

## How to be Assured of a Quality Grout Project

Chemical grout has been used successfully for more than 30 years to stop leaks in sewer systems. However, not all installations have been equally successful. To find out why some installations are more successful than others, we interviewed directors of public works, consulting engineers, grout contractors, suppliers, and equipment manufacturers.

We found that projects which are properly evaluated, specified, and installed, will be successful. If these steps are not carefully followed, the ability to get a good job will be diminished. Here's what our experienced panel of experts recommended:

### **Evaluation**

Chemical grout will stop leaks through cracks and joints in structurally sound pipelines and manholes, but it is not a structural rehabilitation process. Therefore, it is essential that physical surveys and video inspections be made to determine the exact condition of a system before any rehabilitation process is selected.

It is very seldom that one technology will cure all of the ills in a single pipeline, much less an entire drainage basin or system. If pipelines or manholes are structurally damaged, they need a structural repair. However, a careful evaluation is needed to determine which rehabilitation technology will be the most cost-effective. If chemical grout is the best solution, or part of the solution, the following information will be very beneficial.

### **Specification**

Some specifications ensure a high-quality, permanent repair while others ensure the opposite. Therefore, it is very important to know one from the other. Our panel emphasized the five areas which are essential to successful specifications: pre-qualification, clear communication, installation and inspection, and warranty.

### **Pre-qualification**

This may be obvious to many readers, but it is so important it should be reviewed. All contractors should be required to establish their qualifications to install chemical grout before being allowed to submit a bid. Each company should submit information which details the company's experience, equipment, and references. The companies should also identify the key people who will work on the project, and describe their job functions and experience. This process will help eliminate inexperienced potential bidders and those who have produced poor quality work in the past.

### **Clear communication**

It is essential that all bidders understand exactly what will be required of them before they submit a bid. It is not to your advantage to have a contractor bid low due to a misunderstanding. If that happens, the contractor will have a very strong incentive to cut corners in other places to make up for the loss.

It is a good idea to have a mandatory pre-bid meeting with all of the qualified contractors and review the details of the project. Bidders should see where the work will be done so they can make informed judgments about accessibility, traffic control, and other important considerations. All relevant data about the project should be shared with the bidders. In addition, you should detail your expectations and make sure the bidders are aware that a knowledgeable inspector will be present during the entire installation procedure to ensure that your expectations are met.

You will do yourself a favor if you require that all bids be separated by operation. Cleaning, TV inspection, pressure testing, and grout application (sealing) should all be quoted separately. You'll be better able to compare bids, and get a better job, if you require that sealing, including all materials, be quoted at a unit price per joint for each pipe size.

Recognize that the per-joint price will be paid for every joint that requires sealing. The actual number could be as few as 10% of the total joints, or as many as 90%, depending on the age and condition of the pipe. Successful grout contractors are able to use their experience to estimate the number of joints that will require sealing in a specific project.

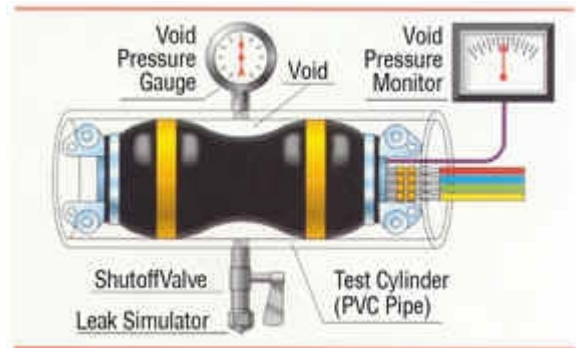
### **Installation and Inspection**

The concept of chemical grout installation is simple. The basic equipment consists of a joint sealing packer, a closed-circuit television system, and the related pumps, gauges, wires, and other gear necessary to properly align the packer with a pipeline joint and to force chemical grout out of the pipeline through the joint. Since much of the process takes place out of sight, it is necessary to test each joint before and after the sealing operation. In order to do a good job, all of the installation and test equipment must be in good working order.

Your inspector must be aware of what is required to install grout properly, and how he or she might be misled during the installation process. For instance, if a packer gauge is miscalibrated, your inspector cannot know the true condition of a joint. Therefore, the inspector should require an above-ground pressure test of each packer at the beginning of each work shift and at other random times. In addition, he should watch the test gauge each time the packer is deflated to make sure the gauge returns to zero. If it doesn't, the operation must be stopped until the gauge is properly calibrated.

*The accuracy of pressure gauges should be tested above ground.*

Since no joint can possibly test better than the barrel of the pipeline itself, a test of the pipe should be made at the beginning of each manhole section. The packer should be positioned in a sound section of pipe, between joints, and inflated. If the pipe will not meet the joint test requirements, either the requirements must be modified or another rehabilitation process used.



Your inspector should know the correct tow cable length for each packer being used, and measure the cable on each packer before it is inserted into the pipeline. The exact distance between the packer and the TV camera is very important because that determines how accurately the packer can be aligned with a pipe joint. If the tow cable length is changed, the packer might appear to be centered on a pipe joint when in fact, it is not. If the pipe joint is covered by the packer's rubber bladder, the joint will appear to pass the air test even though it is not watertight.

Your specifications should identify the specific type of grout to be used, and should include the specific percentage of solids, add mixtures, physical properties, etc.. Also, be sure to check with the manufacturer of that grout to make sure it is suitable for the proposed project. Furthermore, your inspector should make sure that the specified grout is, in fact, being used on the job.

Your inspector should also verify the gel time of the grout each time a new batch is mixed. After new chemicals are mixed, simply inject a small quantity into a paper cup. The gel time should be within the range specified by the manufacturer. It should be recognized that the temperature underground may be significantly different from the one above ground. As a result, the gel time will probably differ, also. If the grout gels too quickly, it cannot be forced through the pipe joint and into the surrounding soil. If it does not gel quickly enough, it may not form into a strong, watertight collar around the outside of the pipe joint. In either event, you may not achieve a permanent seal.



*Chemical grout forms a flexible, watertight collar around a pipe joint, thus preventing infiltration. If groundwater pressure increases, the collar will press more tightly against the pipe, sealing even better.*

While there are many variables in chemical grout installation, most operations should fall within standard ranges. For instance, as a rule-of-thumb, you should expect to pump at least 1/4-gallon of grout for each inch of pipe diameter into joints which fail the pressure test. That translates into 2 gallons per joint in an 8-inch pipe, 2.5 gallons in 10-inch pipe, and 3 gallons in 12-inch pipe. If at least that average is not achieved, your inspector should be on the lookout for an explanation.

Both the contractor and your inspector need to know how many gallons of grout are actually being pumped into each joint. Therefore, the grout contractor must furnish a dependable way to make that determination. Periodically, your inspector should verify the accuracy of the measurement by having chemical pumped into a gallon pail and checking the gauge.

### **Warranty**

Your specifications should also include provisions for an eleventh month inspection of at least 10% of the total joints tested in the original contract. The line sections to be re-tested should be selected at random by the owner. All joints in the selected lines must be re-tested and any joints which fail must be resealed at the contractor's expense. If 5% or more of the tested joints fail, the contractor must continue to test and seal until at least 95% of the total joints tested pass the test. By making these tests during the eleventh month, you may verify the quality of the job before the warranty expires.

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