

Up-Flush Basement Baths

A sewage ejector system uses a pump, like the one shown here being installed in a basement sump. The sump's cover will be tightly sealed but left accessible for servicing.



EE Myers

With a good ejector pump and a couple of extra work days, you can make any basement bath drain uphill

by Richard Trethewey

The biggest single factor determining the ease, practicality, and expense of a basement bathroom installation is the height at which the house's main drain pipe exits the foundation wall. Since this pipe must run slightly downhill from the house, the height of the sewer or septic system will determine the height that the pipe exits the basement. With a sewer, the height is predetermined by the depth at which the town or city installs its drain system. With a septic tank or cesspool, the height is generally determined by the height of the existing water table.

If your client is one of a lucky few, the drain pipe will exit at a level below the basement floor. If that's the case, you need only break a narrow trench in the basement floor, run the new bathroom's drain piping to the main drain, and let gravity do its work. Tie the vent from this plumbing group into the existing plumbing vent system, and the worst of the plumbing is done. The rest is routine bathroom installation.

Unfortunately, few basement bathroom installations go so smoothly. In most cases, you'll find the main drain exiting about halfway up the basement wall. Gravity—usually the plumber's best friend—now becomes the arch enemy.

Pump It Up

Someone once simplified plumbing by saying, "Hot is on the left, cold is on the right, waste goes downhill and if it won't, put in a pump." Such is the case here. If you want a basement bath where the drain pipe is above the basement floor level, you'll need to install a special sump pump called a "sewage ejector" to churn the wastewater and send it uphill to the main drain pipe.

This will mean a little extra work and a few thousand dollars extra expense. But it allows you to install a bathroom in virtually any basement and still get good drainage.

If you have less than a full bath, you might consider a couple of less labor-intensive alternatives to a buried ejector system.

If you need only to drain a laundry sink, a simpler and cheaper "laundry tray" pump will work. A laundry tray pump attaches directly beneath a sink or tub and is turned on as needed. There is no need for a sunken reservoir. These pumps are available through most plumbing suppliers or wholesalers and some hardware stores.

Similarly, if you want to add only a toilet to the basement, you can choose from a variety of power flushing or "up-flush" toilets. Some of these are little more than motorized marine toilets, and others are "macerators." A macerator is a small tank that allows time and/or chemicals to break down the solids before it pumps them out. Two models I've come across are the *Waterflash 2003* by Actana (contact the French Technology Press Office, 401 N. Michigan Ave., Suite 601, Chicago,



Figure 1. If you're installing only a basement toilet, this up-flush model, made by the French company Actana, can do the job without a full ejector system.

IL 60611; 312/222-1235), which uses 0.8 gallons per flush and can supposedly pump discharge as high as 20 feet and as far as 165 feet horizontally (see Figure 1); and the *SaniPlus Toilet*, (Sanitary for All Ltd., P.O. Box 1719, Guelph, ON N1H 6Z9, Canada; 519/763-4916), which uses 1.75 gallons per flush and pumps 12 feet up and 150 feet away. Both of these products are quite new and may not be approved for local use—check with your code official. I haven't installed either type, but I suspect they work well if used within their design specs.

One other option I'm aware of is an above-floor ejector system called *Quik Jon*, made by Zoeller Co. (3280 Old Millers Lane, Louisville, KY 40216; 502/778-2731). This is probably noisier than a buried ejector system, but in most cases it is easier to install. According to the company, this unit—which attaches to a standard toilet—installs easily on the floor, can be hidden behind a wall to deaden sound, and can handle drainage from a full bathroom (see Figure 2). Again, you should check your local code for compliance.

Sewage Ejector Systems

Sewage ejector systems come in a variety of shapes and sizes from various manufacturers. A typical installation

(see Figure 3, next page) consists of a drum-shaped plastic or metal reservoir, or sump, which receives discharge from the toilet, tub/shower, and lavatory. Inside the sump basin, which holds about 30 gallons of effluent, is a specially designed pump triggered by a float mechanism. The unit churns the waste and periodically pumps it to the main drain pipe as needed. A whole unit is typically 18 inches around and about 30 inches deep, with a removable top cover. Since it must be slightly downhill from the bathroom (so the waste can drain to it) and be accessible for servicing, the standard procedure—the one I'll describe here—is to install it in the basement floor. Burying the pump in the floor means you can put your fixtures right down on the floor (instead of elevating them on platforms), and it also makes it easier to hide the low-level noise these units make.

A variety of national and regional manufacturers make ejector systems. Some common names are Zoeller, Little Giant (P.O. Box 12010, Oklahoma City, OK 73157; 405/947-2511), and F. E. Myers (1101 Myers Parkway, Ashland, OH 44805; 419/289-1144). A basic 30-gallon residential model should retail for about \$400 to \$600. Almost all models have a one-year warranty. I haven't found much difference



Figure 2. Zoeller's *Quik Jon* is an ejector system that installs above the floor rather than under it. Using this model can save costly slab excavation.

between the products of these manufacturers. It may be worth paying a little extra for a good model, since it will buy a more reliable pump, and this may save a disruptive and unpleasant replacement later. (Changing the pump is not for the faint of heart.)

Design Considerations

Where can a bathroom in the basement go, and what do you do with this ejector?

Siting the bathroom. Upstream of the ejector, the rules for the drain piping for an ejector-assisted bathroom are the same as for a bath connected in the ordinary way to the main drain. That is, the drain pipes leading from fixtures to the ejector must have a pitch of $1/8$ inch to $1/4$ inch per foot of run, and, given that pitch, they can run as far horizontally as is practical. So, as far as the drain piping is concerned, you can pretty much put the bathroom wherever you wish.

Probably a more important siting consideration for the bathroom is the vent. You'll find installation easiest if you can readily connect the new bathroom's vent pipe into the existing venting system for the main plumbing system. Some plumbing codes require a future vent pipe to be left in the basement when the house is initially roughed in, which can also make things easy.

If you can't practically reach an existing venting system from the site of the new bathroom, you'll have to fish the vent up through the house or out through the sidewall—either of which can be challenging.

In any case, the entire system will likely (depending on your local code) need to meet the general configuration shown in Figure 4, which is from the National Association of Plumbing, Heating, and Cooling Contractors (NAPHCC) National Plumbing Standard, used by many code jurisdictions.

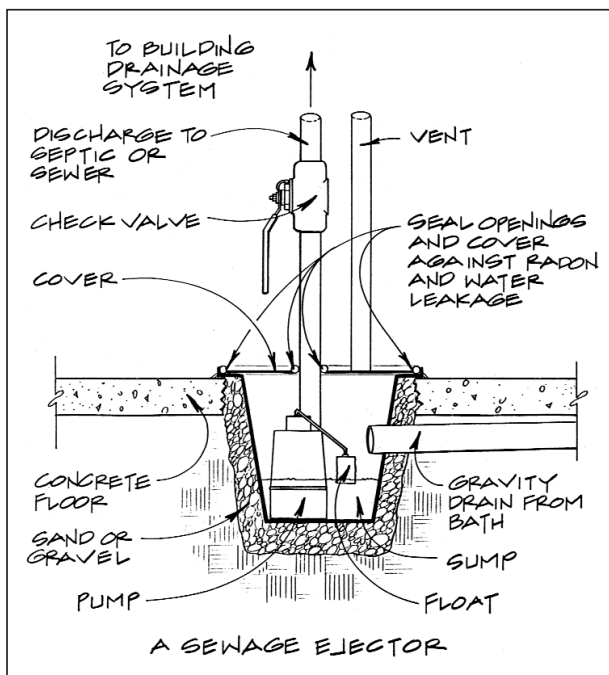


Figure 3. A typical ejector installation. A surrounding bed of sand or gravel keeps the ejector unit firmly in place, while careful sealing around the cover prevents radon or moisture infiltration.

You or your plumber should check your design with your local jurisdiction before you start.

Siting the ejector. Since the ejector may need service at some point, you'll want to put it where its hatch in the basement floor is accessible. A utility area, closet, or unfinished section of the basement near the bathroom is ideal. You don't want it beneath a finished floor unless you can gracefully leave some sort of access panel in the floor.

You should also consider noise when siting the ejector. Most units aren't very loud, but if the new room is to be a bedroom or study, the whirring and pumping noises of a nearby ejector might pose a problem. But don't let noise considerations convince you to site the ejector in an inaccessible spot—Murphy's Law

always shows up on the job that takes that chance.

Installation

Once you've marked the ejector site and the line the drain lines will take, you're ready to install the ejector. Installation time will vary tremendously depending on the complexity of the job. But a standard basement bathroom with standard waste and water piping might take a two-person crew one-and-a-half to three days to rough in, with an additional half day needed to install the finish connections to the fixtures.

Excavation. You'll need a sledgehammer, a jack hammer, a chisel, and a strong back. Start by breaking the slab in a circle that is about 4 to 6 inches wider than the ejector unit. Dig a hole several inches deeper than the ejector is

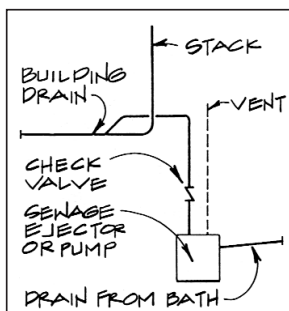


Figure 4. A typical piping and vent configuration for a basement ejector installation. Some codes may not require a separate vent from the ejector pump.

tall—deep enough to allow the required slope down from the bathroom to the ejector inlet, plus another 3 or 4 inches for a gravel or sand base beneath.

With that done, open a trench for the horizontal drain pipes from the new bathroom group. Make the drain pipe trench deep enough to allow the $1/8$ -inch to $1/4$ -inch drainage slope down to the ejector inlet.

You may run into reinforcing steel (rebar) as you excavate the concrete. Cut this as necessary with a reciprocating saw or torch, but leave as much as possible intact to maintain the floor's structural integrity. Often you can slip the pipes below the rebar and hang them from it.

Setting the ejector and pipes. It's a good idea to set the ejector on a gravel or sand base and then surround it with an inch or so of sand or gravel as well. This helps to hold it firmly in place and prevent any settlement or heaving. It also eliminates the risk of puncture from jagged rocks. Put in the base first, then the ejector, and then check that the height is correct and allows the proper drainage slope from the bathroom.

With the ejector installed, but before you pack the sand and gravel around it, run the drain piping from the bathroom fixture drain pipes to the ejector. Use standard piping practices, joining all fixture drain pipes in or near the bath into a single larger drain pipe that runs to the ejector. Although you should check your local code for all these pipe sizes, the required diameters for these pipes are

usually 3 inches for the toilet, 2 inches for a shower or tub, and $1\frac{1}{2}$ inches for the sink.

Once those pipes are hooked up, run the discharge line from the ejector to the house's main drain pipe. The discharge line is usually a 2-inch diameter pipe (again, check your code). You can either run the discharge line straight up from the ejector site, as you see in Figure 3 or, if location dictates, run it in a trench to a spot where a vertical pipe will be less obtrusive. Don't forget to install a check valve on this line to prevent any backwards flow.

Tie this line into the main drain and vent lines. Again, check your design first with your local code officer. Some jurisdictions allow you to tie the discharge line anywhere into the drain line and let venting take care of itself, while others require you to run a separate vent line to a point above the floodline of the highest fixture of the house.

Buttoning up. With the drain piping installed, connected, and double-checked by you and the inspector, it's time to replace the concrete over the trench. Fill the trench and the space around the ejector with sand and gravel. Then compact the fill and cap the trench with ready-mix concrete. Leave an open circle for the bolted cover of the ejector unit, as per the unit's instructions. Once the cover is in place, seal all openings around the ejector cover with hydraulic sealant or caulking to prevent any radon or ground water from entering the basement.

A Word About Radon

If you're in an area that's at risk for radon, be extra careful to properly seal these new penetrations through the basement floor. In fact, you should encourage the homeowner to have the home tested for radon *before* you start the job—this will not only cover your backside later, but may reveal a need for a sub-slab radon mitigation system. Such a system will be much easier to install now, while you're tearing up the floor anyway, than later after the nice new floors are down. ■

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