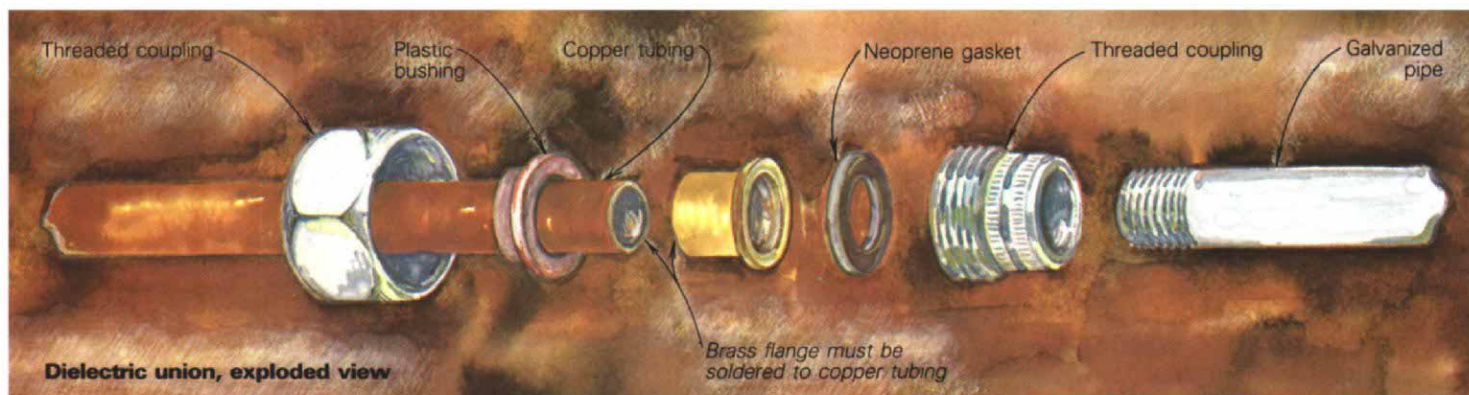


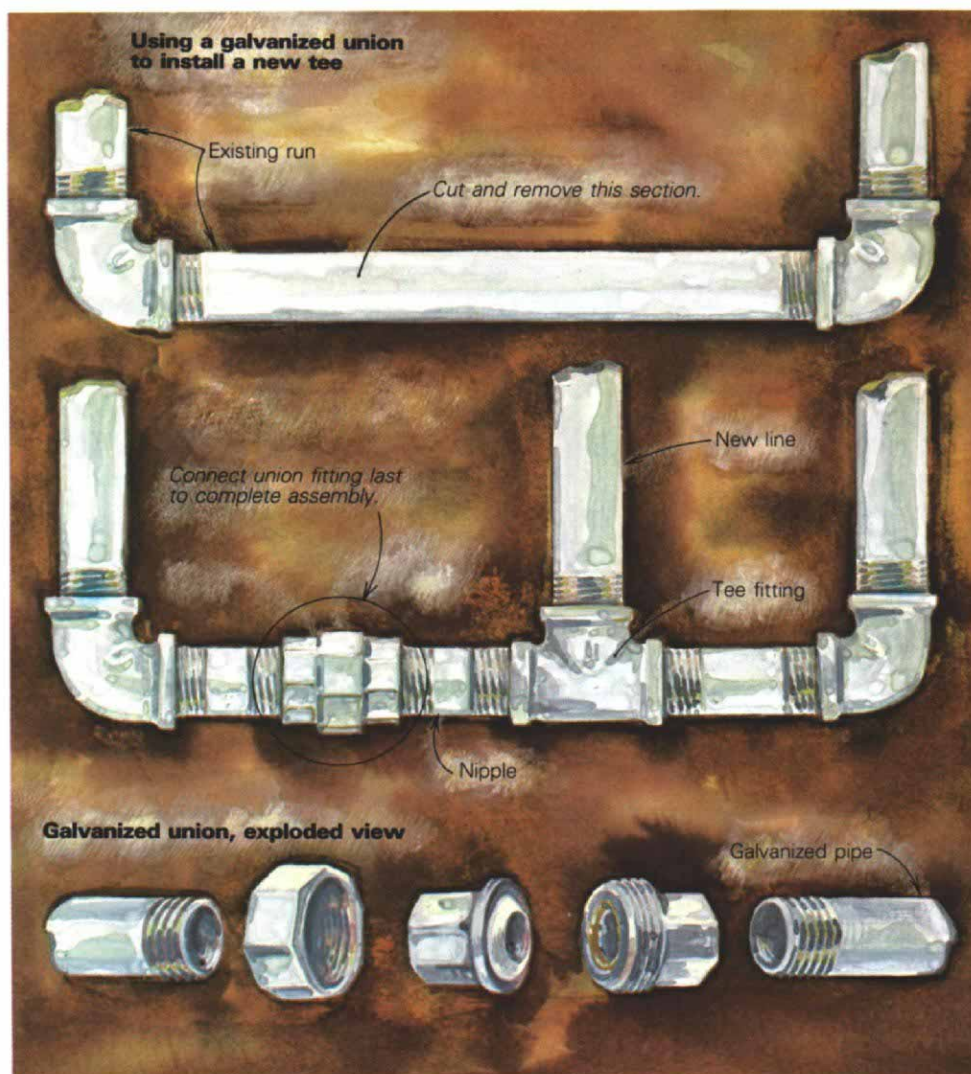
Remodel Plumbing

How to connect the new pipes to the old ones

by Steve Larson



Sound connections. New copper lines can't be joined directly to old galvanized supply lines, or both metals will corrode. The solution is to use either a dielectric union (drawing, top) or a brass union. In the center of the photo, a dielectric union-to-steel nipple screws into the leg of a galvanized tee. Coming off the same tee is a brass nipple/brass union/copper tubing transition. New galvanized pipe is tied into an existing galvanized line with a tee fitting, nipples and union (drawing, right).



At some time in just about every remodeling job, new plumbing has to be joined with the old. You might be replacing a corroded supply line, plumbing a bathroom addition or relocating the lines for a remodeled kitchen. Most plumbers agree that remodel plumbing is far different from doing new work. Sometimes it's as simple as connecting new fixtures to the old lines, but often it's an excruciating exercise in Murphy's Law. The old-pipe diameters aren't the same as the new ones, the pipes aren't made of the same materials and your workspace is ideal for a dwarf contortionist. Fortunately, these are common problems, and those who have been down this road before have figured out some good solutions. This article is a stew of advice, products and tools that can make your remodel plumbing connections work out for the best.

Checking out the old system—Before hooking into the old system, you have to look at what's really there. Check for obvious leaks and look for traces of rust or corrosion on the outside of galvanized fittings. Reduced water flow and rusty tap water are signs that the water-supply system may be ready to rupture. A rust-weakened pipe that might otherwise last for years will often break apart with the first torque of the pipe wrench.

Restricted flow can be caused not only by rust buildup but also by non-corrosive mineral deposits. But in either case, when you start knocking around the old pipes you will often dislodge enough crud to clog things up somewhere else. Make sure that the existing drain lines are working well and that they are properly vented and sloped before you tie into them. Your new work may be fine, but if it overloads a dying system, you'll be the one to inherit the problems.

Tapping into supply lines—If the old supply lines are in good shape, choose a place to tap into them that's close to your new fixtures. You'll also want to make sure that your tap-in location is easy to get at so that you won't lose time working in cramped quarters.

Most older homes have galvanized water-supply pipes, but I recommend using copper tubing for all new supply lines because it will last longer than galvanized and it's easier to cut and assemble (see *FHB* #10, pp. 40-41). Some plumbers have switched completely to plastic pipe and fittings, since two new materials—chlorinated polyvinyl chloride (CPVC) and polybutylene (PB) can even be used for hot-water supply lines. But plastic supply lines haven't been approved by many local building codes, so you'll have to check your municipal regulations before using them. For drain, waste and vent (DWV) lines, I always use plastic for economy and ease of work, and there's little code resistance to this.

If the old line is galvanized pipe, you'll have to cut into it with a hacksaw or a reciprocating saw. If the line is copper, use a tubing cutter. In a tight space, a compact tubing cutter is indispensable for breaking into a copper line. Lacking this, you'll have to use a hacksaw

blade. In any case, make sure the water is turned off before you cut the line, and have a bucket handy to catch the drain-off.

If you're joining new copper tube to existing galvanized supply lines, the dissimilar metals will corrode each other unless you use a dielectric union. This special fitting separates the two types of pipe with a non-metallic gasket (drawing, facing page, top). For the same reason, support copper tubing with brass, copper, plastic or plastic-coated hangers.

A dielectric union in a grounded water pipe will break the ground circuit—the gasket inside the union won't conduct electricity. So this circuit must be reconnected by bridging the dielectric union with clamps and ground wire. Some local codes require a continuous ground wire, so it's important to check with your building inspector.

Another way to join copper and galvanized supply lines is with a brass union and nipple (photo facing page). The brass doesn't corrode in contact with copper or galvanized steel, so it's a good transitional material. Again, codes vary, so check with your inspector for the preferred coupling.

Dielectric unions have a flange that must be soldered to the copper tubing. So that you don't overheat the gaskets, remove them before soldering. And when you solder tubing in place, always keep a spray bottle of water within reach in case something starts to smolder. Otherwise, by the time you crawl out from under the house, you might need a fire truck to put out what one quick squirt could have quenched—and the water is probably turned off too.

If you choose to continue using galvanized pipe, a galvanized union will allow you to insert a tee with minimum dismantling of the old lines (drawing, facing page, bottom). You'll have to cut a small section from an existing straight run of pipe using a hacksaw or reciprocating saw. Again, pick a location that's accessible. Ideally there should be some play in the old pipe so that you will be able to push or pull the line slightly to get your final fit. If the old line is rigidly held in place, you'll have to be more exact in fitting nipples and tees into the section you've cut from the old pipe. Remember to add $\frac{3}{8}$ in. to $\frac{1}{2}$ in. for each threaded connection. The last connection will be the two halves of the union itself.

Threading pipe in place—If you're working on galvanized supply lines, you'll probably have to cut and thread pipe in place. The alternative is to remove an entire existing section to alter or replace it. If your workspace is cramped, or if the old pipe is too corroded to take new threads, you'll save time and aggravation by simply replacing it. But in many cases cut or broken galvanized pipe can be threaded in place using a ratcheted pipe threader (photo right). It holds the die in a ratchet assembly and requires only $1\frac{1}{4}$ in. of clearance around the pipe.

Most plumbers own several pipe threaders, but they're expensive, so you might want to rent one from a contractor's tool yard. Even

with the best tool, threading a pipe in place can be a knuckle-busting proposition. Apart from working in cramped quarters, you have to keep the pipe from wiggling around, as it usually wants to. The best way to do this is to clamp or block the pipe against nearby framing members, or to hold it in place with a pipe wrench. Another trick in tight spaces is to replace the threader's standard handle with a shorter section of $\frac{3}{4}$ -in. threaded pipe.

Flexible connectors—When a new house is being plumbed, water heaters are normally joined to the hot and cold lines by means of rigid pipe and standard unions, but I find it a timesaver to use flexible water-heater connectors. They easily bend to reach a repositioned heater, or one with an intake line in a different location. Where I live, in earthquake country, I strap the water heater to the frame of the house, especially when I'm using flexible connectors. And if the heater doesn't have a temperature/pressure-relief valve, install one in the hot line at the top of the heater or at the specifically marked outlet on the heater itself.

The offset closet flange is another helpful fitting for remodel plumbers. It allows you to change the mounting position of the toilet slightly by rotating the flange. If you need to move a toilet a few inches one way or another to gain some clearance, if you're installing a new unit with different wall-to-flange dimensions, or if you want to avoid chopping into a floor joist, this is the fitting to use.

Tying into the DWV system—The traditional way of plumbing drain, waste and vent lines is with cast-iron pipe. Pipe sections have a bell-shaped hub at one end, and a small ridge called a spigot at the other. The spigot fits into the hub, leaving a small gap that is packed with oakum (an oily, rope-like material) and sealed with molten lead (photos p. 55, left and bottom right). Working with cast-iron pipe is difficult under the best of circumstances, but dragging it around under a house or through a hot and dusty attic while remodeling can be a nightmare.

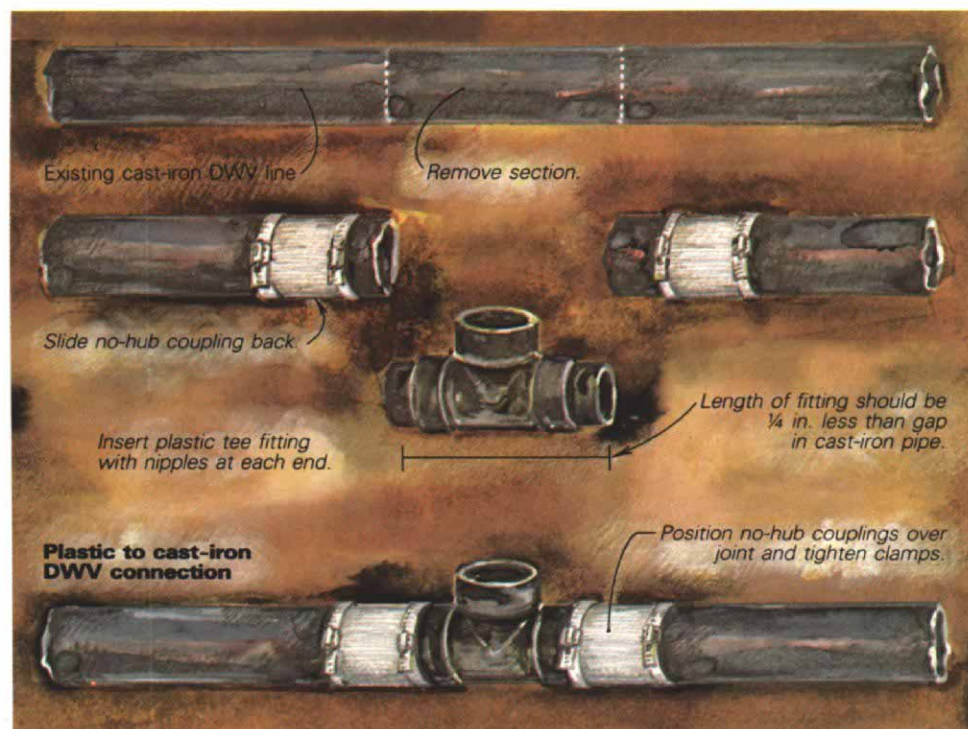
Fortunately, plastic pipe (ABS schedule 40



A ratcheted pipe threader needs only $1\frac{1}{4}$ in. of clearance around the pipe, making it ideal for threading pipe in place. For extremely tight spaces, the handle can be replaced with a short section of $\frac{3}{4}$ -in. threaded pipe.



A snap cutter is used for cutting cast-iron drain, waste and vent (DWV) pipe or clay-tile sewer pipe. Integral cutters break through the pipe as the chain is tightened. In this photo, a plumber is adjusting the tension of the chain before snapping the pipe by bringing the scissor handles together.



or PVC-DWV) can be substituted for cast iron in nearly all residential applications (check with your building inspector). Runs of exterior DWV line are an important exception. Sunlight can cause the plastic to decompose, and extreme temperature changes can cause it to expand and contract enough to break its seal with the roof flashing or with horizontal branch lines. Our local codes allow plastic vent lines on the exterior of the house if they are coated with two coats of latex paint.

If you're joining new plastic waste lines to an existing cast-iron system, you'll probably have to cut the metal pipe at some point. I know plumbers who have used a hammer and cold chisel for this job, but I don't recommend this approach. The best tool to use for cutting cast-iron or clay sewer pipe is the soil-pipe cutter, also called the snap cutter. You can usually rent one at the tool yard or plumbing-supply store.

Most snap cutters have a heavy chain that you tighten around the pipe until the cutting discs in the chain snap the pipe in two (photo above). The snap cutter almost always makes a clean cut, but occasionally old pipe will break unevenly. Another snap usually solves the problem. Whenever I can't afford a mistake, I use a reciprocating saw with a metal-cutting blade. A masonry blade will cut clay sewer pipe in similar fashion.

New plastic pipe can be joined to old cast-iron pipe with the no-hub coupling, a neoprene sleeve that is clamped around the plastic and iron pipes with adjustable, stainless-steel collars, as shown in the drawing above. The collars are just larger versions of the hose clamps used on auto radiators. You tighten them with a nut driver or a screwdriver (the former tool does a faster job). The neoprene sleeve fits over the ends of both pipes, and

tightening the collars makes the connection watertight. Because the seal on a no-hub coupling relies completely on the compression of the neoprene sleeve, it's important to clean or file the outside of the old pipe to remove rust, dirt or other projections.

The outside diameter of 3-in. or 4-in. cast-iron DWV pipes will usually be about $\frac{1}{4}$ in. smaller than the outside diameter of plastic DWV pipes. You can often deal with this discrepancy by cranking down tighter on the cast-iron side of the collar, but in some jurisdictions the building inspector will want you to use Mission couplings. These are identical to the no-hub coupling except that they have a stepped sleeve that accommodates the slight difference in pipe diameter.

Pipes with substantially different wall thicknesses, such as clay to cast iron, are often joined with a Calder coupling (photo facing page, top right). This connector is similar to the no-hub coupling, but is used with adapter bushings, or donuts, of different sizes.

If you run into a situation where you need a Calder coupling but can't lay your hands on one right away, you can wrap a strip of inner tube around the smaller pipe until you've bushed it out to the diameter of the larger one; then join the pipes with a standard no-hub fitting. If the pipes are roughly horizontal, make sure that the strip of inner tube starts and stops at the top of the pipe. This trick isn't sanctioned by code, so you should use it only as a temporary measure.

Plastic pipe has been around long enough so that you may come across an existing plastic DWV system in renovation work. An easy way to tie into such a system is with a glue-on saddle tee. Just cut a hole in the existing pipe (make sure it's the same size as the inside pipe diameter of the tee), swab the tee fitting

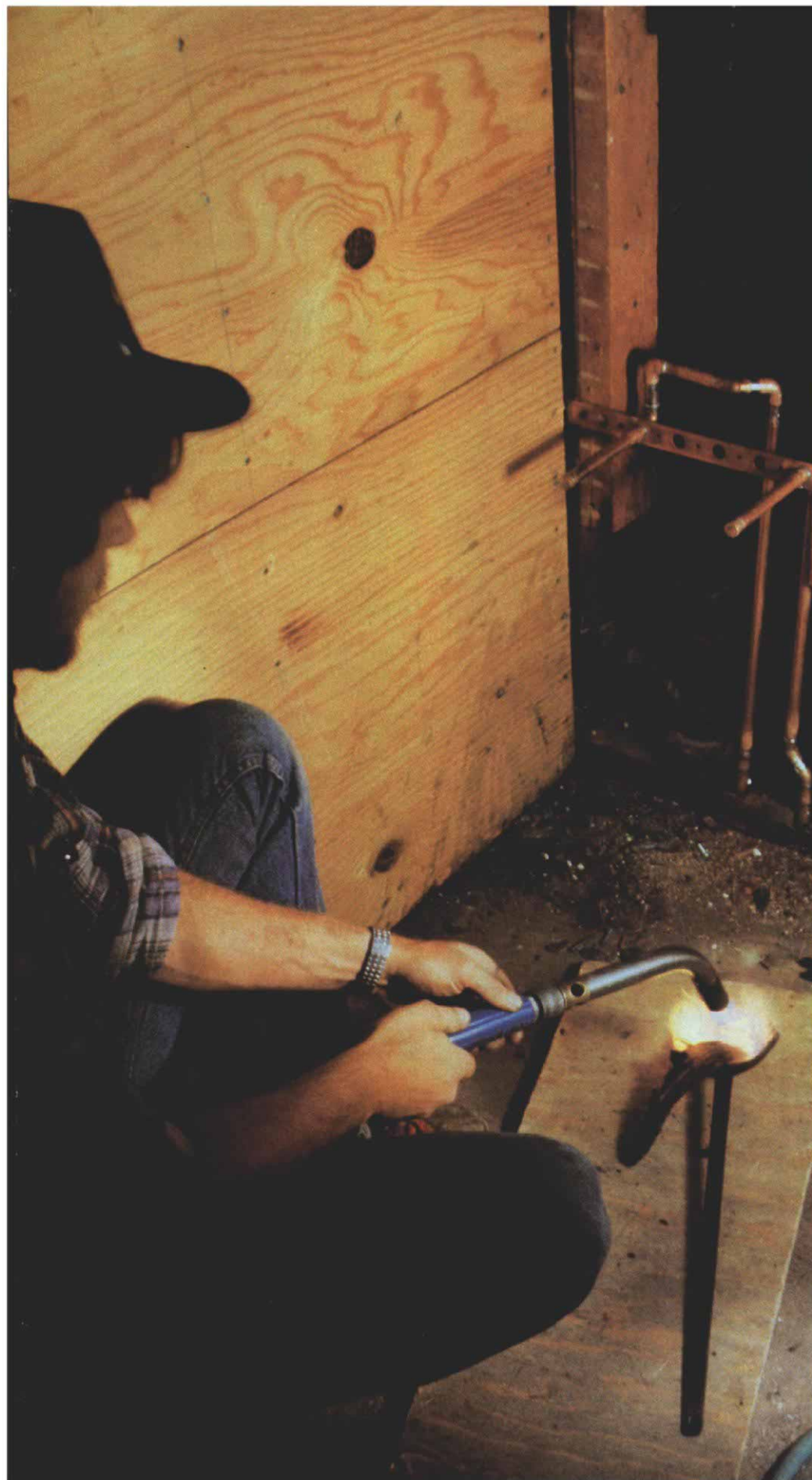
with glue and then temporarily hose-clamp it in place until the glue sets.

Testing your work—A thorough inspection of any remodel plumbing is essential, since a leak can damage the home and ruin the furnishings. Once, in the middle of an upstairs remodeling job, I learned a lesson that I won't soon forget. I'd installed some new copper supply lines, and before heading home for the evening, I turned on the water and checked them thoroughly for leaks. There weren't any, so I left the supply system on. But an overheated solder joint let loose a few hours later, and several hundred gallons of water spewed out all night long. Luckily, it flowed into an area we were planning to remodel anyway.

Now whenever I'm plumbing upstairs, I use air pressure instead of water to test new lines. The idea is to isolate the new plumbing from the old, cap off any openings, attach an air-pressure gauge and pump up the system with an air compressor or a bicycle pump. Pressure test gauges are available at plumbing-supply outlets, and they accept a $\frac{3}{4}$ -in. nipple. I leave the gauge on for a few hours (local code says 15 minutes). If the system loses pressure, I know I've got a leak. I locate it by squirting a detergent/water solution on each pipe joint. Instead of spewing a stream of water, a leak will blow bubbles. This lets me find leaks without producing puddles. If a joint leaks, I don't have to drain water out of the lines to resolder.

For final hookups between new fixtures and the old system, you'll have to rely on the standard test of running water through the lines and watching for leaks. □

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Cast-iron and clay waste lines are connected with a Calder coupling. A thick bushing fits over the smaller pipe to equalize the different outside diameters.



Adding drain, waste and vent lines. Most new DWV lines are plastic, but in old houses, they need to be joined to existing cast-iron pipe. At left, lead is melted with a torch, then poured around the oakum-packed joint between the cast-iron bell housing and nipple of the waste line, above, to seal it. Then a plastic sanitary tee fitting will be plumbed onto the cast-iron nipple with a no-hub coupling. A neoprene sleeve will seal the joint.