is likely escaping through a cracked or corroded overflow tube. In that case, you have to detach the tank from the bowl and replace the whole flush valve.

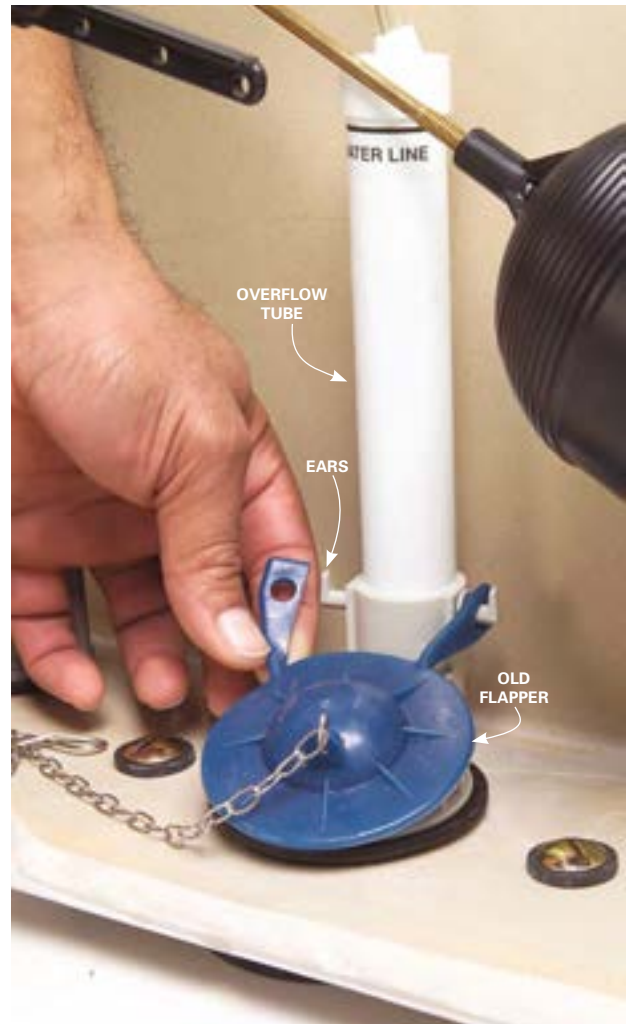
If pressing down on the flapper stops the noise, the flapper isn't sealing under normal pressure. Turn off the water, flush the toilet to empty the tank and then run your finger around the rim of the flush

valve seat. If you feel mineral deposits, clean the flush valve seat with an abrasive sponge or ScotchBrite pad. Don't use anything that might roughen it. If cleaning the flush valve seat doesn't solve the problem, you need to replace the flapper.

Replacing your flapper may require slightly different steps than are shown here (Photos 2 and 3). Your flapper may screw onto a threaded rod or have a ring that slips over the overflow tube. If you have an unusual flush valve, finding a replacement flapper may be the hardest part of the job. To find a suitable replacement, turn off the water, remove the flapper, and take the old one with you to the home center or hardware store. You may not find an identical match, but chances are you'll locate



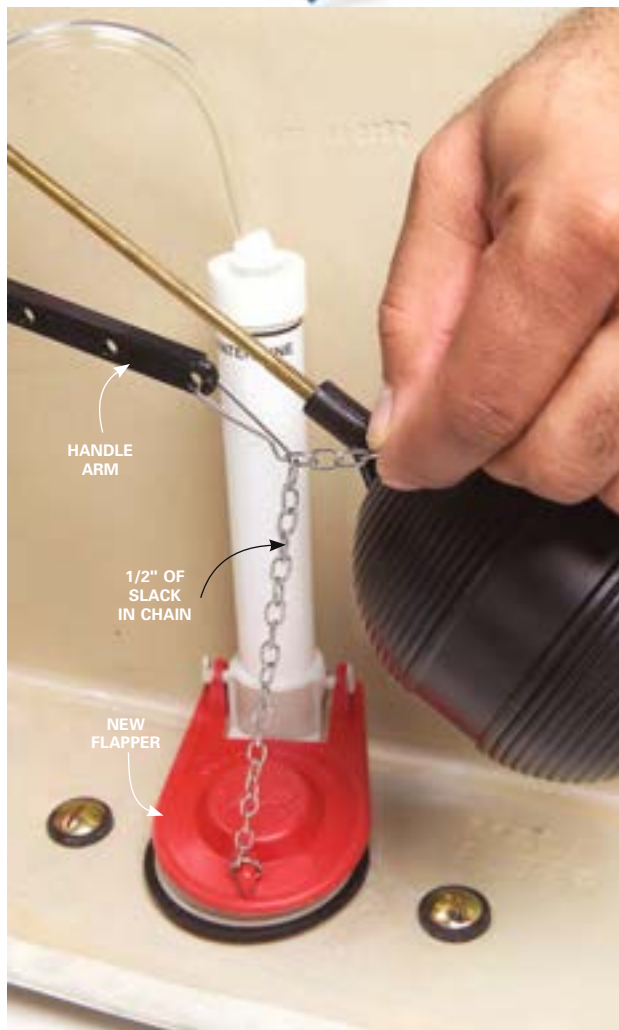
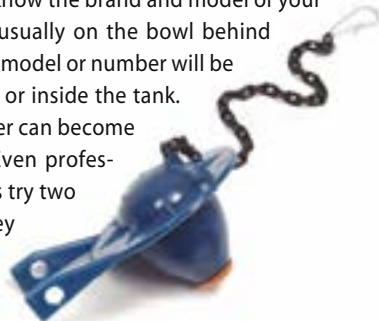
1 Push down on the flapper with a yardstick and listen. If the sound of running water stops, the flapper needs replacing.



2 Remove the old flapper from the ears of the overflow tube and detach the chain from the handle arm.



one of the same shape and diameter. If not, try a plumbing supply store (in the yellow pages under "Plumbing Supplies") or search online (a good source is doplumb.com). It helps to know the brand and model of your toilet. The brand name is usually on the bowl behind the seat. In some cases, the model or number will be on the underside of the lid or inside the tank. Matching an unusual flapper can become a trial-and-error process. Even professional plumbers sometimes try two or three flappers before they find one that works well.



3 Attach the new flapper to the overflow tube and hook the chain to the handle arm. Leave 1/2 in. of slack in the chain. Turn the water back on and test-flush the toilet.

Clean a sluggish toilet

If your toilet flushes slowly, the rinse holes under the rim may be clogged with mineral deposits. With a mirror and a coat hanger, you can clean out those clogged holes without ever getting your hands dirty. The photo says it all—look into the mirror to see if the holes are clogged and poke them clean with a coat hanger.



Use a hand mirror to see the holes under the rim of the toilet. Bend a coat hanger flat and probe the tip into the holes to poke out any mineral deposits.



Hot glue for tile accessories

Most tile setters use masking tape to support ceramic soap dishes and shelves while the tile adhesive cures. Here's a better way: Apply a small bead of hot-melt glue along the seam. Hold the item in place for just a few seconds while the hot glue stiffens. The glue creates a strong seal, so there's little chance of slipping or breakage. Once the permanent adhesive sets, just peel away the bead of glue.

Restore free flow to a clogged faucet

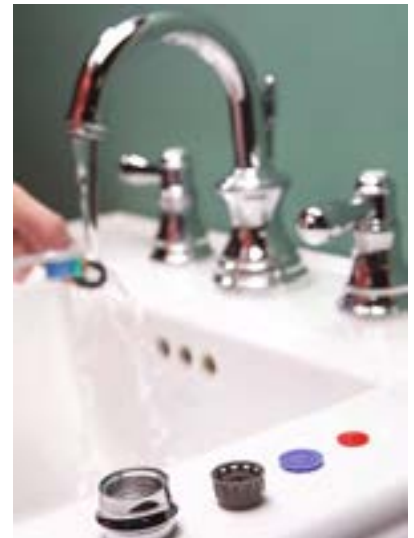
If the flow from your bathroom or kitchen faucet isn't what it used to be, the aerator is probably plugged. An aerator can clog slowly as mineral deposits build up, or quickly after plumbing work loosens debris inside pipes. Usually, a quick cleaning solves the problem. Remove the aerator (Photo 1) and disassemble it. You may need a small screwdriver or knife to pry the components apart. Scrub away any tough buildup with an old toothbrush (Photo 2) and rinse each part thoroughly. Deposits can also build up inside the faucet neck, so ream it out with your finger and flush out the loosened debris.

If the mineral buildup resists scrubbing and you have a standard cylinder-shaped aerator, you can replace it (about \$5). Take your old aerator along to the home center or hardware store to find a match. If your aerator has a fancy shape (like the one shown here), finding a match won't be as simple. So try this first: Soak the aerator parts in vinegar overnight to soften mineral buildup.



1 Wrap the jaws of pliers with electrical tape and unscrew the aerator. Close the stopper so the small parts can't fall down the drain.

If that doesn't work, go to any online search engine and type in the brand of your faucet followed by "faucet parts." With a little searching, you can find



2 Disassemble the aerator and lay out the parts in the order you remove them to make reassembly foolproof. Scrub the parts and reassemble them.

diagrams of your faucet and order a new aerator. Expect to spend \$10 or more for a nonstandard aerator.



Shower valve conversion and cover-up

The best way to replace a two-handed shower valve with a single-handed unit is with a conversion plate. The plate covers the old valve holes and you do the entire job through the hole you cut in the tile. Buy a plate (\$25 to \$50) that fits your new faucet and is wide enough to cover the old valve positions. To find a conversion plate, call a plumbing supply store or order online at absolutehome.com.



1 Unscrew the old handles. Mark the cover hole on the tile and cut it out with an abrasive blade in a jigsaw.



2 Cut the pipes and remove the old valve. Solder in a new one and screw the conversion plate over the hole.

Mount a towel bar on ceramic tile

In the past, ceramic fixtures such as towel bar holders and soap dishes were cemented right to the wall and the tile was fitted around them. Now most are designed to be glued to the face of the tile with 100 percent silicone caulk. The only tricky part is holding them in place until the silicone sets up.

First thoroughly clean the tile with denatured alcohol. Lay a bead of caulk on the back of the fixture, push it into place and secure it with masking tape. Let the caulk stiffen for an hour or so and then add caulk around the perimeter. Use a wet finger or rag to smooth the caulk joint. Let it sit overnight before you pull the tape. Remember to put the rod in before setting the second fixture.



Clean a clogged showerhead

Here's a quick fix for a clogged showerhead. Pour white vinegar into a plastic sandwich bag until it's half full. Pull the bag over the showerhead until its spray channels are submerged. Tape the bag to the showerhead pipe with electrical tape and leave on overnight. Scrub away any remaining buildup with an old toothbrush. Your showerhead will be as good as new. Note: Vinegar may damage old, worn finishes.



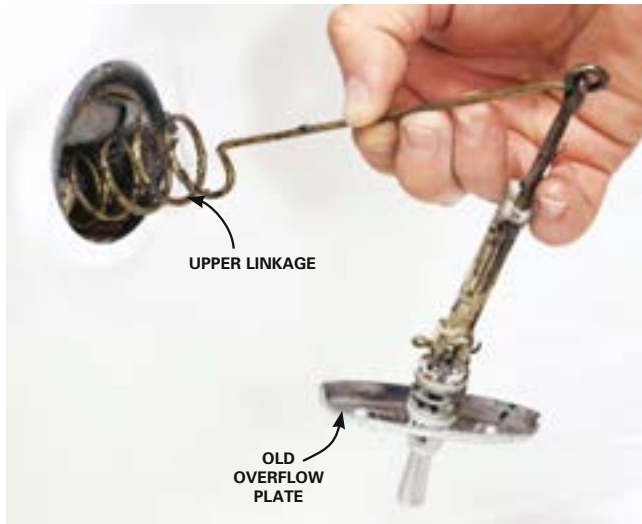
Replace a broken bathtub stopper

When the stopper in your lever-style bathtub drain won't pop up anymore because the linkage is damaged or clogged, replace it with a much simpler lift-and-turn style drain. The linkage in a lever-style drain attracts dirt and hair like a magnet, and must be cleaned regularly in order to keep the drain working properly. The lift-and-turn drain has no complicated linkage to dig out and clean—almost everything catches in the drain grate. Buy the replacement kit at hardware stores and home centers for about \$15 to \$40.

Photo 1 shows how to remove the overflow plate and linkage. The linkage may stick and be stubborn to remove. Grab hold of it and tug hard until it pops out. Screw on the new overflow plate once the linkage has been removed.

The toughest part of the job is removing the old stopper body, but it's all downhill after that. Remove the old stopper body as shown in Photo 2. If you're having trouble unscrewing it, try heating it with a hair dryer set on "high."

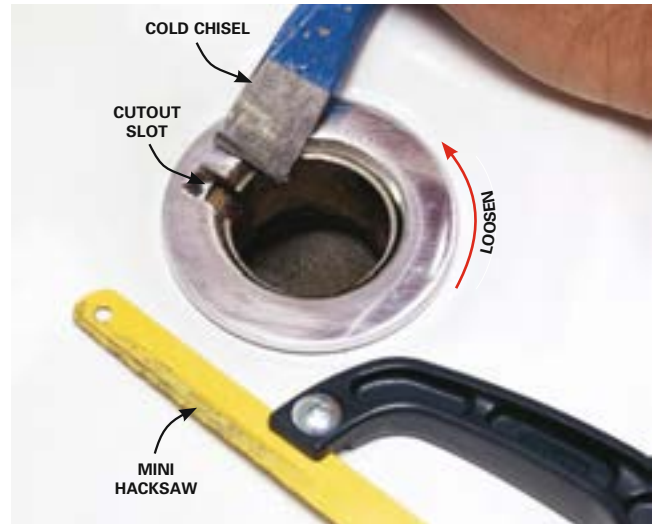




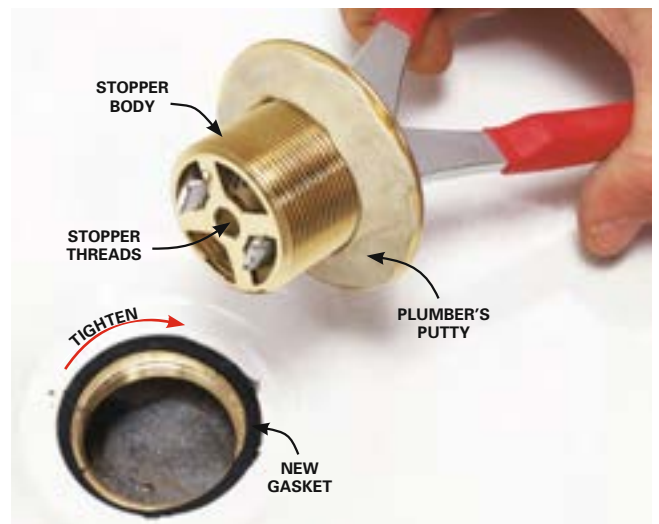
1 UNSCREW the overflow plate and pull the upper linkage out of the overflow pipe. Pop out the drain stopper and remove the lower linkage as well. Tug firmly when extracting both parts of the linkage because they may bind inside the overflow pipe.

The heat may help loosen the old plumber's putty. The old stopper body can also be cut out with a reciprocating saw and metal blade, but be very careful because it's easy to cut into and damage the bathtub.

All that's left is to install the new stopper body and stopper. Slide the new rubber gasket on top of the drainpipe under the tub and insert the new stopper drain flange with plumber's putty on it as shown in Photo 3. Use the supplied bushing if the new threads are different from the old. Screw the stopper into the stopper body and congratulate yourself on a job well done.



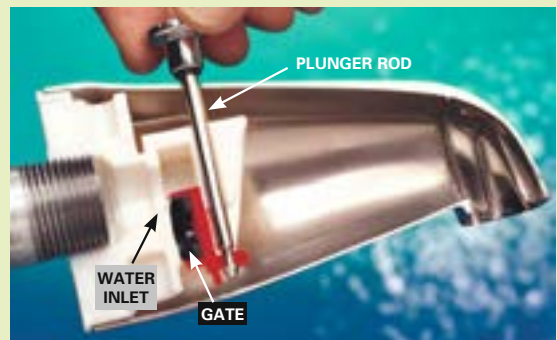
2 CUT a notch 1/4 in. wide and deep in the old stopper body with a mini hacksaw. Check progress frequently to ensure you don't cut into the tub. Wedge a 3/4-in. cold chisel into the cutout slot and pound counterclockwise with a hammer to free the stopper body (use caution when hammering so you don't scratch the enameled tub). Completely unscrew and remove the stopper body.



3 SLIDE in a new gasket. Then roll a pencil-sized bead of plumber's putty and press it around the underside of the new stopper body rim. Stick the jaws of an 8-in. pliers into the stopper body grate and thread it into the drainpipe.

Replace a broken tub spout diverter

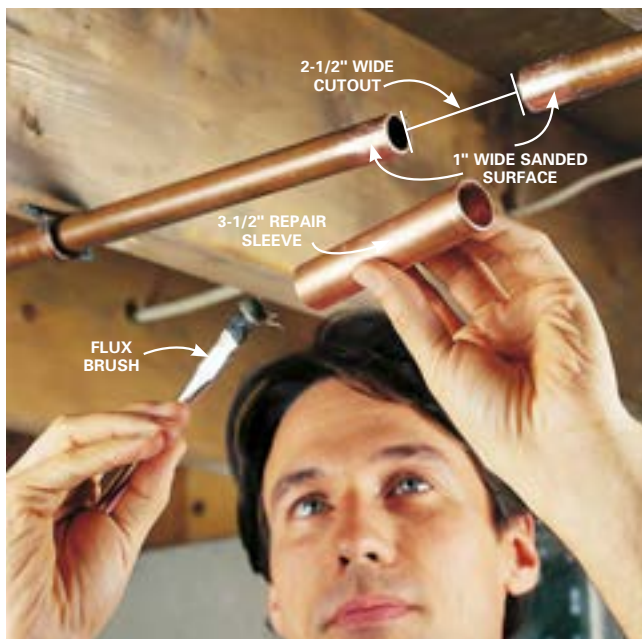
A tub spout diverter is a simple device that blocks water flow through a tub spout and redirects it through the shower pipe above the actual valve. The most common style uses a plunger rod that pulls up a gate to block the flow. If the diverter is faulty, your best bet is to replace the entire spout. The old spout will most likely be threaded, but some are held in place by a setscrew underneath the spout.



Repair a leaking copper pipe



1 SHUT OFF the main water supply valve, drain the damaged water line and use a pipe cutter to cut out a section of pipe that extends about 1 in. to each side of the leak. Start by gripping the pipe firmly in the cutter's jaws and tightening the cutter's screw. Rotate the cutter in the direction shown—as you tighten the screw handle—until the pipe snaps.



2 CLEAN corrosion from the inside of the repair sleeve using a wire fitting brush. Clean the outside of the pipe with plumber's sandcloth or emery paper. Brush flux onto all four cleaned surfaces.

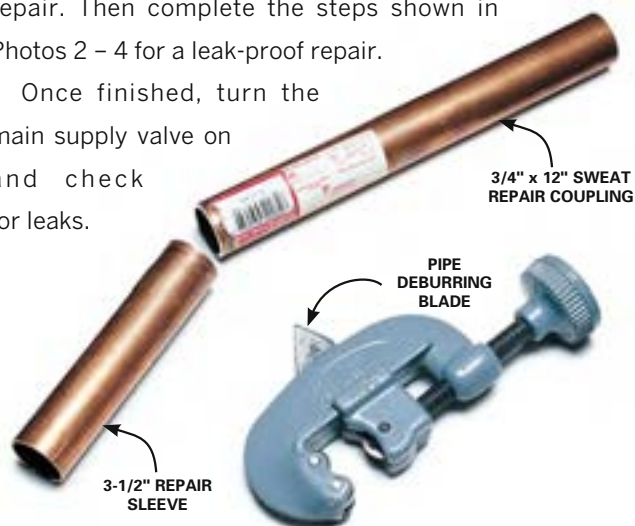
When a copper water pipe corrodes and leaks, or bursts from freezing, you have to fix it fast. If the leak is pinhole-sized and less than 1/2 in. of pipe must be removed, you can make the repair by cutting the pipe and soldering (“sweating”) on an ordinary pipe coupling (30¢).

But to repair longer sections, use a “sweat” coupling, which you can find at home centers and well-stocked hardware stores. For \$3, you can buy a sweat coupling sized to repair 1/2-in. or 3/4-in. copper pipe.

Mark the leak, shut off the main water valve and drain (or thaw and drain) the affected pipe. Cut out the damaged section (Photo 1), then measure the gap and, from the sweat coupling, cut a repair piece that's 1 in. longer than the damaged section.

The key to a good solder joint is to keep the inside of the pipes dry, so keep a cotton rag stuffed in each pipe end to absorb dribbles of water until just before you solder. Open a faucet above that level to keep pressure from building up and dribbling more water into your repair. Then complete the steps shown in Photos 2 – 4 for a leak-proof repair.

Once finished, turn the main supply valve on and check for leaks.

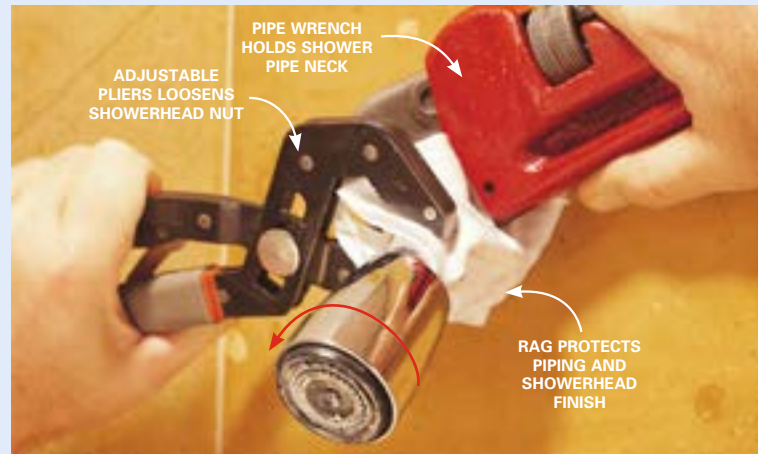


CUT the repair sleeve from the 12-in. repair coupling stock. Smooth the rough-cut inside edges of the sleeve by inserting the blade of the pipe cutter into the cut ends and turning the cutter until the sleeve will slide over the pipe ends without snagging. Clean the sleeve's inside edges for soldering with a 3/4-in.-dia. wire fitting brush.

Unclog a showerhead

Over time, hard-water minerals in tap water build up and clog the spray holes in showerheads. Fix this problem by removing the showerhead and cleaning it. Buy a lime-removing product to loosen the scale, or soak the head overnight in vinegar (either white or apple cider). Check the owner's manual or manufacturer's Web site to confirm that vinegar won't harm the finish.

Carefully remove the showerhead and open the holes using the steps shown in Photos 1 and 2. If the showerhead is too stuck to remove, try filling a plastic bag with vinegar, tying the top of the bag around the top of the showerhead and submerging it overnight in the vinegar.



1 UNSCREW the showerhead by gripping the shower neck with a pipe wrench (as shown), grabbing the nut on the showerhead with the adjustable pliers and turning the pliers counterclockwise until the nut loosens. Protect the finishes on the showerhead and wall pipe by wrapping them with a cloth.



2 OPEN the showerhead holes by soaking the head overnight in a vinegar bath and poking the loosened mineral scale free with a toothpick. Rinse the showerhead in tap water, then reinstall it by applying Teflon tape to the wall pipe threads, screwing it on and tightening it by reversing the technique in Photo 1. Complete the repair by turning on the cold water in the shower and blasting out any remaining mineral gunk.



3 SLIDE an end of the sleeve first over one pipe and then slip it back over onto the other. You may have to loosen nearby pipe hangers. Center the sleeve over the pipe ends so that about 1/2 in. of each pipe is inside the sleeve.

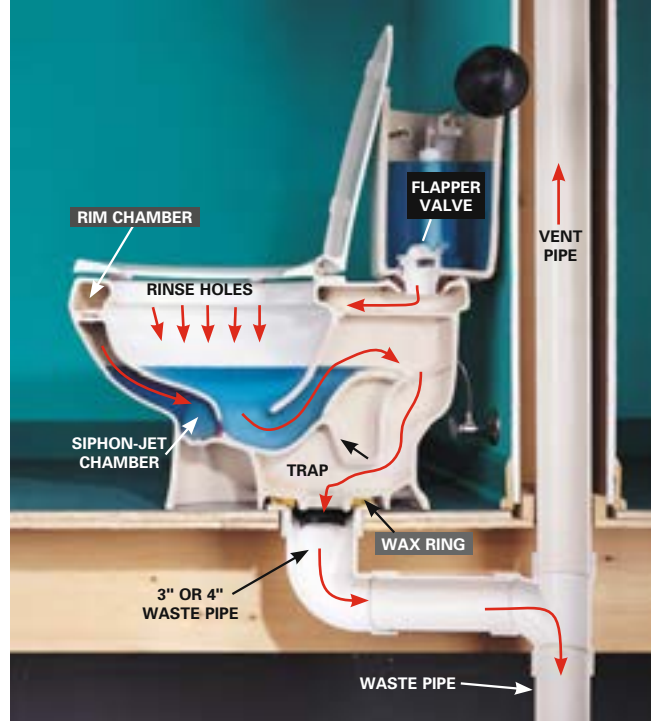


4 HOLD the tip of the torch flame to one side of the joint and hold the tip of the solder wire to the opposite side. Pull the solder away when enough of it melts to completely fill the joint.

Clear a clogged toilet

For about 90 percent of toilet clogs, you need only one special tool—a plunger with a flange-type cup. Toilet clogs are relatively easy to clear because after the clog passes the wax ring, the drain pipe becomes significantly larger, allowing the clog to float away.

Understanding how toilets work will help you diagnose your toilet troubles. Toilets require two things to flush well—a smooth, unobstructed drain and good siphoning action. As the flapper valve lifts, water flows into the rim chamber. Some of the water will exit through the rinse holes to clean the bowl and create the swirling action at the bottom; the rest passes through the siphon-jet chamber, where it picks up speed as it exits the siphon-jet hole. Together, these two water sources create the force necessary to carry waste over the back part of the drain and leave behind a clean bowl. When any part of the water path is limited, troubles begin.



1 **DON'T FLUSH** the toilet if you suspect a clog. Make a first plunge gently to expel air from the plunger bell; then plunge vigorously in and out. Keep the plunger covered with water. If the plunger fails to clear a clog, use a closet auger, as shown in Photo 3.



2 **TEST** the drain by letting in small amounts of water—don't use the flush handle. Instead, remove the tank lid and manually open and close the flapper to see whether water goes down easily. If it's still plugged, you'll have to push the flapper down to restore seal quickly.



3 **FOR STUBBORN CLOGS**, spin a closet auger or regular snake through the drain. The hooked spring end should break through the clog or grab the obstruction (such as a rag) so you can pull it out. Once a clog passes the wax ring into the wider drain, it should move easily.

Select a water-supply tube

Never underestimate the damage a faulty or poorly sealing water-supply tube can do to your home. When you replace a supply tube, you have three basic choices. The chrome type is reliable but must be cut to exact length and can kink easily when you attempt to bend it. The plastic type is the least expensive and is easy to install, but also must be cut to exact length and looks, well, like plastic. The no-burst type has a flexible inner core with a woven metal or plastic skin and built-in nuts and rubber seals at each end. It costs a bit more, but is reliable and easy to install, since it can be bent or looped by hand, so things line up right.



Chrome

Plastic

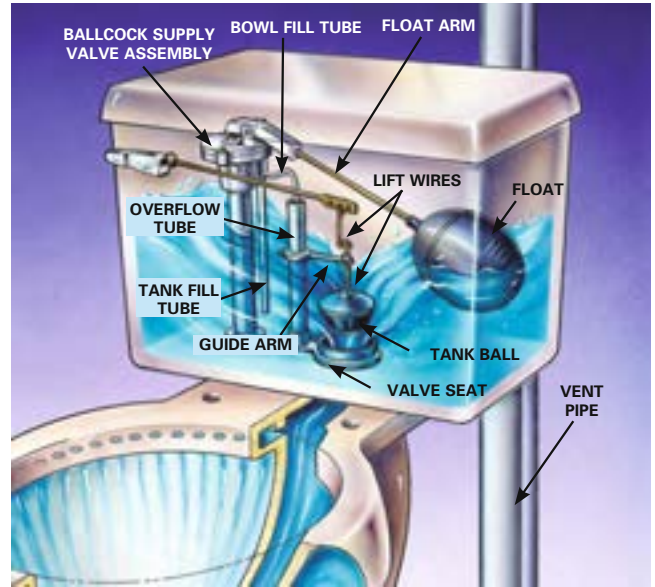
No-burst

Troubleshoot toilet tank problems

When you flush a toilet, a carefully balanced series of events takes place in the tank. As you push the flush handle, the tank-stopper ball is lifted from its valve seat, allowing water to flow from the tank into the bowl. When the tank is nearly empty, the tank ball falls back into the valve seat, cutting off the flow.

As the tank's water level falls, so does the float, opening up the supply, or ballcock, valve just as the tank ball seals the tank. The tank then refills through the tank fill tube, and the bowl and trap refill from the bowl fill tube directing water down the overflow tube. As the float rises, it shuts off the ballcock valve and the toilet is ready for action once again. When any part of this balancing act is out of whack, you'll need to make one of the repairs shown in the chart below.

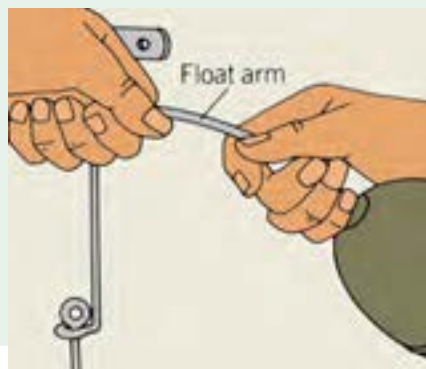
If your toilet tank or bowl develops a leak, check all pipes and connections. If a pipe or tube is corroded or the tank or bowl is cracked, replace it. If the leak appears near a joint, clean away any corrosion, replace any gaskets or washers and tighten the connection. Be careful when tightening bolts and nuts mounted to porcelain—the porcelain may crack and ruin the toilet.



Problem	Solution
Water runs continuously.	Adjust lift wires or chain to align tank ball. Clean valve seat.
Water spills into overflow tube.	Bend the float arm down.
Water runs after flushing.	Bend the float arm. Clean the valve seat. If the float is waterlogged, replace it. Replace tank ball or flapper.
Whistling sounds occur.	Put new washers in the ballcock-valve plunger. Replace ballcock assembly.
Splashing sounds are heard.	Reposition the refill tube to eject directly into overflow tube. Put new washers in the ballcock-valve assembly.
Tank flushes partially.	Shorten the lift wires or chain to make the tank ball rise higher. Bend the float arm upward to raise the water level.
Tank sweats.	Insulate the tank by lining it with sheets of polystyrene or foam rubber. Have plumber install tempering valve to warm the water in the tank.
Tank leaks.	Tighten connections to the water-supply line. Check gaskets and washers around discharge pipe and mounting bolts to the bowl.
Toilet leaks at base.	Tighten bolts at base of bowl. Disconnect the toilet from the floor and replace the wax seal under the bowl.

Adjust a running toilet

Adjust the float arm. If the float still floats (it's not waterlogged), make the water rise higher or lower in the tank by bending the float arm at its center. If arm won't bend under hand pressure, grip it with a pair of pliers on either side of center. Flush the toilet to test your adjustment.



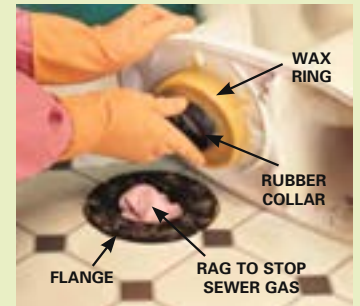
Hush a rattling lid

If the lid to your toilet tank rattles or wobbles, remove it and add a dab of silicone caulk to the four corners of the tank lip. After it dries, replace the lid; the noises should disappear.

Replace a leaking wax ring

When water leaks out from under a toilet, the wax ring must be replaced immediately to avoid water damage. Shut off and drain the water, and loosen one end of the supply tube. Remove the two flange nuts holding the toilet in place—be prepared to use a hacksaw to cut them if they're frozen in place. Plug the drain temporarily with a

rag, then scrape the old wax from the toilet base and flange. Install a new wax ring with a rubber or plastic collar. Remove the rag and lower the toilet straight onto the bolts. Sit on the toilet to compress the wax; it will reseal the connection between flange and toilet bowl. Reinstall the nuts, washers and supply tube.



Clean the rinse holes of a poorly flushing toilet

If your poorly flushing toilet worked well in the past and you live in an area with hard water, chances are the rinse holes around the bottom of the rim have become clogged with lime deposits. Clear rinse and siphon holes are crucial for complete flushing action. Even though the water from the tank will eventually find its way into the bowl, high water volume on the first surge is important for good flushing. There has to be a “critical mass” of water for solids to be flushed.

As a first step, ream out

the rinse holes with a bent coat hanger (Photo A). To do a thorough job, dry the bottom of the rim, then roll up paper towel “ropes” and seal them against the bottom of the rinse holes with plumber’s putty pushed against the bottom of the rim (Photo B). Then seal the siphon jet hole with another glob of putty and pour a bottle of lime remover into the overflow pipe (Photo C). Let it sit for at least eight hours to allow the lime remover to dissolve deposits. Remove everything and flush the toilet several times.



A CLEAN the rinse holes



B SEAL the rinse holes



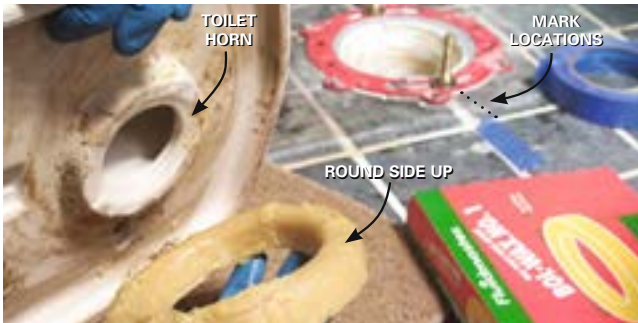
C REMOVE lime deposits

Reset and fix a rocking toilet

Frequently a toilet leaks simply because the wax ring has lost its seal. By far the most common reason for a broken seal is a toilet that rocks when you sit on it. A toilet that rocks even slightly will eventually compromise the wax ring. If you find no evidence of other problems after you pull the toilet, simply replacing the wax ring and resetting the toilet should fix the problem. Usually toilets rock because of an uneven floor—especially tiled floors. After you set the toilet, shim gaps between the toilet and the floor before caulking around the toilet (Photo 3). That'll prevent the

toilet from rocking and ruining another seal later.

Before you mount the toilet, push and wiggle the wax ring to help it stick to the porcelain around the horn. That'll keep it from falling off as you lower the bowl. When you reset the toilet, it's important to drop it directly into place. If it's not aligned directly over the bolts when the wax ring meets the toilet flange, you risk distorting the wax ring and ruining the seal. Marking bolt locations with masking tape will help you see their position (Photo 2) as you lower the bowl.



1 PUSH the new wax ring onto the toilet horn with the rounded side toward the toilet. Mark the water closet bolt positions on the floor with masking tape.



2 ALIGN the bolt holes with the masking tape and lower the toilet bowl straight over the bolts. Push down on the rim of the toilet to seat the wax ring, then close the lid and sit on the toilet for a few minutes to force the toilet all the way to the floor. Stop when the porcelain surface rests on the finished floor.



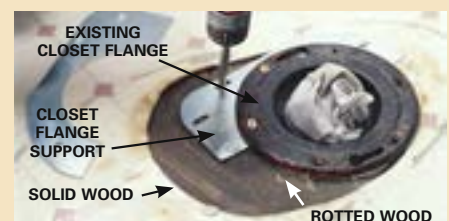
3 SLIP the bolt cap washers over the bolts, then snug down the water closet washers and nuts with a wrench. Be careful not to overtighten the nuts, especially over gaps between the toilet and the floor. Slip toilet shims under any toilet edge gaps and cut off the excess length. Some shims are pretty tough. If a utility knife won't cut through the plastic, you may have to chop them off with a sharp wood chisel.



4 CAULK around the toilet base with silicone caulk, leaving the back end of the base uncaulked. The gap leaves a space for moisture under the toilet to escape. (Some local codes require caulk around the entire base.)

Solidify a small area of rotting floor

If only the area directly below the flange is rotted, you can install a two-piece steel closet flange support. It goes under the flange and transfers the load of the flange and toilet (and you) out onto more solid surrounding wood. But if your floor is severely rotted, say more than an inch beyond the flange, you're stuck replacing the flooring around the toilet. Order a flange support for about \$18 from Sioux Chief (800-821-3944) www.siouxchief.com. The company offers one type for cast iron flanges and one for plastic or brass.



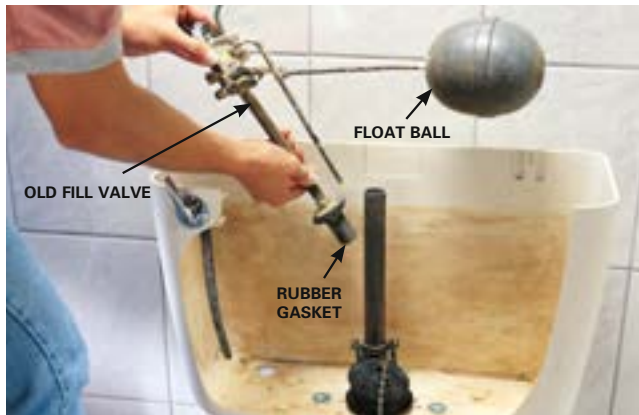
Overhaul a toilet tank

It's often easier to replace the entire working mechanism inside the toilet tank rather than to replace it piecemeal. A universal replacement kit and a few tools will soon silence the annoying watery sounds keeping you awake at night. First, shut off the water supply at the shutoff underneath the toilet or at the home's main shutoff. Be prepared to replace the toilet shutoff—corrosion or lack of use frequently causes it to seize or not close completely.

With the water off, flush the toilet to drain the tank. Sponge up the remaining water in the tank. Be sure the tank is completely empty before you remove any parts.



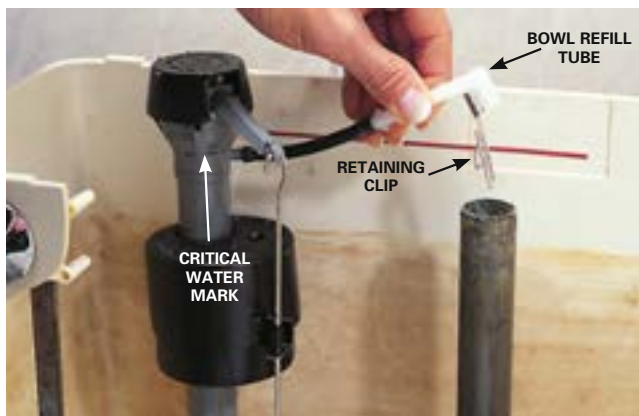
1 DISCONNECT the water supply tube located under the tank's bottom left side. Inside the tank, attach locking pliers to the base of the old fill valve to keep it from spinning. With adjustable pliers, remove locknut on outside of tank.



2 REMOVE old fill valve after unscrewing locknut under the tank, then lift out the mechanism. Float ball and refill tube are attached and will come out with it. Clean area around the hole where the fill valve mounts to the tank.



3 ADJUST the length of new fill valve by twisting fill valve base stem until the critical water mark (see Photo 4) is 1 in. above top of overflow tube. Install rubber gasket and test-fit height by setting valve in place. Orient fill valve so bowl refill tube points toward overflow tube. Secure fill valve with locknut.



4 TRIM bowl refill tube to length to avoid kinking and install it. Push refill tube over stem on valve and clip it to rim of overflow tube so water will be directed straight into overflow. Install and tighten water supply tube and turn on water to test toilet.



5 CLEAN out new valve to remove any dislodged mineral deposits. To do this, turn off water, take off cap, and then open water shutoff valve slowly to let water bubble out.

Unclogging toilets

A \$4.95 plunger will make you the family hero!

Avert a morning household disaster by clearing a clogged toilet fast. With a little practice, even a home repair rookie can get most clogged toilets back up and running in minutes, without flooding the bathroom and making the situation worse . . . sometimes much worse!

For about 90 percent of clogged toilets, you only

need one special tool—a plunger. Buy one with an extension flange on the rubber bell-shaped end (photo below). It's designed to fit toilets better so you can deliver more “oomph” to the plunge. You could pull a woodchuck from a hole with one of these things. It'll unplug sink and tub drains too, if you simply fold the flange back into the bell.



Do you have a slow-drainer or a no-drainer?

A poor flush means that your toilet drain is either partially or completely plugged. A toilet that's completely plugged—a no-drainer—is obvious. The toilet bowl will fill to the brim with flush water and perhaps overflow. Give the water level 10 minutes or so to drop, then attack the problem with a plunger (photo at right).

However, most clogged toilets are slow drainers, that is, flush water partially fills the bowl but doesn't rush out and clean away the waste. The water level remains high, then usually drains down to normal height within a minute or two. You might not know the toilet is clogged until you flush it. *So if you suspect a problem, test the drainage first as we show in the top photo below.* If it doesn't drain, don't flush it. Reach for the plunger.

Plunge the toilet with the rubber flange pulled out to get a better seal. Push in and out vigorously, keeping enough water in the bowl to cover the plunger. Keep towels handy to wipe up water that splashes out.



1



Become a master plunger

The photo above shows how a plunger fits over and seals the toilet drain. Wear rubber gloves—things can get messy—and follow these plunging tips:

1. Make your first plunge a gentle one. Initially the bell is full of air. A hard thrust will force the air back around the seal and blow water all over the bathroom and you!
2. Once you force out the air, plunge vigorously in and out, maintaining the seal. You'll be forcing water both directions in the drain, which will effectively loosen most clogs. Stick with it, plunging 15 to 20 times if necessary.
3. Be patient. Try alternating between steady strokes and occasional monster heaves.
4. Keep enough water in the bowl so the plunger stays covered. Trying to force air through the toilet trap won't generate much pressure.

Most of the time, this is all it takes to clear the clog. However, if the plunger won't open the drain, or if you can force out the water with the plunger but the toilet still won't flush well, reach for the snake (photos on p. 40).

Don't flush the toilet if you suspect that it's clogged. Instead, remove the tank lid and lift the flapper valve slightly to let a cup or two of water into the bowl to see if the water goes down. Flushing a clogged toilet may flood your floor!

3



HOUSEHOLD SNAKE, \$7

Bore through the clog with a snake

A drain snake is a long wire coil with a corkscrew-like tip that you feed into your pipes until it encounters the clog. Then you turn the snake clockwise, so that the tip screws into or through the clog and breaks it up. Or the debris winds onto the wire so you can pull it out.

Even the least expensive snake (photo above) will clear a toilet. But the closet auger (photo below; \$15) is a special type designed to get around the first bend, keep debris at arm's length, and yet still spin the coil to hook "foreign objects." A rubber sleeve protects the enamel bowl from scrape marks. These snakes are short because most obstructions catch in the first S-bend or at the floor flange. (Plumbers report that the most common foreign objects are toys.)

Do's and don'ts

1. Avoid chemicals. Don't be suckered into thinking that powerful chemicals will do the messy work for you. They sometimes work, but they're slower. And when they don't work, you have a drain full of corrosive water on your hands.

If you tried chemicals and they didn't work, run as much water into the toilet as possible and let it sit overnight to drain through the clog. Then, when you plunge, wear safety goggles and rubber gloves to keep the water out of your eyes and off your bare skin.

2. Keep the toilet cover down, especially if you have small kids, so toys and hairbrushes won't fall into the toilet.

3. Don't pour hardening compounds down the toilet. These include such things as drywall joint compound, grease, caulk and wax products.



4



CLOSET AUGER

Major surgery

If the clog resists all your efforts, you'll probably have to pull up the toilet. This job will take several hours, because you have to turn off and unhook the water supply, partially disassemble the toilet, and unscrew it from its mounting ring. Chances are, you can then get at the problem. Be sure to buy a new wax ring (\$1) and new mounting bolts (\$1) to reseal the toilet base to the mounting ring.

However, if other drains in your home are plugged, or if water comes up through them, the problem is probably farther down in the main drainpipes, often out of easy reach. For those clogs, you may need to call a plumber or sewer cleaner. (Some plumbers aren't equipped to clean long sewer drains.)

Spin a special "closet auger" or regular snake through the drain if plunging doesn't dislodge the clog. The wire coil end should break through the obstruction or grab it so you can pull it out.



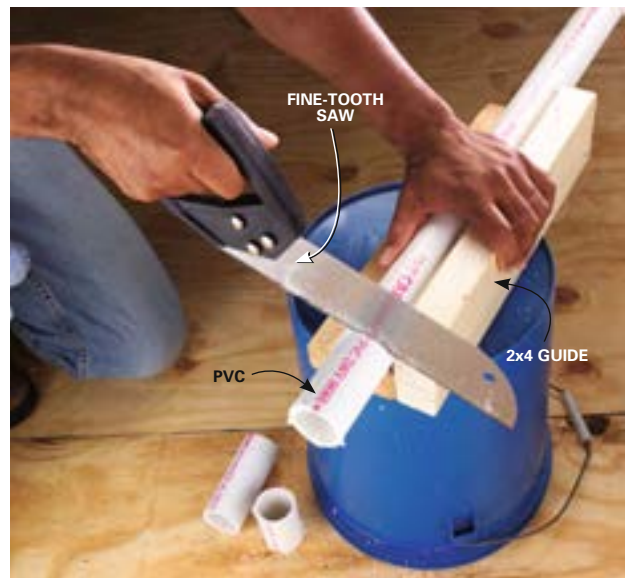
Joining plastic pipe

At first glance, plastic plumbing pipe looks easy to cut and join. But don't be fooled. There's more to a top-quality installation than meets the eye. Here are some tips for cutting and joining plastic pipe that'll guarantee a long-lasting, leak-proof plumbing job.

Make square cuts for the strongest joints

Square pipe ends fit snugly into the fittings, allowing plenty of contact area for the solvent cement (p. 43) to work. They also make a smoother interior surface for better water flow. A power miter saw and other special tube cutters guarantee square cuts, but you don't have to buy them. You can do a good job with just a handsaw and an improvised guide. The photo shows an easy-to-use guide that's made by screwing together scraps of 2x4.

For the best results, use a saw with fine teeth and a blade that's 3 or 4 in. wide. A hacksaw is a poor choice because the narrow blade tends to wander easily. Special saws for cutting plastic pipe cost about \$10 to \$15 and are a worthwhile investment if you do much plumbing work. You'll find them in the plumbing tool area or with the handsaws in most home centers and hardware stores. Otherwise, any fine-tooth saw will work.

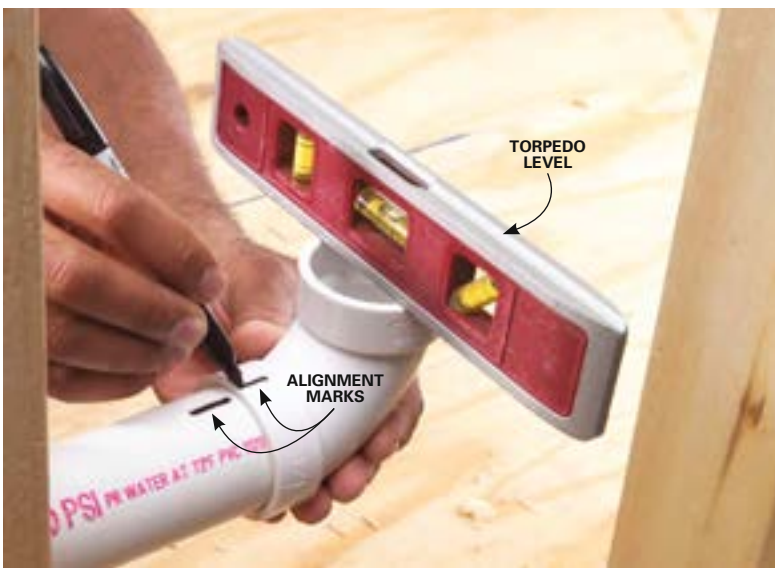


Sand off the saw burrs for a better fit

Plastic burrs left from sawing can cause trouble. Outside the pipe they'll interfere with a good fit. On the inside they can collect debris and slow the water flow. You can remove them with a file or pocketknife, but sandpaper is easier to use and works great. Simply roll



a quarter sheet of 80-grit sandpaper into a tube and flatten it slightly to match the curve of the pipe. Then hold the sandpaper at an angle and sand the inside and outside of the plastic pipe until you create slightly beveled edges.



Mark the pipe and fitting for precise orientation

By the time you spread the solvent cement on both the pipe and the fitting and press them together, you have only several seconds to get the alignment right before the pieces are stuck together. That's why it's a good idea to make alignment marks beforehand on joints where orientation is critical. Dry-fit the pipe and fitting, using a torpedo level if needed to align the fitting, and make a mark across the fitting and pipe. Use these marks to align the fitting and pipe when you join them with solvent cement.



1 Wipe the inside of the fitting and the outside of the pipe with primer. Spread an even layer of solvent cement on the inside of the fitting and outside of the pipe.



2 Push the pipe into the fitting and twist until the marks are aligned. Press and hold the pipe for about 15 seconds.

Use an even layer of cement and the quarter-turn technique for the strongest joints

Just swiping the pipe with cement and pushing on the fitting won't ensure a strong joint. You want to make sure you have an even layer of cement over all mating surfaces.

If you're using PVC or CPVC pipe, wipe primer around the pipe and into the fitting to prepare it for the solvent cement. Let it dry about 10 seconds. Then spread an even layer of solvent cement on the same surfaces. To keep excess solvent cement from being pushed into water piping, don't apply too much to the inside of the socket on the fitting. At this point you have to work fast to complete the assembly. Align the fitting and pipe about a quarter turn from their final orientation. Then twist the fitting a

quarter turn as you press it onto the pipe. Twisting the fitting helps spread the solvent cement evenly to ensure a solid joint. If you've made alignment marks (Photo 2), make sure they're aligned with each other. Hold the pipe and fitting together for about 15 seconds until the cement grabs. If you let go immediately, the pipe may push out of the fitting, resulting in a weak joint.

Caution:

The solvent vapors from the primer and cement can make you dizzy and are dangerous to your health. Make sure you have plenty of ventilation or wear an approved organic vapor respirator when working with primer and solvent cement.

Don't sweat it—mistakes are usually easy to fix with a coupling

It's always disappointing to make a mistake. But at least with plastic pipe it's easy to fix. Simply saw out the messed up section, whether it's too long, too short or crooked. Correct the mistake and reassemble the joint with a coupling. In some cases, you can reuse the old section of pipe and fitting. Otherwise, set it aside and cut new parts. You may be able to use the bad section later.



Buy extra fittings. Having extra on hand will save you a trip to the store. And you can return the extras when you're done with the project.



1 OOPS! The assembled pipes don't reach the predrilled hole because we dry-fit the pipes and forgot to allow extra length for "shrinkage." See below.



2 Saw out the bad section. Fix the goof, using new parts if necessary. Use a coupling to rejoin the parts. Prime (if needed) and cement the parts together.

Allow for shrinkage if you dry-fit the pipes

Most novice pipe fitters find it reassuring to cut and assemble a group of pipes and fittings before gluing them together. It's OK to do this as long as you're aware of the pitfalls.

Don't jam the pipe and fitting together too tight. They'll get stuck and can be difficult to get apart. If a fitting does get stuck, just set a block of wood against the lip and pound the fitting loose with a hammer.

Leaving the fittings loose keeps them from getting stuck, but it creates another problem. You can't assume

that the final assembly will be the same size as the dry-fit parts. When you apply solvent cement to the pipe and fitting and press them together, you'll lose a little length at each joint. On 1-1/2-in. pipes, this could be as much as 3/8 in. per joint. So keep this in mind if you dry-fit, and allow extra length where fit is crucial.

Another tip is to limit dry fitting to a small group of pipes and fittings. Join this group with solvent cement before moving to the next section.

Use the proper solvent for each type of plastic

There are three common types of plastic plumbing pipe: PVC, CPVC and ABS. Each requires a different kind of solvent cement. The white

or beige pipes (PVC and CPVC) also require a primer. You don't need a primer with black ABS pipe. Read the label to match the sol-

vent cement to the type of pipe you're using. Avoid universal solvent cements.



Leakproof plumbing connections

Use two types of Teflon on threaded joints

Connections that rely on threaded pipes and fittings are prone to leaks if they're not sealed with either Teflon tape or Teflon pipe joint compound. Careful plumbers use both on every joint for extra security. They don't want to have to come back.

Start by wrapping the male threads with Teflon tape (Photo 1). With the end of the threaded pipe facing you as shown, wrap the tape clockwise. Usually three layers is enough. Once in a while, you'll run into a loose fitting that requires four or five wraps. Stretch and tear the tape to complete the wrap.

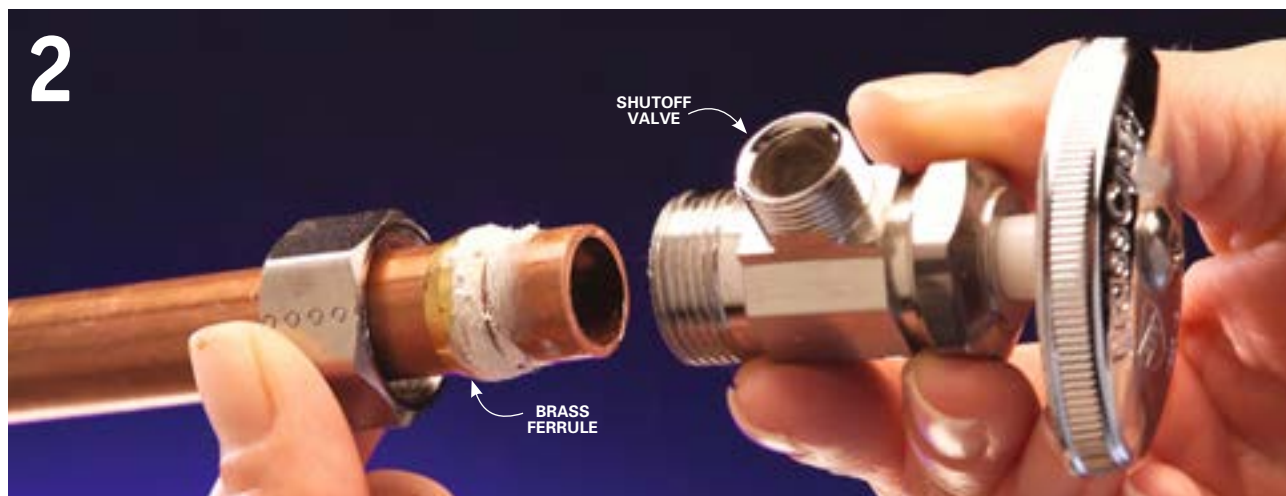
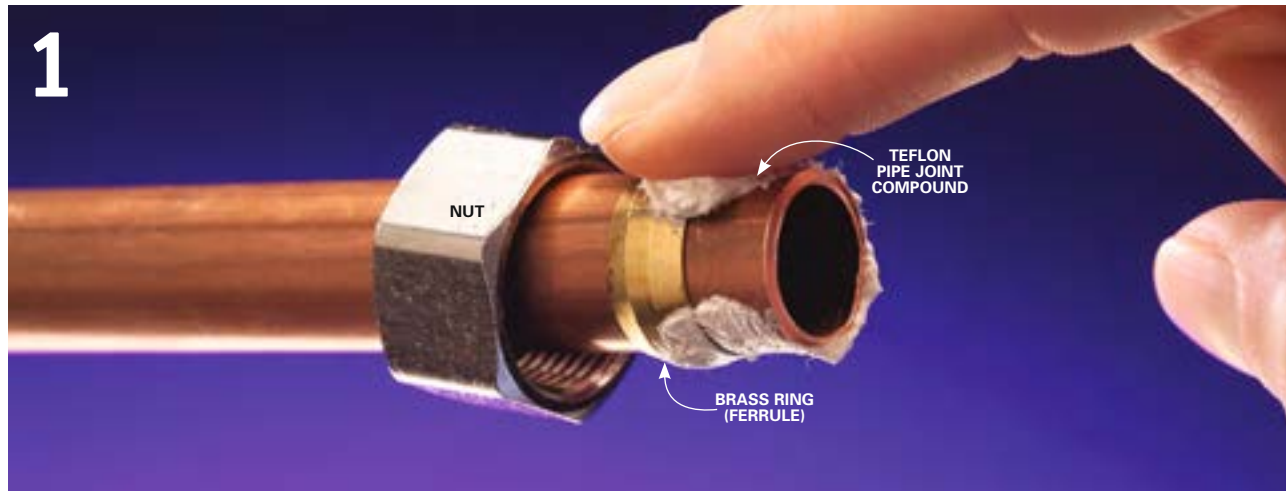
Spread a thin layer of Teflon pipe joint compound over the tape (Photo 2). If you're working with plastic pipe, choose Teflon pipe joint compound that's compatible with it. Then start the threads by hand before tightening the connection with wrenches (Photo 3). Wipe away the excess.



Lubricate the ferrule on compression joints

Compression joints are most common on shutoff valves, although you find them on other fittings as well. They have a brass or plastic ring (ferrule) that's compressed into a recess when you tighten the nut, forming a seal. Lubricating the pipe and the ferrule with a bit of Teflon pipe joint compound (Photo 1) helps the ferrule slide along the pipe and squeeze tightly into the recessed

fitting with less wrench pressure (Photo 2). Tighten compression fittings firmly with two wrenches to crimp the ferrule onto the pipe (Photo 3). Also make sure the pipe or tube goes straight into the fitting. Misalignment will cause a leak. If the fitting leaks after you turn on the water, try tightening the nut an additional one-quarter turn. This usually stops the leak.



Align slip joints precisely for a tight seal

Joints on chrome trap assemblies rely on rubber slip joint washers for the seal, which often leak. If you're reassembling a chrome trap, buy new slip joint washers and nuts. However, new washers sometimes stick to the pipe, causing them to twist or distort as you push them tight with the slip joint nut. To avoid this, lubricate the drain tubing and slip joint with a little pipe joint compound (Photo 1). The compound helps the washer slide smoothly and creates a tighter seal.

Start the slip joint nut by hand, and twist it on until the threads are engaged correctly. Hand-tighten all joints first (Photo 2). Then adjust the trap parts until they're aligned and pitched slightly for drainage. This is key; a misaligned joint will leak, even with new washers. Finally, use a large slip joint pliers to tighten the nuts an additional half turn.

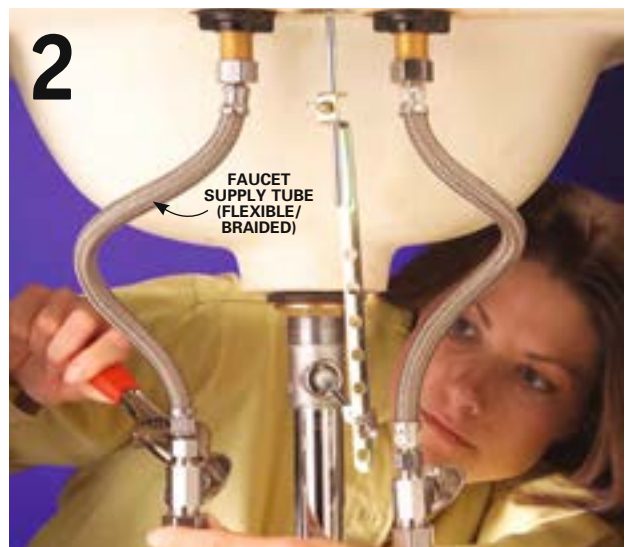
Plastic trap parts use hard plastic slip joint washers for a seal. Make sure the flat part is against the nut with the tapered side facing the fitting.



Choose flexible supply tubes

The skinny copper or chrome supply tubes used to connect faucets and toilets (Photo 1) are tricky to cut, bend and align. But you don't have to put up with them. When you're replacing a faucet or toilet, use flexible supply hoses with a braided covering instead (\$3 to \$6 each; Photo 2). They have rubber gaskets at each end and don't require much force to seal. They're available in many lengths and are flexible enough to fit almost any configuration. The only trick is buying a connector with the correct size nuts on the ends. Take your old tubing and the nuts on each end along with you to the store to be sure of an exact match.

Start the nuts carefully and hand-tighten. Then tighten an additional half turn (Photo 2). Avoid over-tightening. It's easy to tighten the nuts a little more if the joint leaks.



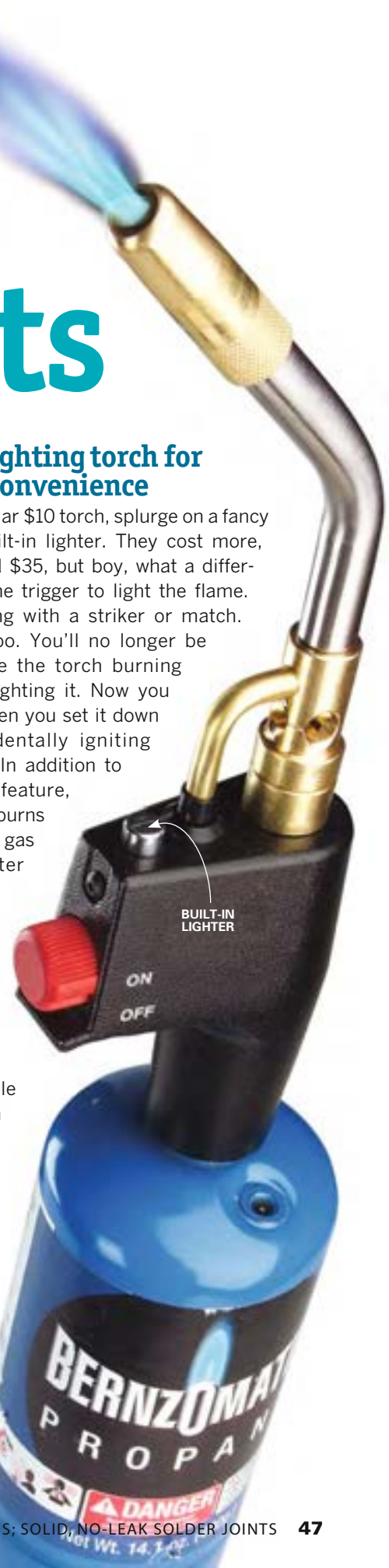
Solid, no-leak solder joints

Even a pinhole leak in a soldering job creates a bunch more work. But luckily, if you take a methodical approach and a little extra care in cleaning and fluxing the joints, leaks in newly soldered copper pipes are rare. Soldering copper plumbing is a skill anyone can learn with a little practice. And it doesn't require a large investment in tools. Here you'll learn how to do a leakproof soldering job the first time—and a few cool tools to make the job quicker and easier.



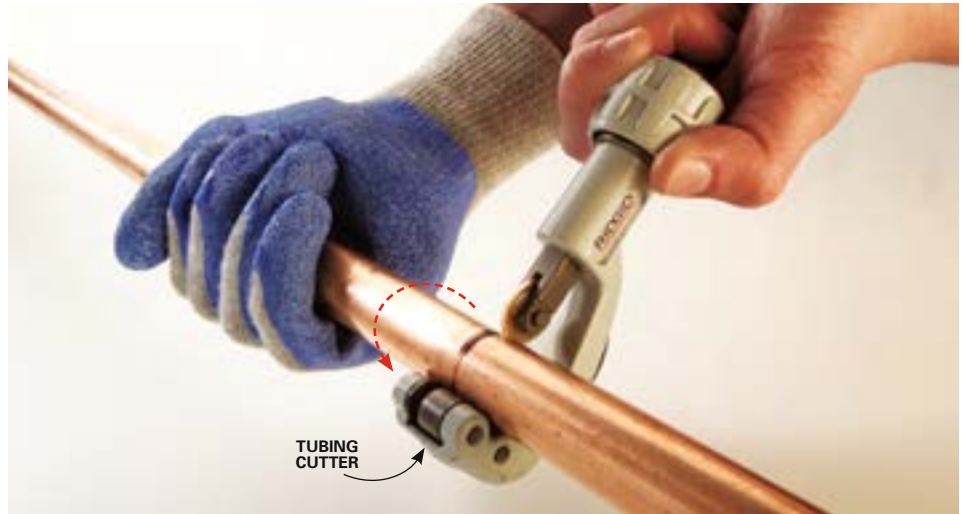
Buy a self-lighting torch for safety and convenience

If you have a regular \$10 torch, splurge on a fancy model with a built-in lighter. They cost more, between \$20 and \$35, but boy, what a difference. Just pull the trigger to light the flame. No more fumbling with a striker or match. And it's safer, too. You'll no longer be tempted to leave the torch burning just to avoid relighting it. Now you can turn it off when you set it down and avoid accidentally igniting your blue jeans. In addition to the self-lighting feature, look for one that burns MAPP gas. MAPP gas produces a hotter flame, which is better for soldering larger diameter pipes (1-in. and larger) and brass valves. Once you're comfortable with how much heat to apply for a good solder joint, you can switch to MAPP gas to speed up all of your soldering jobs.

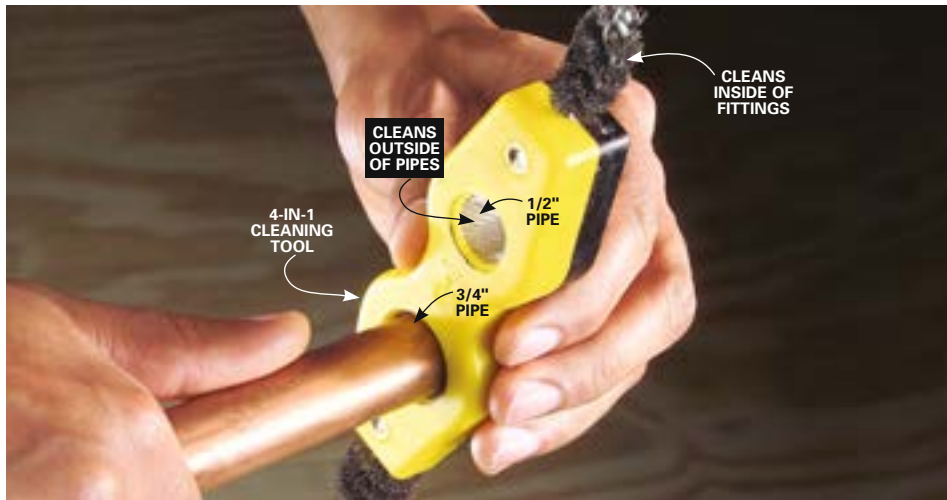


Use a tubing cutter to cleanly cut copper pipes

Use a good-quality tubing cutter (\$15 to \$25) rather than a hacksaw. You'll be assured clean cuts with square ends that fit neatly into the fittings. The cutting process leaves a small burr inside the pipe. To avoid creating undesirable turbulence inside the pipe, remove the burr with the flip-out burr remover on the cutter or with a special pencil-shaped, burr-removing tool.



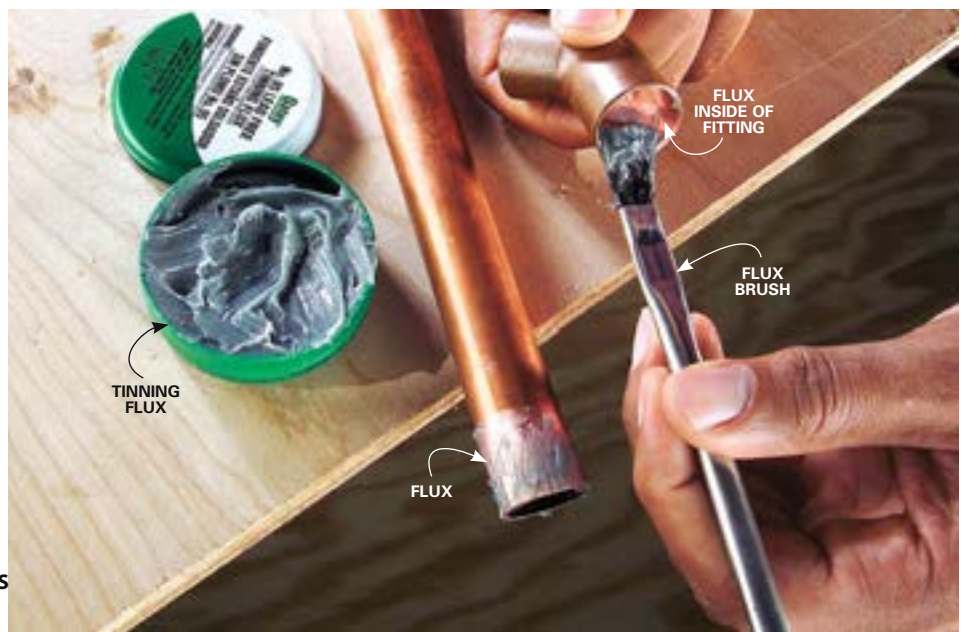
Use a steel brush for complete cleaning of pipes and fittings



Oils, oxidation and other impurities on the outside of pipes and inside of fittings prevent solder from sticking. To clean them, you can use just about anything that's abrasive, including sandpaper and emery cloth. But for the quickest, cleanest results, buy a 4-in-1 cleaning tool like the one shown (\$9). Use it to clean the outside of pipes and the inside of fittings for 1/2-in. and 3/4-in. copper.

Apply tinning flux rather than regular flux

After a thorough cleaning, coat the pipe and fitting with flux before heating the joint. This helps solder flow into the joint. You may find two or three kinds of flux on the shelf. We recommend tinning flux. It contains a bit of powdered metal alloy that is similar to solder. The alloy melts and coats the inside of the joint and helps ensure a solder joint that's completely filled and leakproof.



Assemble the pipes, then solder the joints all at once



We don't recommend trying to assemble the entire plumbing run before starting to solder, but cutting, sanding and fluxing a grouping of pipes is a good practice. It allows you to accurately cut and fit the pipes before soldering. With this done, it's an easy matter to solder the joints one after the other. Since the pipes are held firmly in position, you don't have to worry about accidentally disturbing a joint before it's cooled.

Heat the joint just enough to melt the solder

If you don't heat the joint enough, the solder won't flow into it. If you heat the joint too long, you'll burn the flux (it'll smoke and turn black) and make it difficult to get the solder to flow into the joint. Applying just the right amount of heat comes with practice, but it's not hard to learn. Here's how: Light the torch and, if possible, adjust the torch until the blue part of the flame is about 1 to 2 in. long (this depends somewhat on the type of torch and tip you use). Then position the tip of the blue part of the flame on the fitting and heat the joint about five seconds or until the flux starts to bubble and sizzle.

Test the joint by touching the solder to the seam on the side opposite

the flame. When the copper is hot enough, the solder will melt like butter. Move the flame away from the joint and feed about 1/2 in. to 3/4 in. of solder into the joint.



The solder will flow into all areas of a properly cleaned and fluxed joint. Then to make sure the joint is completely filled, run the tip of the solder quickly around the seam. It's easier to reach around the back side of the joint if you bend a hook on the end of the solder before you start.

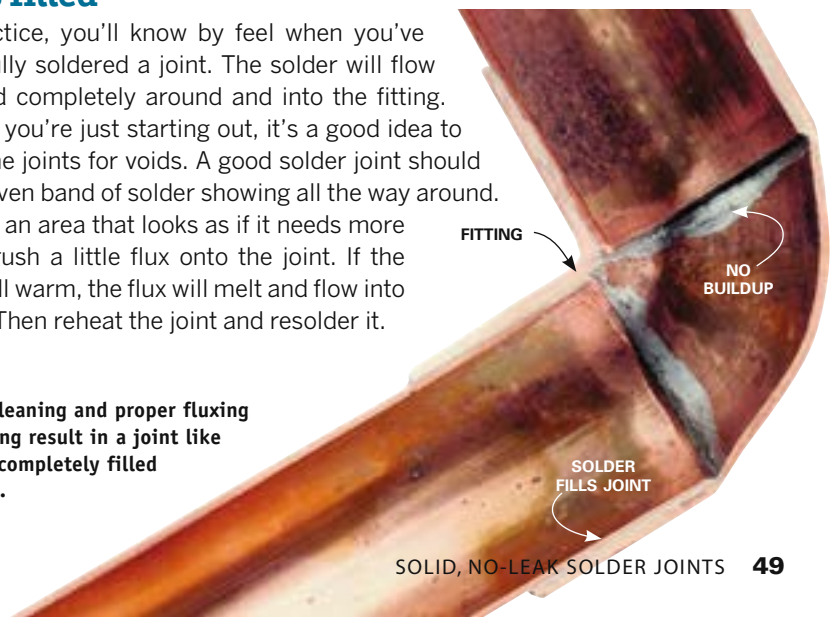
If the solder beads up and rolls off rather than flowing into the joint, you've probably burned the flux or the copper isn't clean enough. You'll have to take the joint apart to clean and reflux it before trying again.

Check to make sure the joint is filled



With practice, you'll know by feel when you've successfully soldered a joint. The solder will flow easily and completely around and into the fitting. But when you're just starting out, it's a good idea to inspect the joints for voids. A good solder joint should have an even band of solder showing all the way around. If you see an area that looks as if it needs more solder, brush a little flux onto the joint. If the joint is still warm, the flux will melt and flow into the void. Then reheat the joint and resolder it.

Complete cleaning and proper fluxing and soldering result in a joint like this that's completely filled with solder.



Tighten connections and straighten crooked pipes

The washers that seal pipe joints won't hold water unless one section runs straight into the other. The "ground" joint on the trap has no washer, but it too will leak if it's misaligned. Eyeball the leaking joint to check its alignment. If it's crooked, simply loosen the nut, straighten the pipe and retighten. Since the whole assembly is interconnected, you might misalign one joint while straightening another. Don't be surprised if you end up loosening and tightening several joints to straighten just one.

If a joint is aligned but leaks anyway, tighten the slip nut. Use two slip-joint pliers on metal pipes: one to hold the pipe, the other to tighten the nut. If you have old metal pipe, you might find that it has worn thin and collapses when you put a pliers on it. With plastic pipe, hand-tighten first. If that doesn't stop the leak, use a pliers. But be gentle; plastic threads are easy to strip.

LOOSEN slip nuts, then straighten crooked pipes. Retighten metal nuts with a slip-joint pliers. With plastic nuts, hand-tighten first. If that doesn't stop the leak, gently snug up the nut with a pliers.



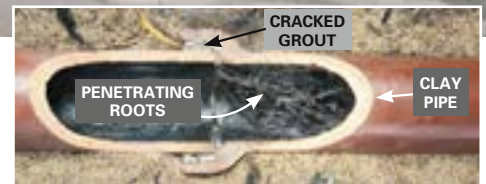
Install a new adapter on old steel pipe

The drainpipe coming out of the wall has an adapter on the end. This adapter has a washer and slip nut and works just like the other joints in your drain assembly. If your drainpipe is plastic you shouldn't have any problems. But if your drainpipe is old galvanized steel, you might run into corrosion that makes the slip nut almost impossible to loosen or retighten.

Here's how to bypass those rusty old threads: Unscrew the old slip nut. Cut it off with a hacksaw if you have to, but try not to cut deep into the drainpipe's threads. Buy a plastic trap adapter, a rubber transition coupler, a section of plastic pipe and cement (\$10 altogether). The pipe and adapter can be PVC (white) or ABS (black); just be sure to get the right cement for the type of plastic (PVC also requires purple primer). Cement the adapter to a 4-in. piece of pipe and join the plastic pipe to the old metal pipe using the rubber coupler.



Unclog a main drain



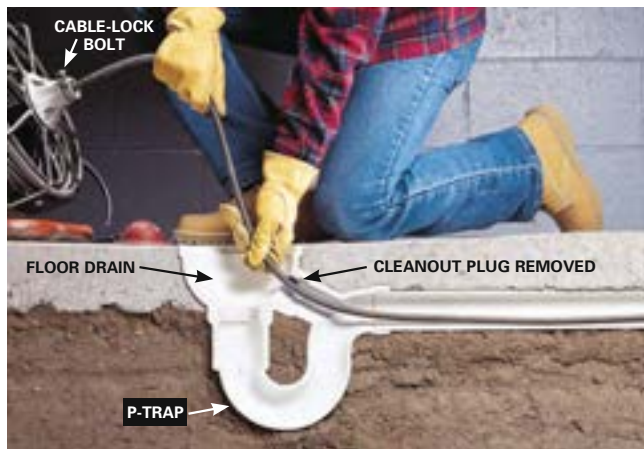
If a group of fixtures, or a floor drain, is backed up, you have a clog in one of the main drain lines. These clogs often require that you remove cleanout plugs and open the drain using heavy-duty power-driven augers. Frequently these clogs form when tree roots penetrate the main drain or when certain foreign objects are sent down the drain.

To clear the drain, you can call a professional or rent a drain-cleaning machine. Be careful removing the cleanout plug—it may release a flood of backed up wastewater, so be prepared with buckets and rags.

Caution:
Never attempt to remove a cleanout plug from, or run a cable into, a drain that contains chemical drain cleaner.

Tree roots work their way through cracks or joints in older sewer lines made of clay tile, cast iron or other piping. Newer sewer lines, made of plastic, don't suffer from this problem. When a drain becomes root-bound, it needs to be reamed out using a root saw, but the problem will soon recur unless one of the following extra measures is taken:

- Dig up the old line and replace it with plastic.
- To slow root growth, treat the drain with poison formulated to kill nearby roots.
- Seal the line by having the existing pipe lined with an internal plastic fabric and epoxy.

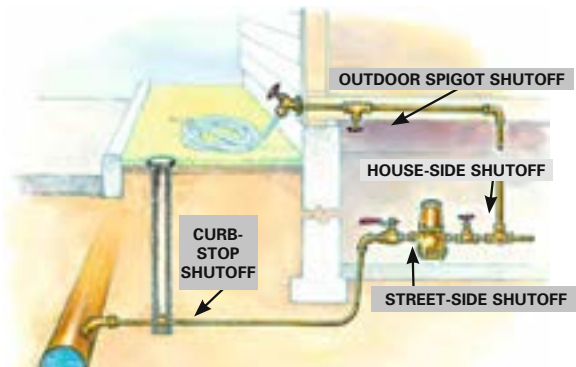


1 REMOVE the cleanout plug from the floor drain or cleanout. Feed cable into the drain with the motor off until you can't push any farther. Start and stop the motor using the foot switch as you feed cable. Proceed slowly. Do not allow tension to build up if the cable head stops and the cage continues to rotate. To chew through the clog, tighten the cable-lock bolt and loosen and feed cable as needed.

2 ATTACK the clog through the main drain cleanout, if necessary. Correctly installed systems will ensure the snake follows the correct path. Stubborn or stripped cleanout plugs can be replaced with special friction-fit plugs.

Emergency shutoff valves

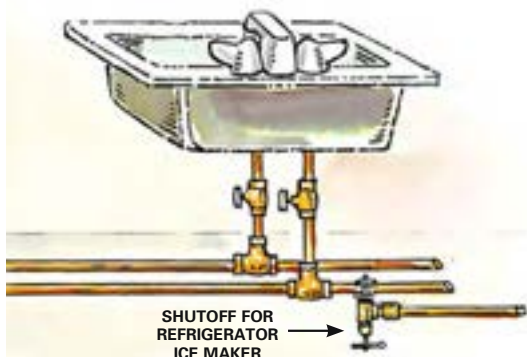
Shutoff valves allow you to control water flow to all or parts of the water-supply system to reduce damage from a supply leak or to make repairs or replace fixtures. The main shutoff, whether indoors or outdoors, is generally near where the service line enters the house, usually next to the meter. On a private system, it will be near where the line leaves the pressure tank. You'll also find shutoff valves at the water heater, boiler, individual fixtures and outdoor water lines.



MAIN shutoff. This valve controls the flow of all water entering the water-supply system.



TOILET shutoff. This valve is usually on the cold-water supply located underneath the tank.



FAUCET shutoff. Separate valves control the hot and cold water.

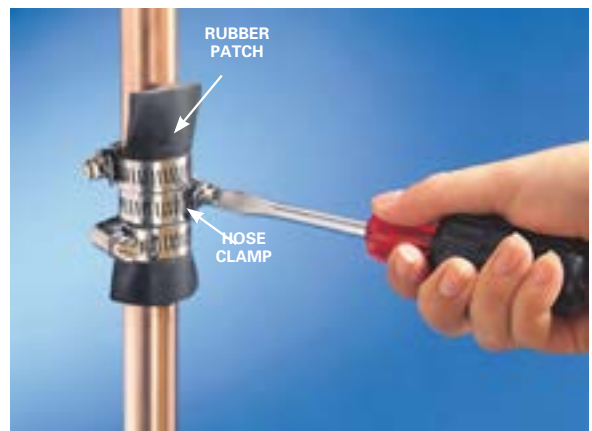
Install pipe insulation

Wraparound foam pipe insulation is available in several sizes. It will help maintain the temperature of water in the pipes, but it won't protect pipes in areas prone to long-term freezing. The insulation is split to allow it to slip over the pipe and cuts easily with a serrated knife. The insulation also keeps warm, humid air from condensing on pipes, stopping the pipes from sweating in the summer.



Temporarily fix a leaking pipe

The best way to deal with a hole in plumbing is to replace the section of pipe, but a temporary fix helps you deal with emergency leaks. First, shut off the water supply. Next, slit a section of hose or a rubber coupler, available at hardware stores, and place it over the hole. Finally, secure the rubber patch with hose clamps. Larger holes will require multiple clamps placed side by side.



Easy water softener fixes

Is your soft water not so soft anymore? You can often fix the problem yourself. However, if you have an older softener (20 years or more) and none of these fixes work, it may need replacement (\$500 and up).

All softeners, whether they have one or two tanks, work the same way. As cold water flows through the resin tank, the mineral content—the hardness—is removed because the minerals stick to thousands of resin beads. When the softener recharges, the flow of fresh water is stopped while salty water from the brine tank is sucked into the resin tank, where it dissolves the accumulated minerals and is flushed down the drain.

Before you tear apart your softener, check the control settings—especially after a long power outage. The timer clock has to show the right time so that the resin tank is cleaned and recharged when no one is using water (usually early morning).

Also make sure the hardness setting is still correct—well water hardness can change over time. Bring a small container of your water to a water softener dealer for a water hardness test, then check the results against your settings.

Note: Set the water supply to “bypass” before working on the softener. And run the hot water after you turn the softener back on to flush out any hard water.

1 Look for salt problems

Check for salt problems in the brine tank. Start by pushing a broom handle down into the salt to break up salt bridges (like a dome), blocking salt from dropping to the bottom of the tank. If too little salt gets dissolved, the resin bed won't get clean and the water won't get softened.

Also, when the salt level is low (or at least once a year), check for a crust of salt mush at the bottom. This thick salt paste doesn't dissolve well, reducing the salinity of the brine solution, and needs to be removed.

Don't use rock salt; it contains dirt and other impurities that can clog the softener.

2 Clean the resin bed

Clean the resin bed twice a year with resin bed cleaner (available at water softener dealers) if you have “clear water iron” (dissolved iron makes a glass of water turn cloudy or rusty after sitting for several minutes). Otherwise the resin bed won't remove the iron.



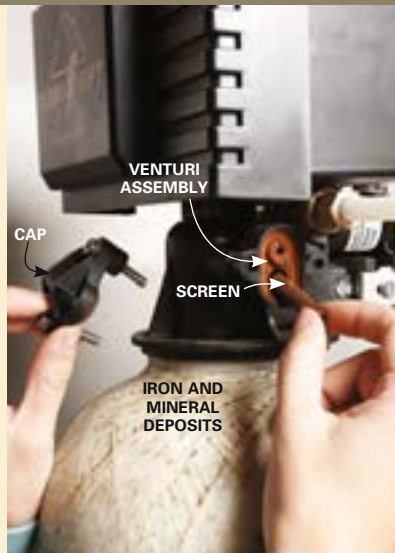
Scoop out the mush at the bottom of the tank, then pour in hot water to dissolve the rest before regenerating the system.



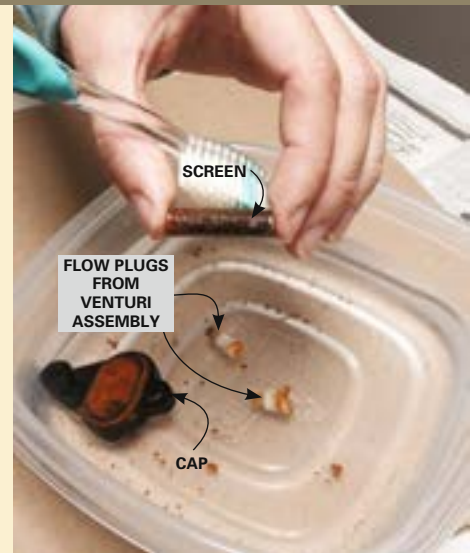
Pour diluted resin cleaner into the brinewell tube. Lift out the air check valve (or brine valve assembly) and clean it in warm water.

3 Clean the venturi assembly

The salty water flows through these parts from the brine tank to the resin tank. If the screen and nozzle get clogged by sediment, the resin bed won't be cleaned and the water will stay hard (photos at right).



1 Remove the cap that covers the venturi assembly and filter screen and carefully remove the parts.



2 Gently clean dirt and mineral deposits from the screen and from the venturi assembly parts in a pan of warm water.

Extend the life of your water heater

Water heaters often work perfectly for a decade or more without any care, so they're easy to neglect. But a few minutes of maintenance once a year pays off by extending the tank's life span and maintaining your water heater's efficiency and safety.

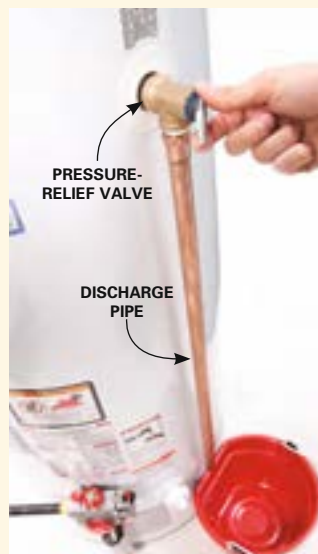
Before you do any maintenance, close the shutoff valve on the cold water supply pipe that feeds the water heater. Then turn on the hot water at any faucet to release the pressure inside the heater's tank. Leave the faucet on until you finish your work. If you have an electric heater, turn off the power at the main panel. With a gas heater, turn the gas control dial to "off."

First, test the pressure-relief valve located on the top or side of the water heater (Photo 1). This safety valve opens automatically if the pressure inside the tank gets too high. (Excess pressure can actually cause the tank to explode.) If the valve doesn't release water when you lift the lever, replace the valve (\$13 at home centers and hardware stores). Replacement is simple; unscrew the discharge pipe and then unscrew the old valve. Wrap the threads of the new valve with thread sealant tape and screw it into the tank. If your valve is several years old and has never been tested, it might leak after you test it. In that case, replace the valve.

Next, drain the tank to flush out sediments that have settled to the bottom of the tank. Sediment buildup adds to your energy bill by reducing the efficiency of your water heater, and shortens its life. Draining 2 or 3 gallons of water is usually enough to flush out sediments, but

always let the water flow until you no longer see particles in the bucket. Caution: The water is scalding hot.

Don't worry about any gurgling or groaning noises coming from the heater; it's just air entering the system as water drains out. If the drain valve won't close tightly when you're done, drain the tank completely, unscrew the old valve and screw in a new one (\$8). To restart the water heater, open the shutoff valve and let the hot water run at any faucet to purge air from the system. Then turn on the power or relight the pilot.



1 Place a bucket below the discharge pipe and gently lift the lever on the pressure-relief valve to test it.

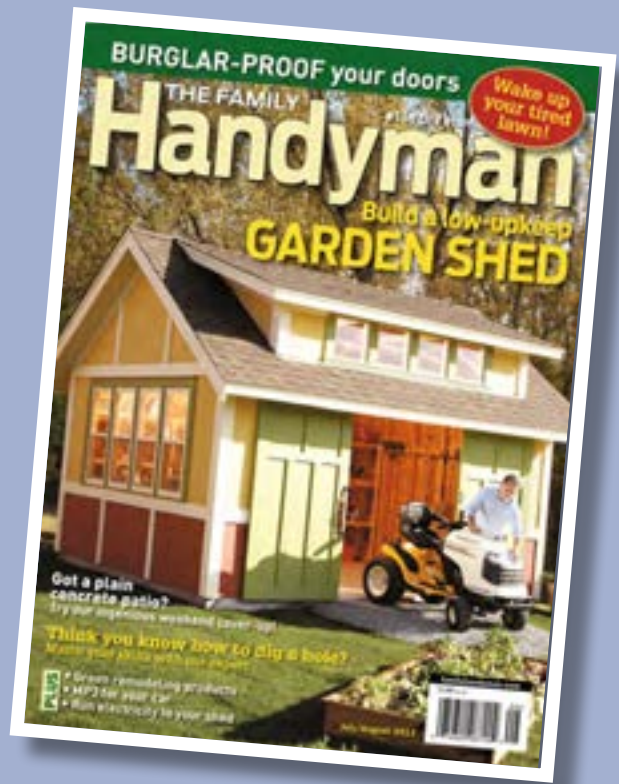


2 Open the drain valve slowly and let the water run until it's clear and free of sediments. Caution: The water is hot!

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