



By Charlie Lerman

## OUT OF SIGHT BUT NOT OUT OF MIND: Sealing Manholes with Polyurethane Grouts

**Y**ou cannot fix something until you determine the cause. Once this is identified you can select an appropriate repair method and product to remedy your problem.

Now let's talk manholes.

Manholes are built out of various materials and can be configured in an endless number of ways. Many municipalities like to line or coat their manholes to extend their life expectancy, but before they can do so properly, active water leaks must be sealed completely. Polyurethane grouts excel at controlling infiltration in instances of high or low water flows, around penetrations and at joints and cracks. The balance of this article is going to briefly outline five techniques to successfully seal manholes using polyurethane grouts.

Precast manholes are common and beginning to show their age at 50-plus years. Their joints are often a point of infiltration in both new and old manholes. This is an easy fix with urethane grouts. Normally, it is required that two to three holes are drilled to intersect the joint, but be careful not to drill all the way through the structure. Next, you pump a flexible grout into the joint that allows the structure to "breathe." This is a low-volume, low-pressure injection that can be accomplished with or without the use of a pump. Coatings and cementitious seals can fail when loading, settling or temperature changes cause minor movement of the joint. Flexible urethanes often have elongation properties of 100 to -250 percent and can easily withstand any movement short of a devastating earthquake.

Cracks in manholes can become complex as their walls are typically too thin to allow angle drilling and usually have active leaks making surface mounting an impracticable option. If you stop the water before it gets to the crack, then there may not be a leak. For best results, set up a grid pattern for your holes spread one foot apart and pump directly into the sub-

strate. The grout can penetrate any crack that allows for water movement and creates a permanent waterproof seal from the inside-out. Typically, we use a rigid foam or a gel to fill voids, encapsulate the crack and consolidate the substrate into a water impermeable mass. I like to call this "spot" curtain grouting. It is effective and, like all urethane repairs, long lasting.

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Old brick manholes can leak from almost every mortar joint in the structure. You may seal one joint only to have the leak move to the next joint. Again, a polyurethane gel or foam is ideal for encapsulating the entire brick structure via curtain grouting. Depending on what your customer requires and how many courses of brick you have, curtain grouting can be used in just the brick or in the surrounding substrate. When using rigid foams, it is commonly a combination of both. The foam will lock the bricks together and bound them to the substrate. Since gels are weakest in their "neat state" (not bound to soils), it is best to concentrate them in the substrate. Either way

the leaks are stopped and the surrounding soil is stabilized, leaving the manhole with an infiltration-free environment.

Penetrations — manholes always have them, some more than others. It may not look like underground structures move, but they do. PVC, High Density Polyethylene (HDPE), metal, brick and concrete all have different coefficients of expansion. The changing of seasons and temperatures bring movement to the structure that cementitious grout cannot handle. This is where a flexible grout flourishes. Flexible grouts can be injected, but often there is enough annular space around the structure to pack urethane-soaked Oakum in the penetration. When the Oakum is packed tight, the urethane grout attempts to expand but is unable to reach its full expansion state due to the confined space it is in. This is a design feature that causes the foam to produce a dense, flexible seal that has an adhesive, compressive, and mechanical bond.

In this article, I have avoided the topic of hydrophobic and hydrophilic grouts, and have concentrated on the rigid, flexible, or gel grouts. When deciding on which product is the correct one to use, decide if you need flexibility or a rigid fix. If you are concerned that the grout might dry out, choose a hydrophobic. Hydrophobic grouts can withstand wet/dry cycles. Simple as that.

In summary, there are some repairs that require some flexibility from the structure like joints, cracks and penetrations. On the other hand, there are repairs that require a rigid or semi-rigid foam or a gel like curtain grouting. After an inspection of the manhole, or any underground structure, you can better determine which application is best fit for you to stop leaks, stabilize soil and control infiltration — permanently.

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