Plumbing 水管

The Drain Pipe System 排水管系統

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- Vent Pipes 排氣管
- Fixtures 固定裝置
- Appliances 家電

Typical Drain System 典型排水系統

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- Remove the Old Ballcock 移除舊的浮球旋塞
- Installing a New Toilet 安裝新廁所

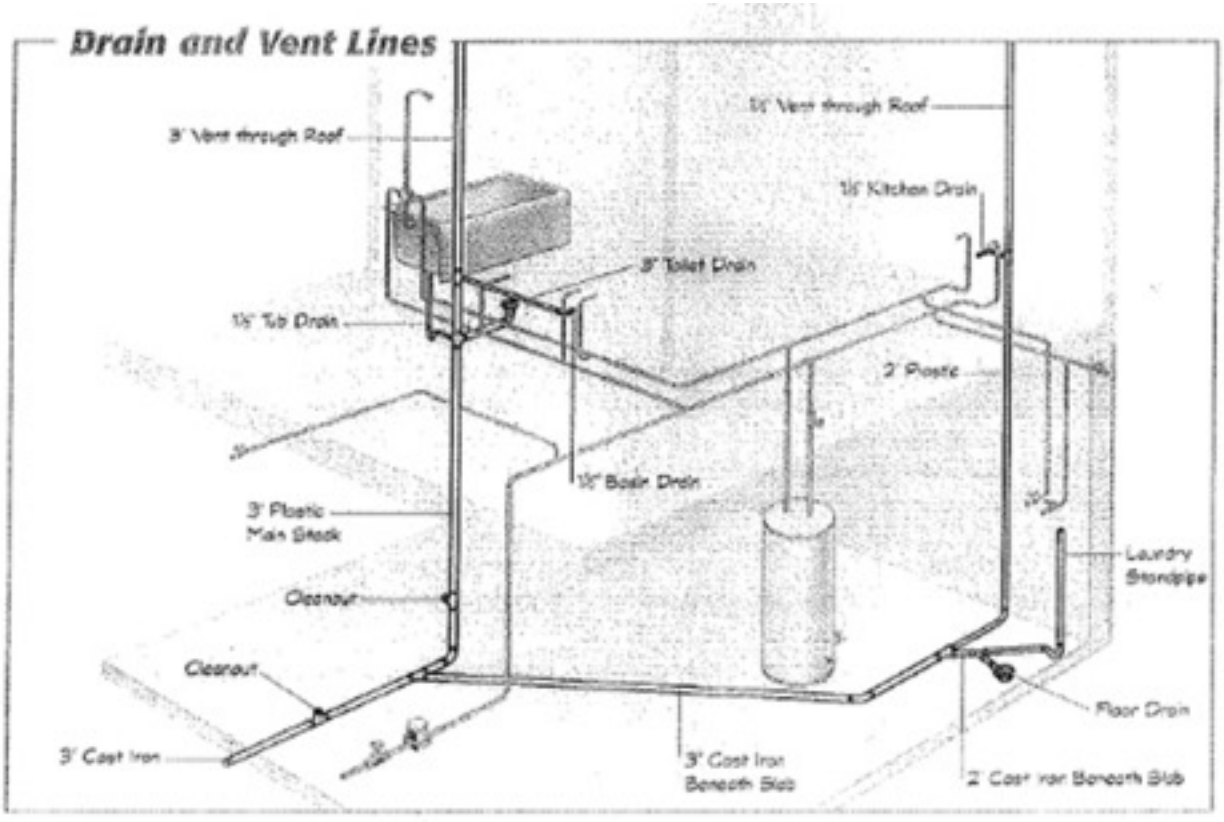
The Drain pipe System

The in-house drainage system starts with a main pipe several feet outside an exterior wall, which passes under the house footing and into the basement or crawl-space. This below floor drain pipe, usually 4 inches in diameter, is called the “main soil pipe”. (Any pipe carrying solid waste is technically a soil pipe.)

The main soil pipe continues horizontally under the basement floor or slab (or along a wall), sometimes branching off and reducing to serve a laundry standpipe, or maybe a floor drain or two, and possibly a basement bathroom and kitchen riser. Where the main soil pipe runs under the basement floor, it terminates in a 90 degree sweep bend through the floor and becomes the base for the primary vertical stack or the main stack.

Smaller drain stacks also come off of the main soil pipe and continue upward. These secondary drain and vent stacks may tie into the main stack above the highest fixture or pass through the roof independently.

Every home should have a full size (3 or 4 inch diameter) stack that travels from the soil pipe to roughly 12 inches above the point of exit through the roof. Think of the main stack as the trunk of a tree. At each floor, horizontal branch lines reach out to serve individual fixture groups.

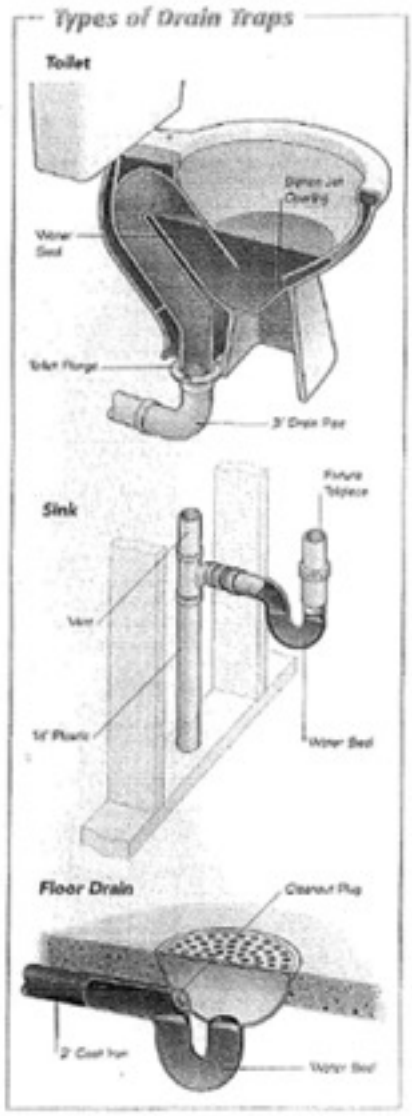


Drain Traps

Each fixture in the system is joined to its branch line via a water trap. These are critical components because they hold back the considerable volume of sewer gas present in every sewer system. While every fixture and drain must have a trap, not all traps are the same.

Toilets, for example, have built-in, or integral traps. The water you see standing in a toilet bowl is trapped there by an outlet passage that sweeps up before it sweeps down to its drain pipe connection. Floor drains also have integral traps, as do bidets and some urinals.

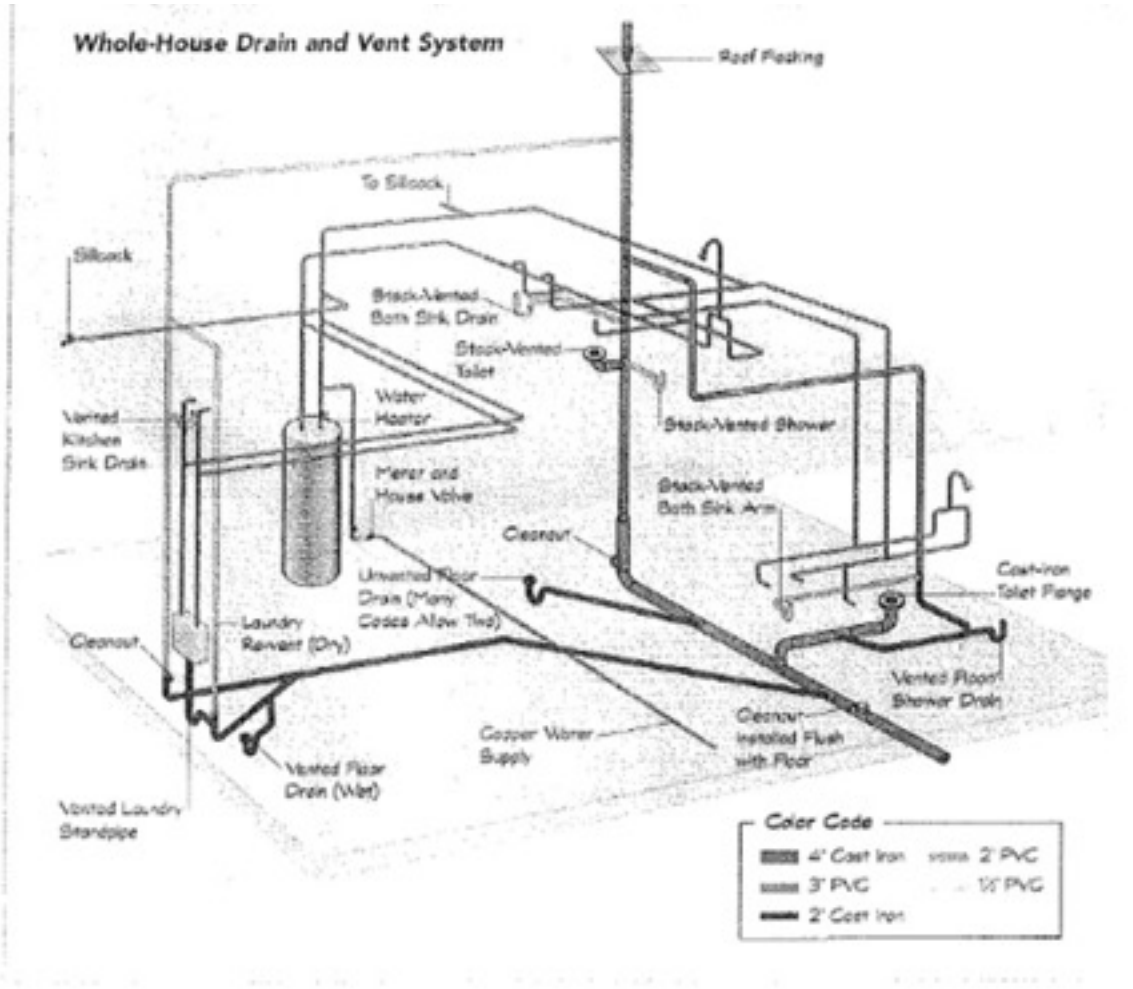
Sinks have sharply curved external chrome or plastic tube traps (P-traps), which can be disassembled for service work. Tub, sower, and laundry traps, in contrast, are usually fixed one-piece units.



Vent Pipes

Vents are important to a drainage system because they allow traps and drains to function properly. When water flows from a fixture through a pipe, it displaces an amount of air equal to its own volume, creating negative pressure behind the flow. This localized suction can be quite strong, especially at bends in the pipe. A toilet flushing near a sink, for example, can easily pull water from the sink's P-trap, allowing poisonous sewer gas into the living quarters. In fact, without adequate venting, a toilet wont flush properly.

Every home needs a stack vent through the roof, of course, but that's not always enough. All sorts of common situations can choke a vent, so it's necessary to have auxiliary vents, called re-vents. The shape, size, and location of these vents are critically important. (See Chapter 3, starting on page 40, for an in-depth discussion on venting.)



Fixtures

The point of all this piping begins and ends with the fixtures: sinks, toilets, tubs, and shower stalls. Fixtures are not as permanent as they appear. They are designed to taken up and put back with relative ease and at moderate expense. Even bathtubs, which can look as though they've grown right out of the structural timbers of a home, are not that difficult to replace. If an old or defective fixture has you mumbling to yourself with every use, don't be intimidated: tear it out and put in a new one.

Appliances

The list of plumbing-related appliances has grown over the years to include water heaters, dish-washers, water softeners, water purifiers, clothes washers (which are not really plumbed in), waste-disposal units, hot-water dispensers, whirlpool tubs and even refrigerators with their ice makers. However, only the water heater is an essential and code-required part of every home's plumbing system.

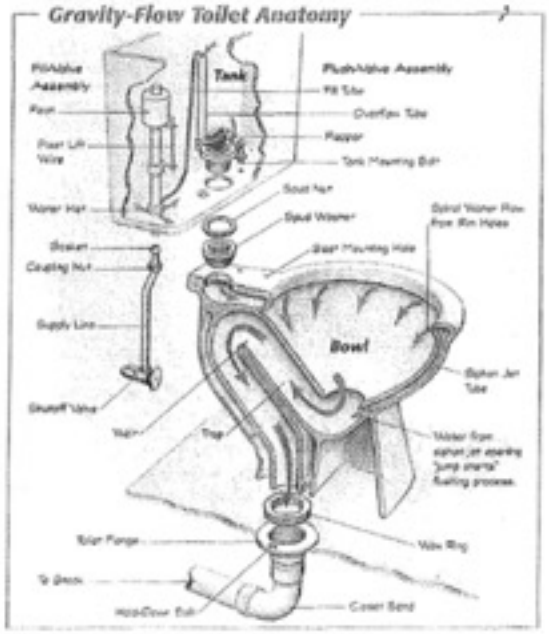
Typical Drainage System

Working backward – that is, starting with where the waste water exits the house – the drainage system begins with the 4-inch soil pipe, which enters the house under an exterior footing or slab. (In some cases, the soil pipe may enter the house through the basement or crawlspace wall, especially in a septic system arrangement.) Just after the cleanout, a 4 x 2 inch Y-fitting splits off to drain the laundry in the basement and the kitchen on the main floor. Codes often require that this take off be down-stream of the larger toilet branch line.

The next in-line fitting is a 4 inch Y-fitting that serves the basement bath group – toilet, tub, and sink. The toilet line is re-vented because it is a lower floor installation; it does double duty as a wet vent for the shower and sink.

Before the soil pipe sweeps up to become the primary 3-inch vertical stack, an unvented 2-inch Y-fitting serves a trapped floor drain. On the stack, a 3-inch T-fitting with a 1 ½ side inlet serves the toilet and shower. The fitting allows both fixtures to enter the stack at the same level and , therefore, allows bath to be stack-vented.

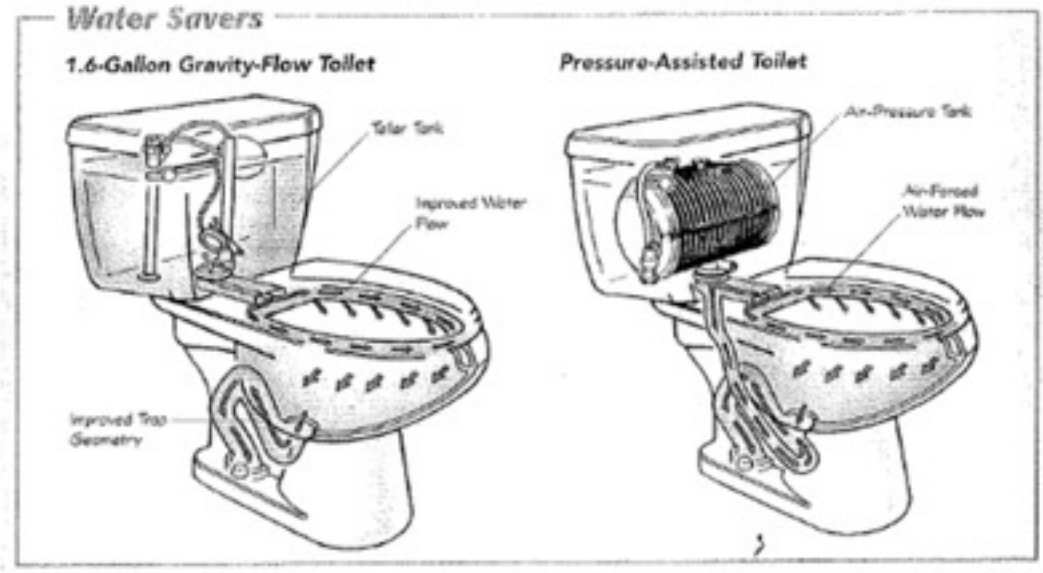
Approximately 16 inches above the floor, a second T-fitting drains the sink basin, which is also stack-vented. From the topo of this T, the stack continues through the roof.



Toilets

As the bowel empties, a new water enters the tank through the ball cock or fill valve. (All ball cocks are fill valves. But not all fill valves are ballcocks. The term “ballcock” applies only to the traditional fill valves, which have ball floats on the end of a pivoting arm. Newer fill valves use a vertically mounted float cup.) This flow begins the moment you flush the toilet. Most of the water entering the tank does so through a tube that terminates near the bottom of the tank.

Delivering the water to the bottom of the tank provides a measure of noise control. The sound is muffled as soon as the water in the tank rises above the end of the tube. At the same time, a small stream of water is diverted into the flush valve overflow tube – via a ½ inch diameter fill tube – and falls directly into the bowl’s rim. This stream restores the water in the bowl to its maximum level. As soon as the tank fills, the float shuts off the fill valve, and the toilet is ready for another flush.



Water-Saving Toilets

Responding to legislation enacted several years ago, manufacturers reduced the volume of water needed to flush a toilet efficiently. Ironically, the very first toilets had small flush tanks, holding only about 3 gallons. The toilets worked because the tanks were mounted on the wall, high above the bowl. Elevating water in a column increases its downward force (pressure) – an effect known as head pressure. The more pressure generated for the flush, the less water you need. The reverse is also true, so when tanks were moved down the wall and mounted near or just above the bowl, manufacturers increased the size of the tanks to as much as 8 gallons. This was clearly more volume than was needed, and the industry eventually settled on 5 gallons.

During the late 1960s and into the '70s, fresh water came to be recognized as a limited resource, and tank sized was reduced again, to 3.5 gallons.

Water-Savers Are the Law

In the late 1970s, a number of Scandinavian countries began using and manufacturing super-low-flow toilets which flushed with an amazingly, skimpy 1.6 gallons of water. Before long, these toilets appeared at trade shows here in the United States, and manufacturers began experimenting with low-flow toilets trying to improve performance. Eventually, the US enacted a national standard that limits to 1.6 gallons per flush (gpf) the water used for residential toilets made in this country after January 1994.

Do low-flow toilets work as well as 3.5 gpf ones? The early models certainly didn't. From the start, manufacturers offered two distinctly different low-flow toilets. The gravity-flow model and the pressure-assisted model. The gravity-flow model, much like traditional toilets came with minor changes all around, including new fill valves and flush valves. The engineers reduced trap geometry, along with water spots – the surface area of the bowl water – and outlet diameters to cut down the flow of water. These early water misers were so sluggish that they often needed additional flushes to clear and clean the bowl, and clogs were common. With steady engineering refinements, however, gravity-flow toilets now work reasonably well and are a good choice for most households.

Pressure-Assisted Toilets.

In general, pressure-assisted toilets work better than gravity models. These toilets use incoming water to compress air in a chamber inside the tank. (A water pressure of at least 20 pounds per square inch is required.) Flushing releases this compressed air in the burst, forcing water to prime the trap almost

instantly. Air assist allows the tanks to operate with less water, making more water available for the bowl. More water in the bowl means a larger water spot and a cleaner bowl. And finally, the tank-within-a tank construction completely eliminates “tank sweat” caused by condensation during hot, humid weather.

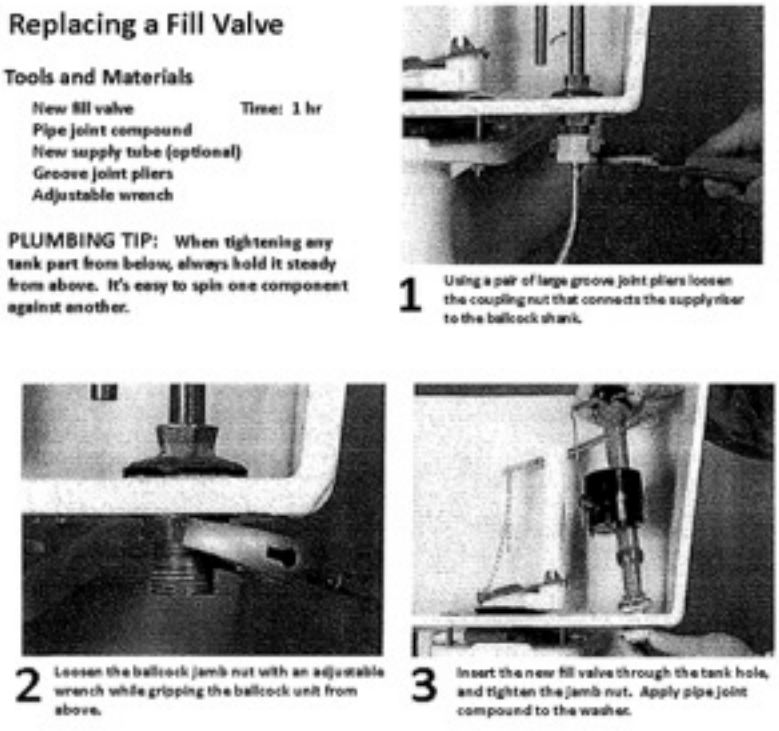
With these advantages, you’d think everyone would want a pressure-assisted toilet, but that hasn’t been the case. The most common complaints are they’re too noisy and too complicated. Starting each flush with a burst of compressed air does make them noisy, and they’re certainly less familiar. Most people would recognize the tank components in a traditional toilet, but lift the lid on a pressure-assisted unit, and all you’ll see is a sealed plastic drum, a water-inlet mechanism, a hose, and a flush cartridge. Most manufacturers use almost identical tank components, all made by a single supplier. It’s easy to repair and replace these parts, but not all hardware stores carry them. Plumbing wholesalers do, but they don’t often sell to non-plumbers. Plumbers may sell the parts, but they’d rather that you pay for the installation as well.

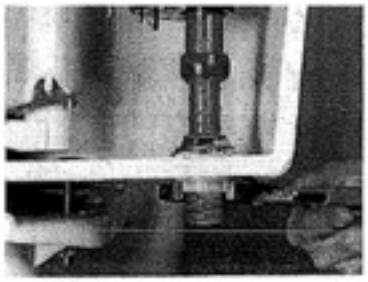
SMART TIP Which Toilet to Buy?

If you need a new toilet, which toilet should you buy: a pressure-assisted model or a gravity-flow unit?

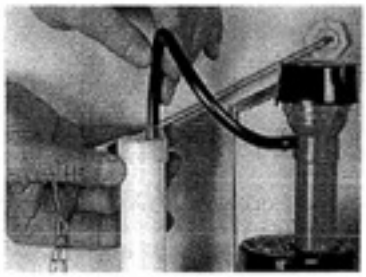
Prices is one consideration. Pressure-assisted toilets are more expensive than conventional models, upwards of $150. Past experience and the condition of your existing plumbing is another consideration. If your old toilet clogged frequently or you have a system that is more than 50 years old, a pressure-assisted unit is probably your best bet.

If you’ve had few clogs with your old toilet, you’ll likely get along fine with a 1.6 gpf gravity-flow toilet; but buy a good, moderately priced one and not a bargain-basement model. For the best performance, look for a trap diameter on the large side; they range from 1.5 to 2 inches.

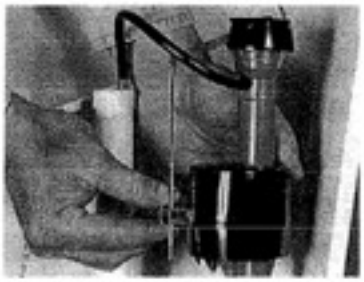




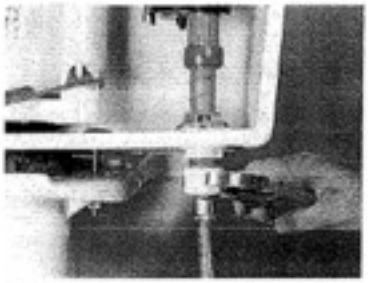
4 While holding the unit steady, carefully tighten the fill valve's jamb nut with pliers until the nut feels snug and bgins to squeak.



5 Measure, cut and install the fill tube. Don't allow it to kink. Connect one end to the fill valve and the other to the overflow tube.



6 Adjust the fill valve's float by compressing and sliding the clip up or down the lift wire. This will control the water level in the tank.



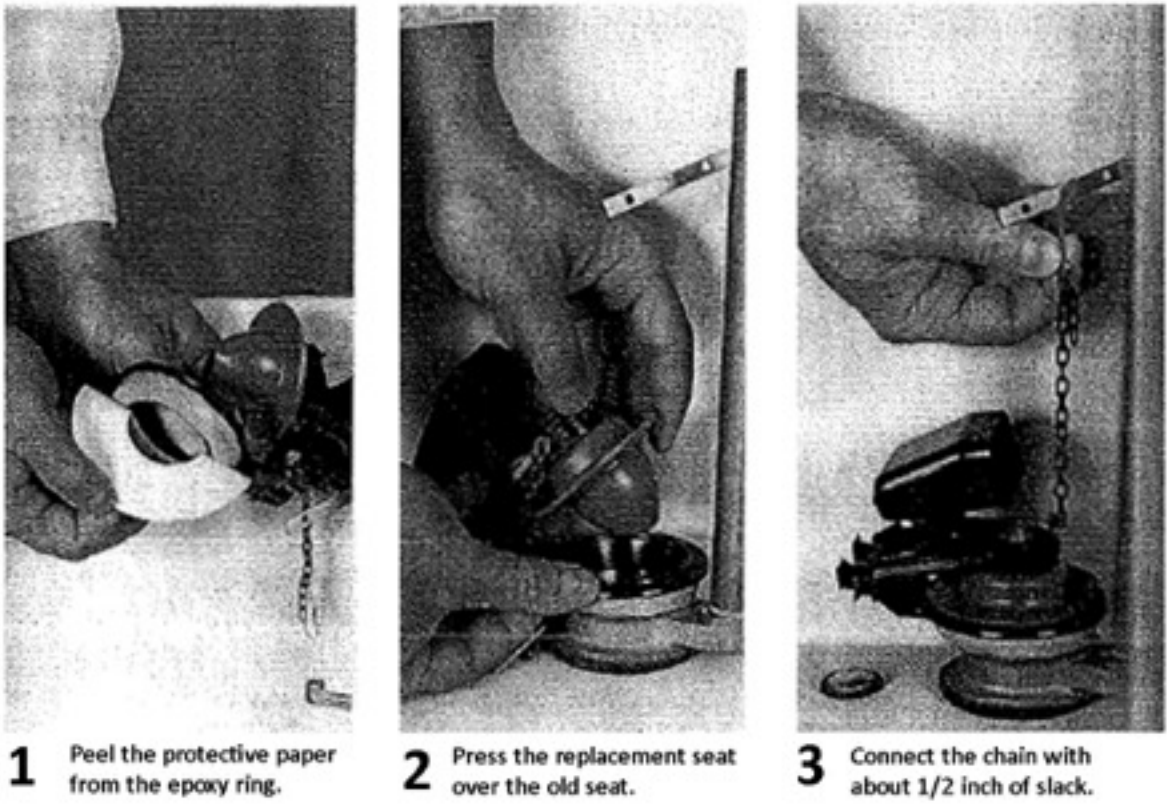
7 Using the pliers again, tighten the supply riser's coupling nut on the fill valve's exposed shank threads.

Toilet Repairs

Replacing a Fill Valve

If you're having trouble with a toilet's fill valve, it's usually best to replace the entire unit. You'll see several types on the market. The most familiar is probably the traditional ballcock, in brass or plastic, but you'll also see some that have floats that slide up and down on a vertical riser and some low-profile valves that are activated by head-water pressure.

Codes require fill valves to have built-in backflow protection. Backflow preventers keep tank water from back-siphoning into the water system. Although all codes require them, some manufacturers make both protected and nonprotected fill valves. Check the product labeling, and choose a valve that lists built-in back-flow prevention as one of its features.



1 Peel the protective paper from the epoxy ring.

2 Press the replacement seat over the old seat.

3 Connect the chain with about 1/2 inch of slack.

Remove the Old Ballcock.

1. To remove the old fill valve (ballcock), start by shutting off the water and flushing the toilet. Sponge any remaining water from the bottom of the tank. Loosen the coupling nut that binds the supply tube to the ballcock shank.
2. Then loosen the compression nut that binds the bottom of the supply tube to the shutoff valve. Finally remove the jamb nut from the ballcock shank, and lift the old assembly from the tank.
3. Insert the new fill valve through the tank hole and tighten the jamb nut. Apply pipe joint compound to the washer.
4. Before tightening the jamb nut, make sure the fill valve is aligned properly in the tank. If you're installing a traditional-style ballcock with a gloat ball, make sure the ball doesn't contact the tank wall or the over flow tube. Ideally, the ball should ride at least ½ inch away from the back of the tank. Grip the fill valve to keep it from rotating against the fill tube, and then tighten the jamb nut until the sealing washer flattens out and the nut feels snug.
5. Next, install the fill tube between the nipple on the fill valve and the flush valve's overflow tube. Use the provided fitting to hold the fill tube on the overflow.
6. You can adjust the float (a ball float if you're installing a ballcock.) now by approximating where you want the water level. With a vertical fill valve, pinch the stainless-steel adjustment clip on the float rod, and move the float cup up or down. To adjust a ballcock float, see "Problem 6: Hissing Toilet." Page 106

Hook UP the Supply Line.

7. The last step is to reconnect the water supply. If the new fill valve's shank extends the same amount form the bottom of the tank as the old one's, you can just reconnect the old water supply tube. If the new shank is more than ¼ inch longer or shorter than the old one, however, you probably need a new supply tube. The easiest to install is a prefitted tube made of polymer plastic encased in stainless-steel mesh. You just attach the couplings at each end of the tube and you're done. To avoid damaging the tube, tighten the lower end first.

Installing a New Toilet