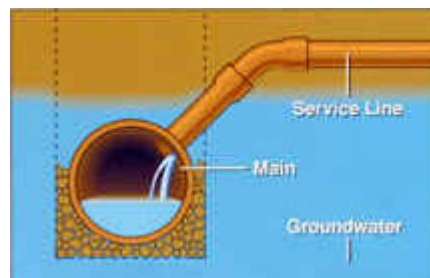


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Title: Save Money, Seal Service Laterals with Chemical Grouting

The more we learn about our sewer systems, the more we discover how much customer service lines contribute to the expensive problem of groundwater infiltration. The American Society of Civil Engineers (ASCE) reports in their manual Existing Sewer Evaluation and Rehabilitation, "On average, over one-third of system infiltration enters through the laterals, most of which comes in at connections, or very near the main line." Now, there is good evidence that cities can actually save money by sealing those laterals with chemical grout.

Not many hard facts exist to help you make infiltration calculations, so the few available facts are very important. Washington Suburban Sanitary Commission (WSSC) has extensive experience with lateral service lines. After all, they have a lot of sewer service laterals (about 371,000), and they have actively worked to reduce infiltration through laterals and connections since 1980.

Most groundwater Infiltration occurs at, or very near, the service connection because service are very near the main.



WSSC has tested 12,400 lateral house connections and sealed 6,700 between June 1981, and June 1997. They have spent just over \$6.2 million to seal lateral connections with chemical grout during that period of time and reduced infiltration through lateral connections by over 3.3 mgd. The reduction in infiltration has saved WSSC a net \$3.1 million in transportation and treatment costs, based on a 20-year present-worth analysis.

Several important conclusions may be drawn from the above information: 54 percent of the lateral connections to the sewer main tested in the WSSC system leaked. Each sealed lateral reduced infiltration by an estimated 500 gpd.

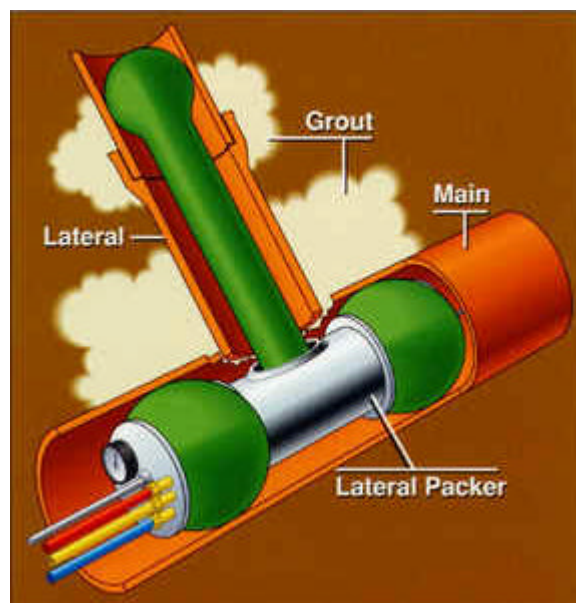
If your environment is somewhat similar to that of Prince George's and Montgomery County, Maryland, you might estimate that half your laterals each contribute 500 gpd of infiltration, and that is one-third of your total infiltration. If you know what it costs you to treat a gallon of water, you could estimate your cost for treating groundwater.

Of course, when you stop infiltration, you get more benefits than just the reduced treatment costs. Richard M. Berry and Robert R. Farrar reported in an ASCE paper that treatment plants are more effective when the wastewater is more concentrated. Reduced infiltration also means fewer overflows, more plant capacity available for wastewater, fewer consent orders, less soil eroding into pipelines, and less danger of soil voids around pipelines and the dangerous, destructive cave-ins which they can cause.

IMPROVED TECHNOLOGY

The basic technology used to seal lateral connections is not new. It has been used to seal joints in sewer mains since at least 1965. However, there are challenges in grouting laterals which are not present in main lines. The solutions to these unique challenges are constantly being improved upon.

Grout, pumped out through cracks and joints, forms a watertight collar outside the pipeline. Lateral packers are used to seal the connection between laterals and mains, and can seal cracks and joints far into the lateral lines.



Commonly used lateral packer systems such as those made by Cues and Logiball may be accurately positioned in a main line by remote control so the center section of the packer aligns with the lateral line. At that point, an inflatable tube can be inserted a prescribed distance into the lateral line. (Some packers extend up to 25 feet into laterals.) The free end of this tube is larger than the rest so it will press out against the lateral pipe and form a tight plug. When the two ends of the packer are inflated in the main line, a T-shaped area, including part of the main and the lateral line, is effectively isolated from the rest of the sewer system and can be tested with air pressure. If a leak is found, chemical grout can be applied to seal it. After the grout has been applied, the connection is pressure-tested again. This process may be repeated until the connection has been sealed.

“I’d say between 90 and 95% of all the laterals we air-test, fail,” said Frank Costandino, Assistant Vice President, Video Pipe Services, Newfield, NJ. “The connection between the laterals and the

mains is the big problem. When those connections were originally made, they didn't have the saddles and other connection methods we have now. They also didn't know the importance of that connection. Many of those connections were "Break-ins" which were closed with mortar. Now, that mortar is pretty much shot," he said.

OWNERS SPECIFY SEALING

Many sanitary sewer owners such as Miami, Nashville, Washington, DC, and Kissimmee, FL, as well as their engineers and consultants, are specifying air tests for rehabilitated lines.

"We recommend that all lateral connections be sealed after sewer mains have been lined," said Larry Mitchell, Project Engineer, Hartman & Associates, Inc., Orlando, FL. "Lateral connections are a major source of groundwater infiltration, even after a pipeline has been lined. If those connections are not addressed, you have only corrected part of the problem."

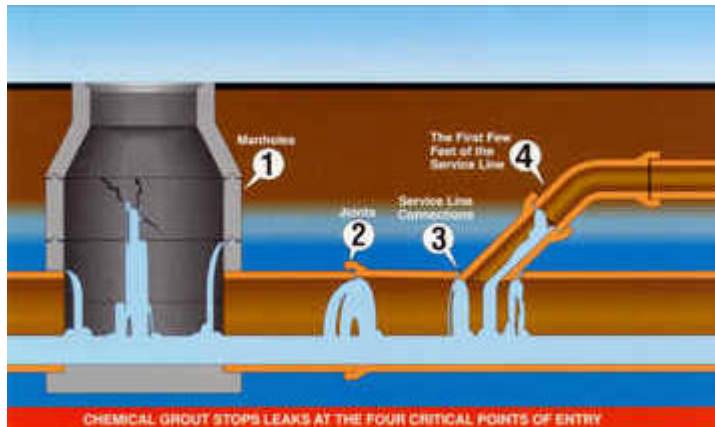
"Recently, we were responsible for the rehabilitation of 29,000 feet of sanitary sewer line in Kissimmee, FL, and we specified that each lateral connection and the first 36 inches of the lateral line must pass an air test after the lateral was reinstated and grout sealed," Mitchell explained.

In this case, the owner, Kissimmee Department of Water Resources, had reservations about the laterals, and believed a lot of sand, grit, and groundwater was entering their system through the lateral lines. They wanted to make the system as nearly watertight as possible.

Madsen/Barr-Allwaste, Longwood, FL, won the contract to install a liner in the mains, and approximately 500 cleanouts in service laterals at the homeowners' property lines. After the installations were complete, the first 36 inches of all 498 laterals were pressure- tested from the main as the laterals were reinstated.

"Most groundwater infiltration can be stopped by grouting the first few feet of lateral lines," Mark Harris, Vice President, Madsen/Barr, said. "Few service laterals are below the water table until they are very near the main. When you test and seal the part that's under the water table, you eliminate almost all infiltration," he explained.

All laterals were sealed with AV-118, a chemical grout manufactured by Avanti International, Houston, TX. U- Liner, a Deform/Reform, high-density polyethylene (HDPE) pipe manufactured by CSR Pipeline Systems, Houston, TX, was used in the main.



PENALTY CLAUSE

Since it was not possible for the client to provide constant on-site inspection, the contract contained a re-inspection clause. \$25,000 of the purchase price will be held by the client until the eleventh month of the one-year warranty period. At that time, the client will randomly pick 15% of the lateral connections to be re-inspected by the contractor. If 90% of the chosen laterals pass the test, the work will be accepted and the final payment will be made. If more than 10% of the selected laterals fail, the contractor will be required to retest all of the laterals and to seal any that leak.

SAVING MONEY

We utilize chemical grouting of joints and house connections because it is the most cost-effective way to stop infiltration in structurally sound sewer pipelines,” said Frank J. Scaldaferrri, Contract Manager, Sewer Reconstruction Program, WSSC. “Typically, we try to seal leaks as small as 360 gallons per day.

Since the amount of infiltration through an opening will depend on many variables such as season, groundwater table, and recent rainfall, WSSC has developed an estimating formula to help account for those variables. The formula is based on the total amount of grout necessary to achieve a seal, the soil surrounding the pipeline, and the rate of air loss.

“In Austin, we have examples where the grout lasted longer than the pipe,” said Louis Gonzales, Supervisor II, City of Austin (Texas) Water and Wastewater Pipeline Rehabilitation Investigation Services. “I know of one section of 8” pipe on Greenlawn Parkway that held up for more than 20 years. The line was grouted with acrylamide in September, 1967. It was retested in August, 1984, and November, 1988 and passed both times. Unfortunately, when we attempted to retest in May, 1997, the wall of the concrete pipe was so corroded that a pressure test could not be obtained. However, there was no visible leakage at the time of the test, indicating the grout was still holding back the groundwater.”

Frank J. Scaldaferrri said WSSC has been using chemical grout in the WSSC system for about 30 years. “WSSC began using chemical grout in the late 1960s,” he said, “but we did not start a specific grouting program until the mid 1970s. Using the later date, chemical grout has a demonstrated longevity of at least 20 years in our service area.

“In our current contract, we are grouting laterals after sanitary sewer mains have been lined,” Scaldaferrri said. “That way you seal any annular space that may exist between the liner and the host pipe. Groundwater will find any opening in a pipeline. If you seal the joints, the water will migrate to the laterals, so you have to keep at it until you have a completely watertight system. Once you do that, all of your previous investment begins to pay much higher dividends. Chemical grout is the most cost-effective way to stop leaks in a structurally sound pipeline.”