Chemical Grout
-from the inside out

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What is Chemical Grouting?

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Why Eliminate Infiltration?

- Infiltration is **Costly**
  
  *Check the math:*

  If you have a 300 lf section of 8” sewer main with 3 foot joints and 20% of the joints are actively leaking at 1 gal/min your inflow of excess water is 1200 gph or 28,800 gpd.
Why Eliminate Infiltration?

○ Infiltration is **Costly**

  Excess inflow over a single year will be 10,512,000 gallons.
  Treatment costs at $2/1000g = $21,024.00
Why Eliminate Infiltration?

- At an average cost of $14/lf the same 300 foot section of pipe will cost $4,200.00
- An immediate savings of $16,824.00 ($21,024-$4,200)
- A ten year savings of $206,040.00
Why Eliminate Infiltration?

Infiltration is damaging!

- Water flowing through the joints brings with it the substrates holding the sewer in place.

- Over time the sewer lines begins to shift and fracture because of the lack of support.

Figure 1 The Process of Sewer Failure
Why Eliminate Infiltration?

- Reducing the total amount of inflow by eliminating infiltration is equal to increasing your total system capacity.
- Reduce overflows
- Meet Capacity regulations
What is Acrylamide Grout?

- Acrylamide is a readily polymerized amide, derived from acrylic acid.

- Most Acrylamides are found as water soluble thickeners used in wastewater treatment and also in the manufacture of permanent press synthetic fibers.
3 Components of Chemical Grout

- Acrylamide Monomer (AM) and Methylenebiscrylamide (MBA)
- Triethanolamine (TEA)
- Ammonium Persulfate

- When combined these three chemical compounds diluted in water create chemical grout.
How Long Does Grout Last?

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- Buried Nuclear Waste was leaching into the surrounding streams and waters.
- Solution was to encapsulate the waste without digging or removing the soils.
How Long Does Grout Last?

- The material had to be able to saturate the surrounding ground.
- Possess an extremely long life.
- Able to encompass and resist the radioactive material.
- Form a water-tight barrier.
- Have an adjustable long gel time.
How Long Does Grout Last?

- In 1986, studies were performed for the **US Department of Energy**
How Long Does Grout Last?

- In 1986, studies were performed for the US Department of Energy.
- Carbon-dating methods performed during the study proved that the *half-life* of Acrylamide Grout was **362 years**!

The Exterior of Structures?

- Grouting is commonly mistaken for the methods of filling in the gaps of floor and wall tiles.
- The question often asked is if the grout will inhibit the flow of water after the grouting is done.
The Exterior of Structures?

○ Before gelling, chemical grout has the consistency of water allowing the material to easily flow to the outside of the pipe and combine with the surrounding soil, creating a water tight grout collar.
No-Dig Technology

Grout Rigs contain several common features including chemical tanks, winches, water heaters, grout packers and a tv control studio.
Applications for Chemical Grout
Mainline Joint Test and Seal

- The packer is centered over joint.
- Upon failure of air test, grout is pumped to form seal.
- Joint is then retested.
Lateral Connection Test & Seal

- Lateral is located and sock is inflated.
- Connection is first air tested.
- Upon failure grout is pumped forming seal.
- Connection is retested.
Lateral Grouting From Cleanout

- Sausage packer is pulled in from cleanout installed in lateral
- At each designated length packer is inflated and grout is pumped into joint
Manhole Grouting

- Holes are drilled evenly through the manhole walls.
- Chemical is pumped to form a grout curtain.
Sealing Annular Gap In CIPP

“If designed to reduce inflow and infiltration, the liner should be adequately sealed at laterals to ensure that there is no inflow into the pipe. This can be achieved by adequately grouting around the openings or by using sealing gaskets.”

Sealing Annular Gap in CIPP

- “There was evidence of good mechanical interlock in the large diameter liners installed in the brick sewers, but no evidence of significant adhesion of the liner to the host pipe.”

- “A significant annular gap also increases the potential for water migration between the host pipe and the liner. If lateral connections and/or liner terminations at manholes are not sealed, then infiltration into the sewer system can occur.”
Sealing Annular Gap in CIPP

- “The problems encountered relate to watertightness. GS’s aim is a watertight system, and after 15 years of using CIPP, and some 15,000 watertightness tests, determined that it (CIPP) is an excellent long-term repair method, but will not provide a permanently watertight system. This is due to problems of sealing ends at manholes and of sealing the openings at lateral connections.”

-A Retrospective Evaluation of Cured-in-Place Pipe (CIPP) Used in Municipal Gravity Sewers Publication EPA/600/R-12/004 Published by the United States Environmental Protection Agency January 2012.
Lateral Connection Sealing In CIPP

- Lined pipe contains annular space allowing inflow of water from joints to openings at laterals.
- Seal pipe with lateral packer at connections.
Grouting Recap

- Acrylamide Grout was determined by carbon dating methods for the US Department of Energy to have a half-life of 362 years.

- Sealing of pipes and manholes is achieved by producing a grout collar or curtain on the exterior of the structure.
Grouting Recap

○ Newly installed and existing Cured In Place Pipes contain annular spaces that can be sealed by chemical grout.

○ When sealing joints and structures keep in mind that the goal is a permanent seal. Not just passing a pressure test.
Questions?

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Thank You!