Areas of Infiltration:
- Manholes
- Mainlines
- Lateral Service Lines
- Lateral Connections
- Lift Stations
- Wetwells
- Storm Vaults
- Curb Inlets
- Concrete and CMP Culverts
- Storm Sewers
The structure, prevents further soil erosion, and at the same time, protects the structure long-term by infiltration from crack to crack. The curtain grouting prevents water from further entering the structure. Soils creating an impermeable gel/soil matrix that simply filling the individual crack may have you underground structure such as a manhole or vault, If multiple cracks or leaks exist in a wall or focusing on the curtain grouting technique. When it comes to stopping leaks in manholes, vaults or other underground structures, there are two schools of thought: Crack Injection and Curtain Grouting. In crack injection, you inject grout into the wall that has a leaking hole, crack or joint. The grout reacts to moisture creating a strong seal that will move with any future movement of the structure. In curtain grouting, there are two application options: inject from within the structure, or inject from outside the structure. With both applications, grout is injected into the surrounding soils creating an impermeable gel/sol matrix that prevents water from further entering the structure. While both crack injection and curtain grouting methods can be effective, this brochure focuses on the curtain grouting technique.

If multiple cracks or leaks exist in a wall or underground structure such as a manhole or vault, simply filling the individual crack may have you spending a great deal of time chasing water infiltration from crack to crack. The curtain grouting technique enables you to stop several leaks at the same time, protects the structure long-term by preventing groundwater infiltration from entering the structure, prevents further soil erosion, and stabilized the structure. It is an especially useful technique on brick or block manholes where there are significant amounts of joints or defects which water can penetrate through.

Curtain grouting can be done successfully with expansive polyurethane foams or with non-expansive acrylic gel grouts. To curtain grout an underground structure you will need:

- Injection grout and its catalyst(s)
- Grout Pump: Acrylic grouts use a dual-component, stainless steel pump, while expansive foams use single-component electric airless spray equipment. Each pump should be fitted with hoses rated for the specific type of pump/grout.
- Clean tanks or buckets for mixing
- Injection tools: probe, wand, wall spears or injection ports
- Hammer drill
- Quick setting non-shrink mortar
- Cleaning products: soap and water for gels, and solvents for foams
- As needed: Confined space equipment for entering the underground structure

BY THE NUMBERS...

The cost to treat groundwater infiltration vs. the cost to stop infiltration with injection grout:

- Water leaks are active 24/7.
- Leaks bring water and soils into the system creating voids around the structure and decreasing pipe capacity. Soil fines lost into the sewer system lead to sinkholes and depressions at the surface, often resulting in costly road repairs.

(1) leak in one manhole at 1GPM = 525,600 gallons of infiltration per year = $2,100 to treat clean groundwater per year.*

(20) leaks in one manhole at 1GPM = 10,512,000 gallons of infiltration per year = $42,000 to treat clean groundwater per year.**

With average treatment costs of $4.00 per 1,000 gallons, it can cost upwards of $40,000 per year to treat clean groundwater from one excessively leaking manhole.

The average cost to stop infiltration with injection grout is $1,000 - $1,500 per manhole.

*Conditions and costs vary

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**Curtain Grouting from Inside an Underground Structure**

Here is a quick glance at the steps you would take to curtain grout from inside a structure. This method requires confined space certification and equipment:

1. Drill holes through the wall of the structure into the soil. The holes should be equally spaced around the entire structure. Holes are typically drilled two to three feet above, below, and to the sides of the initial hole so movement of the grout will be evident.
2. You can use urethane or acrylic grouts to curtain grout. For urethane grouting, you will mix the catalyst with its designated resin and inject as a single component. Using an airless paint sprayer pump (Graco 490 or similar) is recommended.
3. Keep mixing operations and hoses out of direct sunlight and away from heat sources to avoid pre-polymerization.
4. Inject grout at the appropriate ratio into the lowest injection hole. Check Technical Data Sheets for accurate ratios.
5. When grout begins to exit the hole to the left or right of where you are injecting, move to that hole and repeat the process for remaining holes at the lower level.
6. Repeat Step 5 on each row of holes.
7. After all holes have been injected with grout, patch the holes with a quick set mortar.
8. When finished, be sure to adequately clean your equipment and hoses for storage.

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**Curtain/Probe Grouting from Above an Underground Structure**

Here is a quick glance on how to curtain grout and underground structure from the ground surface.

1. Identify and mark all buried utilities/pipe/cables within the probe grouting zone to avoid damaging these underground fixtures.
2. Start by drilling holes through the pavement or ground surface around the top of the structure. Ensure that the drive end of pipe is protected/covered to prevent soil impaction into the probe during the driving operation.
3. You can use urethane or acrylic grouts to curtain grout. For urethane grouting, you will mix the catalyst with its designated resin and inject as a single component. Using an airless paint sprayer pump (Graco 490 or similar) is recommended. For acrylic grouting, you will mix the grout and its catalysts in two separate tanks or containers and inject at a 1:1 ratio into the soil using a stainless steel, dual-component pump. Mixing instructions are available 24/7 at avantigrout.com
4. Keep mixing operations and the hoses out of direct sunlight and away from heat sources to avoid pre-polymerization.
5. Insert the probe into the drilled hole. Start injecting grout at the bottom of the structure. Once you have injected a thorough amount of grout, pull the probe up two to three feet and start pumping again. Continue this until you have filled all voids surrounding the structure.
6. Move to the next hole and continue process until entire structure is encapsulated by grout.

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*Conditions and costs vary
CURTAIN GROUTING FROM INSIDE AN UNDERGROUND STRUCTURE

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4. Inject grout at the appropriate ratio into the lowest injection hole. Check Technical Data Sheets for accurate ratios.
5. When grout begins to exit the hole to the left or right of where you are injecting, move to that hole and repeat the process for remaining holes at the lower level.
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CURTAIN/PROBE GROUTING FROM ABOVE AN UNDERGROUND STRUCTURE

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CURTAIN GROUTING
MANHOLES • VAULTS • UNDERGROUND STRUCTURES

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