Resiplast US Inc.
A Solid Team

Infrastructure Repairs
Using
Chemical Grouts

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What are Chemical Grouts

- Chemical grouts are water reacted or chemically reacted materials, that are designed to shut down active water leaks, stabilize soils and slabs in various structures.
- These materials are formulated to stop high volume leaks (2000 gpm) or used to stop small leaks in water and waste water treatment tanks by utilizing proper crack injection methods.
- Geotechnical applications: Soil stabilization, railroad ballast rock stabilization, tunnels, mines and Sea wall repairs

Markets for Chemical Grouts

- Locks & Dams
- Tunnels / Box Culverts
- Soil Stabilization
- Slab Stabilization
- Sea Walls / Retaining Walls / Block Walls
- Desalination plants
- Water / Waste Water Treatment Plants
- Manholes /Storm Drains /Utility Vaults
- Elevator Pits / Pipes

"Most Places that water is causing Damage or leaking into or out of a structure or soils"

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Topic's

Crack injection

Curtain Wall Grouting

Municipal Applications

a) Storm Culverts

b) Manhole rehab

c) Point Grouting

Viscosity

Viscosity is the Measurement of liquid expressed in a scale of Centipoises.

1 cps = Water

Spetec PUR H 40 (Soil Grout) 40 cps

Spetec PUR H 100 120 cps

3000 cps = Honey

Measurements

1 gallon of liquid is equal to 231 cubic inches.

Chemical Grouts have an average expansion rate of 8 times.

One cured gallon, would be 1848 cubic inches of cured material.

This can be used when estimating material quantities on a project.

Hydrophilic & Hydrophobic

Hydrophilic

- Flexible
- Resin only
- Great Bond
- Absorbs Water
- Medium to High Shrinkage
- Medium Expansion
- Foam or Gel

Hydrophobic

- Rigid and Flexible
- Resin + Catalyst
- Good Bond
- Repels Water
- Low Shrinkage
- High Expansion
- Adjustable Set Times
- Foam

Multi Component

- Rigid
- Flexible
- High Expansion
- Rapid Set times
- High Density
- High Compressive
- strength

Crack Injection

- Injection of cracks in concrete structures has been performed using chemical grouts for over 40 years. These materials react with water so draining the tanks is not required. The Chemical grouts used for crack injection are a flexible material which allows the cracks to maintain movement.
- Advantages over Other Methods

1. Tank can remain in service and full.
2. Material reacts with water so unlike Epoxy drying the crack is not required.
3. Material remains flexible.

Application: Crack Injection

Selecting A Chemical Grout

- Selecting a resin may be confusing because of the selections available, not one product can solve all repairs.

Considerations

- Potable or Non-Potable application
- Wet and Dry Cycles
- Crack Width
- Crack Movement
- Amount of infiltration
- Method of injection
- Jobsite conditions **

Crack Injection Procedures

Step 1. Identify crack location.

Step 2. Estimate cubic inch of crack.

(+ - 25 If per gallon)

Step 3. Prepare surface of crack.

Step 4. Drill injection holes at a *45 degree angle*.

Step 5. Flush out all injection holes with water.

Step 6. Insert injection ports.

Step 7. Inject water into each port.

Step 8. Start injection of material.

Where do I Start Injecting ?

Vertical cracks:

Start at the bottom working up the crack or against gravity. This will force the material up and through the crack and will avoid any trapped air pockets.

Horizontal cracks:

Can be started at one end or the other working across the crack.

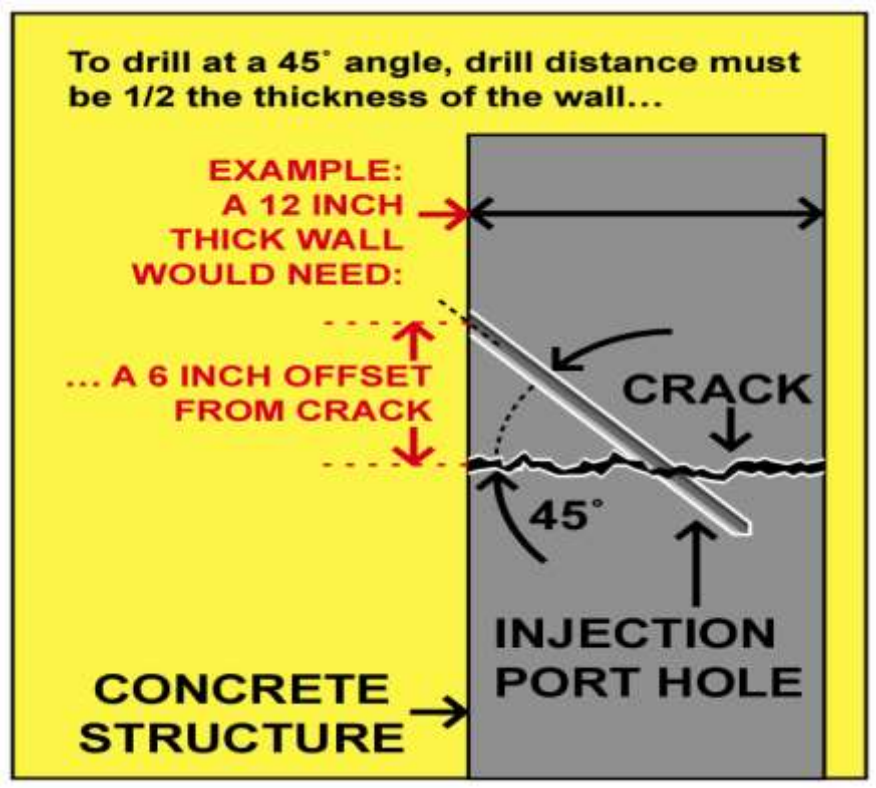
Port Spacing Rules

Port spacing is estimated by the width of the crack, wide cracks can be 8 to 12 inches apart, tight cracks can be 1 to 6 inches apart.

Staggering ports is always a good practice to insure intersection of the crack.

Incorrect Injection Steps

1. **Spacing:** One of the biggest mistakes made is port space and spacing off the crack.



45 degree angle

Identifying Crack

Stagger Ports

Injection of Material

Complete Injection

Dardanelle Lock and Dam Tunnels

Injection of the cross passages was performed using Spetec PU F400

Injection Week

Questions on Crack Injection??

Curtain Wall Grouting

Curtain wall grouting was performed in the 1960, on a sewer manhole

Chemical Grout was injected through the manhole to the back side to create a positive side seal.

This method is still used today and is the most effective method for grouting manholes to stop infiltration.

Curtain Wall Grouting

Curtain Wall Grouting can be effective on various materials, Wood, Steel, Concrete, Block and Brick.

This procedure is used to inject behind a wall or under a slab to create a Positive side waterproofing barrier.

Injection is achieved by drilling through the wall and injecting Chemical Grouts to the back side and into the soil.

This Process is also effective going through a floor slab. Injection holes are drilled on a grid pattern and Chemical Grout is injected under the slab to create a positive side water tight seal.

Material selection

Material selection is based on various factors.

1.Soils

2.Voids

3.Moisture Conditions

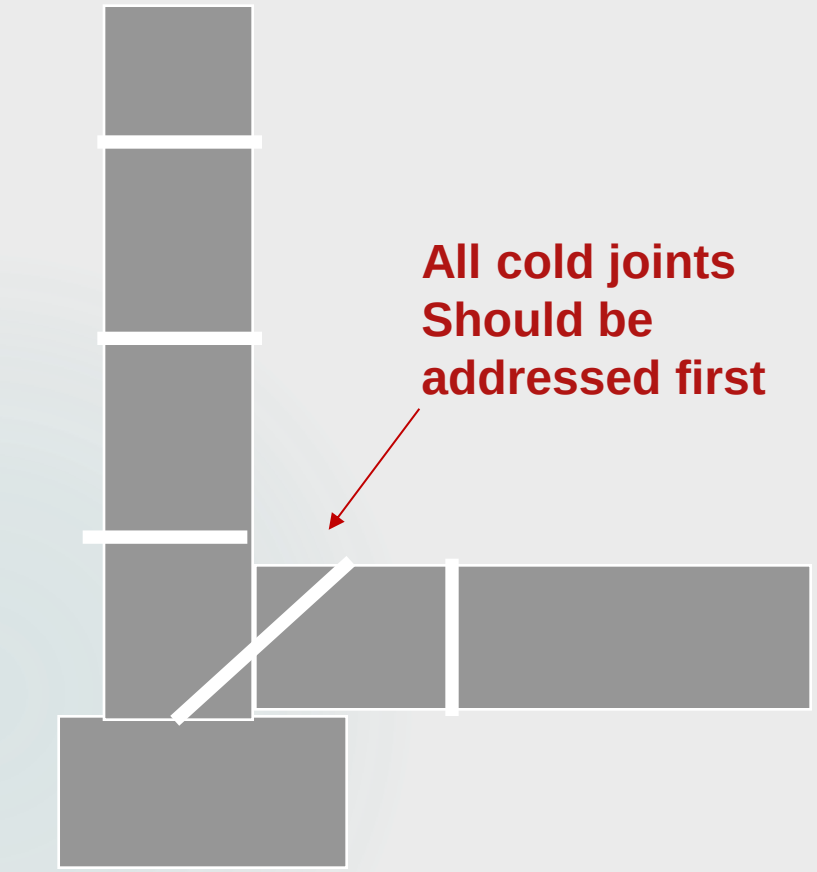
4.Injection Process

a) Through wall injection

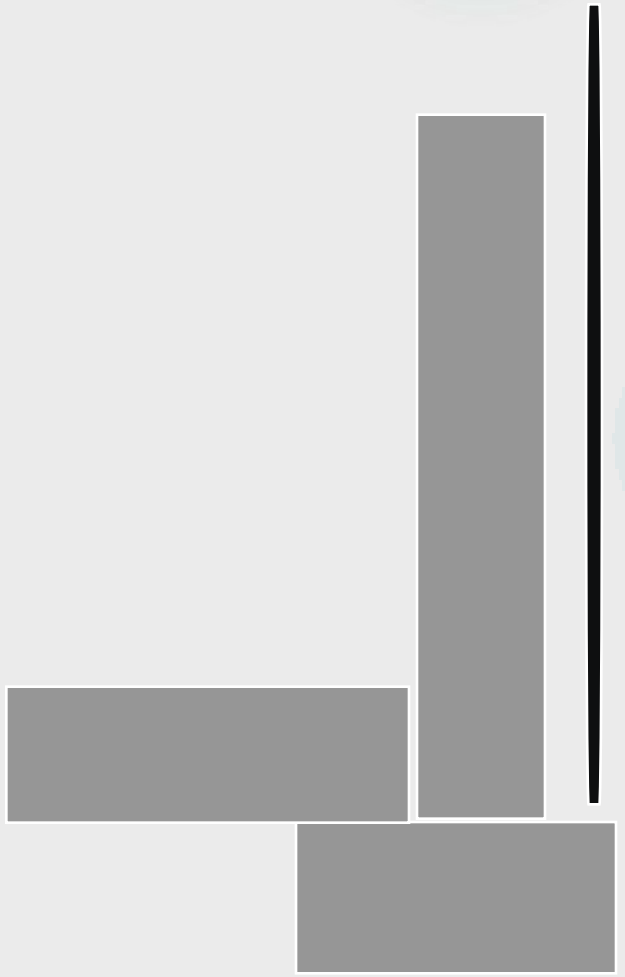
b) Under slab injection

c) Probe injection

Injection Hole Pattern



Through wall injection



Probe Injection

Case Study

Project: Gulf Harbour Elevator Shafts

Owner: Gulf Harbour Condominium Association

Engineer: Jenkins and Charland, Fort Myers Florida

Contractor: Consel Inc. Naples Florida

Application: 25 elevator shaft constructed on the beach out of concrete block with NO waterproofing.

Solution: Injection of Polyurethane Chemical Grout was injected through the walls and floor to create a positive side waterproofing.

Failed negative
Side waterproofing

The walls were sprayed with a negative side material that lasted around two weeks.

Grouting Elevator Pits

- Injection was performed Through the walls and slabs to stop all infiltration.

Panama City Beach

Below grade
Valve box was
Leaking, allowing
Water to access
Control panels.

Injection Process

Chemical Grout Traveling

Injection Sealing Holes

Case Study

Project: McLane Distribution Center

Owner: McLane Corporation North Carolina

Application: 100,000 Sq Ft warehouse slab with excessive moisture intrusion .

Solution: Injection of Polyurethane Chemical Grout was injected through the floor to create a positive side waterproofing membrane on the under side

Holes were drilled on a 3 foot Grid pattern, staggering port layout
Chemical grout was injected And allowed to travel under The slab to next location.

Injection of floor slab

Cored hole

Case Study

Project: Japanese Tea Garden,
Owner: City of San Antonio, Texas
Contractor: Fuquay Construction
Application: 2 Acres pond with excessive water loss.
Solution: Injection of Polyurethane Chemical Grout was injected through the slab to create a positive side waterproofing membrane on the under side

Injection of Slab Area

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Holes were drilled on a 6 foot grid

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Injection was completed and pond was filled

Municipal Applications

TRENCHLESS REPAIRS

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Repair without Excavation

- Storm culverts are becoming a common problem around the world. These structures transport large volumes of water and when leaking allow exterior soils to be carried in allowing sink holes on the exterior of the structure to develop.
- Chemical grouting these structures is a non – excavation repair, that will seal joints and leaks and stabilize soils.
- Unlike pumping concrete chemical grouts add little to no weight to surrounding soils.

Injection Process

- **Injection of storm culverts can be achieved by man entry or via probe grouting from above when access is not possible.**

Man Entry Method:

All joints need to be identified and inspected for any possible concrete repair that may need to be performed prior to injection process.

Wide joints should be packed using Oakum rope and chemical grout to minimize waste and contain injection grout in joint, Once prepared injection can be performed.

Storm Culvert Repairs

Concrete Pipe

Packing wide joints with Oakum

Injection of Joints

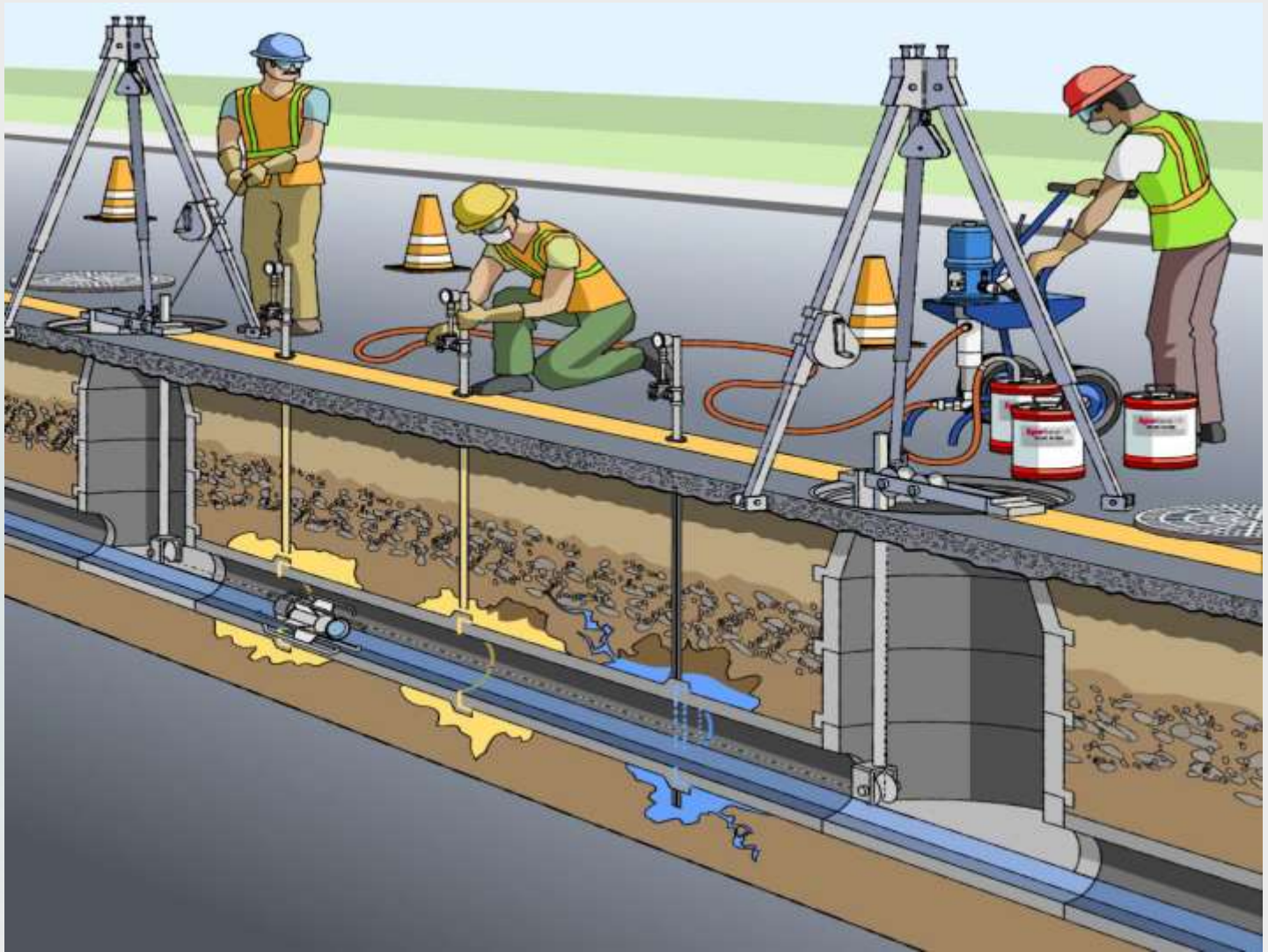
Corrugated metal pipes can be Repaired by injecting chemical Grout to stop infiltration.

Entering the pipe to repair leaking joints of a new storm water line.

Drilling & Installing injection ports

Injection Started & Leak repaired

Probe Grouting Method



Probe Grouting

- This method is effective when entry is not allowed or not possible.

1. Map off leaks using cctv camera and documents locations
2. Measure out and mark locations on the street.
3. Drill holes though street if needed at each location
4. Insert probe pipe to a depth of one foot below bottom of pipe.
5. Start injecting a rate of 1 gallon per foot stopping at the top of the pipe.

Storm Pipe Repair

Water blasting injection probes Into the ground can easily be achieved by using the Vac truck. Injection Probes should be inserted to a depth of 1 foot below the bottom of the host pipe.

Storm Water Pipe

Manhole Injection

- Injection on manholes or utility vaults is a low cost repair that will pro long the life of the structure.

Injection Procedures

INJECTION STEPS

1. Determine location of the leaks.
2. Slow Down Water Flow.
3. Drill Injection Port Holes.
4. Insert injection Ports or Wall Spear.
5. Mix Material
6. Inject Material
7. Clean up equipment and job site.

One of the biggest mistake is injecting material before slowing down the water flow.

Injection Methods

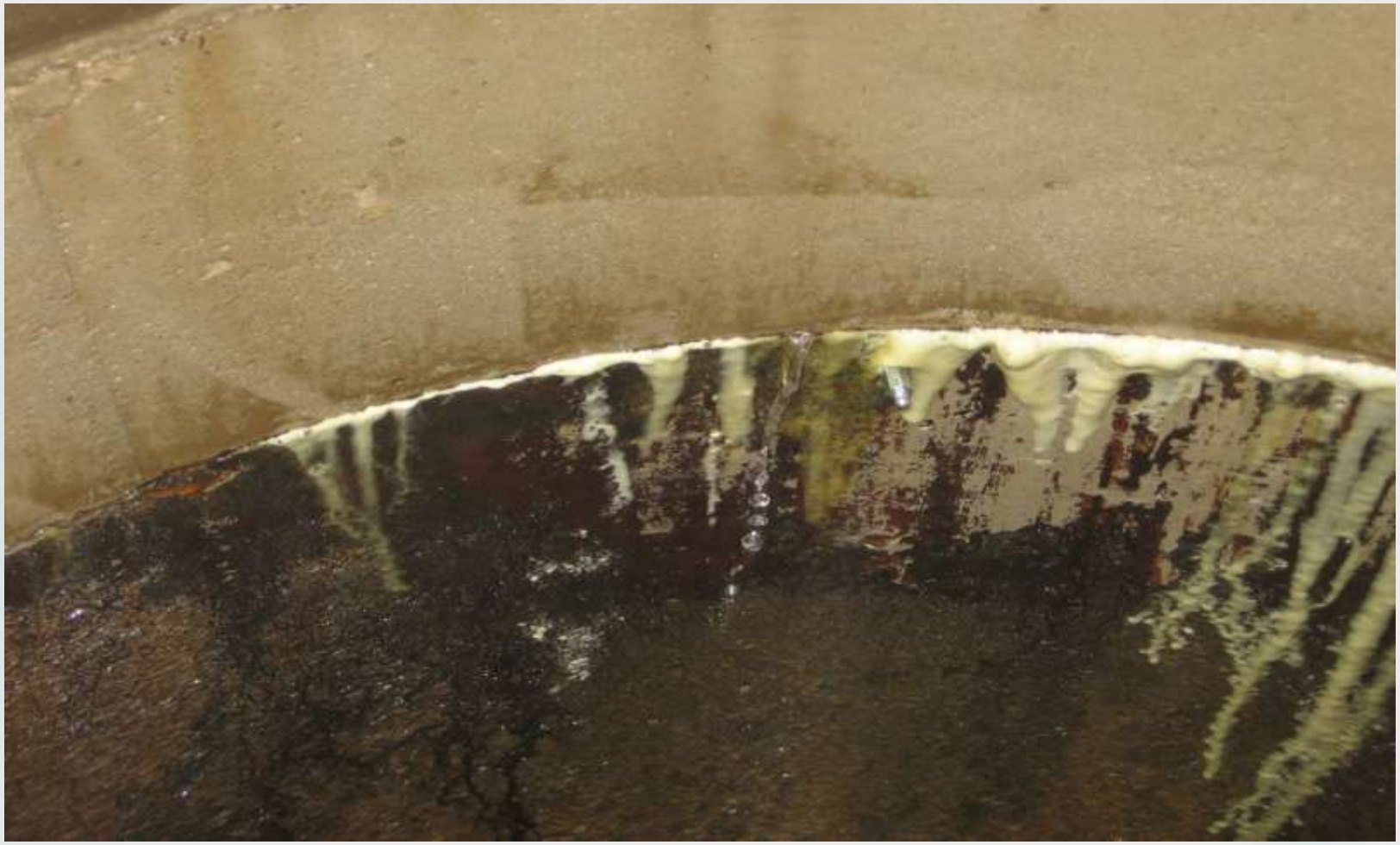
Brick Manholes

- Drill to outside of manhole through a brick not through the mortar joint.
- Repair all pipe penetrations
- Have oakum ready
- Start injection of material starting at the bottom and work

Precast manholes

- Repair all pipe penetration.
- Oakum rings if to wide.
- Drill injection holes into rings at clock positions,
- Start injecting material from bottom up.

Injection Port



Sealed Ring

Finished Hole


Sealing Pre Cast Manholes

High Flow Leaks Repaired

Enjoy your work and take pride in it

Case Studies

- Project: Panama City Box Culvert
- Issue: Water migration under the box culvert was causing road cave ins.
- Solution: Injection of Hydro Active Cut using injection probes through the bottom of the culvert to create a cut off wall
- Special Procedures: Because the water was traveling under the culvert through a large void we injected a dye through the probes first from the up stream side to determine our set times on our material.

Box Culvert Repair

Panama City, Florida

- The box culvert was being undermined by the lake water traveling under the base slab.

Injection of Chemical Grouts

Injection of Chemical Grouts was the only Repair procedure that Allowed the roadway To stay open.

Injection was achieved by drilling through the base and inserting injection probes. Chemical Grout was injected through the probes to create a cut off wall under the culvert.

Recap and Completion

- What's the number one issue that will make or break any project?

Proper Supervision

Thank You

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