# Subsurface, Inc.


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Subsurface-inc.com


# Efficient, Effective, Convenient

UV CIPP Lining, Culvert Joint Repair, Void Filling, Soil Stabilization, AND MORE!


# UV Cured in Place Pipe Lining

# Cured In Place Pipe (CIPP)

**UV CIPP** is a trenchless rehabilitation method used to repair existing pipelines.

UV CIPP is a joint-less, seamless, pipe-within-a-pipe.

It has the capability to rehabilitate pipes ranging in diameter from very small to very large (4”-72”).

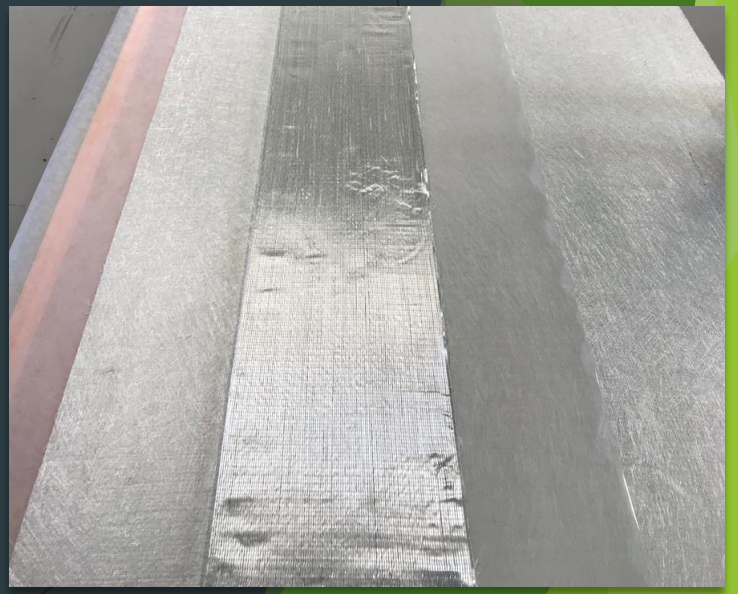
Each UV CIPP Liner Must Meet Specific Criteria Designed For The Environment That We Expect It to Live In.

Starts out as raw fiberglass and resin and is made into a tube that will be pulled into place, inflated and cured in place.

Made to the thickness and diameter required by ASTM standards.

# GRP Liner

- Outer Foil
  - Additional layer of protection
  - Slides easily on the glide foil.
  - Creates a barrier between host pipe and liner.
  - UV Light Impermeable
- Fleece
  - Restricts excess movement of resin.
- E-CR Fiberglass (Electrical grade, Corrosion Resistant)
  - Reinforcing Strength and structure.
  - Number of layers of Fiberglass is governed by the ASTM Design Calculations.
- Resin
  - UV light activated
  - Strength hardening agent
- Inner Foil
  - Barrier on the inside to contain fiberglass and resin.
  - Inflation foil.



# GRP Liner Impregnation

- Every step of the Liner Impregnation is monitored for quality control purposes.
- Resin is injected into the fiberglass and Pinch Rollers are used to disperse the resin evenly throughout the fiberglass mat.

# OMEGA LINER

## PRODUCT SPECIFICATIONS

| | |
|---|---|
| Manufacturer | Omega Liner Company |
| Product name | Omega Liner |
| Manufacturing since | 2017 |
| Environmentally friendly | No discharge of contaminated water or condensate. |
| Low carbon footprint | Minimal fuel consumption |
| Inflate procedure | Low pressure high volume blower |
| Curing method | UV or LED Light |
| Installation technique | Pull-in Place |
| Manufacturing - Impregnation | Manufacturers plant only |
| Certification | ISO 9001: 2015 |
| MSDS Sheet | Available |
| Resin System(s) | Unsaturated Polyester or Vinyl Ester |
| Diameter range | 6" (150mm) to 66" (1676mm) |
| Special profiles | Circumferences up to 207 inches |
| Pipe transitions | Yes (Example: 15" to 18") |
| Reinforcement | EC-R Glass |
| Chemical resistance | According to ASTM D 543 |
| Barcol hardness according to ASTM 2583 | ≥ 40 |
| Recovery period | Minimum 50 yrs |
| Maximum residual styrene content after curing | ≤ 3% |
| Short-term Flexural Modulus ASTM D790 | 2,200,000 psi |
| Long-term Flexural Modulus ASTM D790 | 1,460,800 psi |
| Short-term Flexural Strength ASTM D790 | 30,000 psi |
| Long-term Flexural Strength ASTM D790 | 19,920 psi |
| Poisson´s ratio according ASTM D3039 | ≤ 3 |
| Retention after 10.000 h Per ASTM D2990 | 50 yrs = 66.4% |
| Creep behavior after 24 h ASTM D2990 | < 10% |

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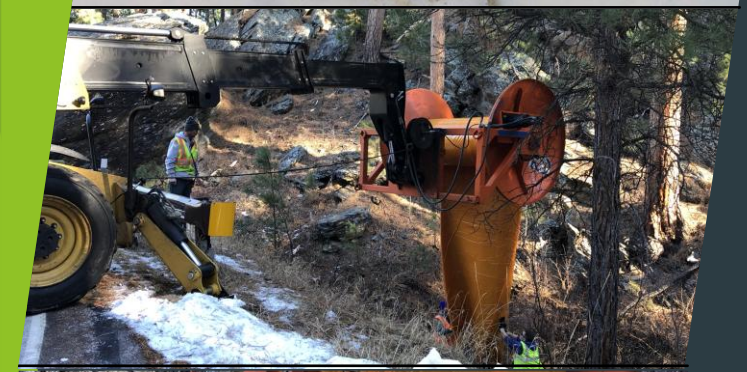
# Installing UV CIPP

## Before Installation of Liner


## After Installation of Liner

# Step 1 : Clean Existing

| | |
|---|---|
| Cofferdam | Install patented portable steel cofferdams (if needed) to isolate culvert to be lined and enable dewatering and cleaning. |
| Dewater | Dewater culvert using pumps or truck mounted suction tube. |
| Clean | Clean pipe using high-pressure water jet or other method. |
| Televise | Conduct CCTV inspection of the pipe to ensure cleanliness and assess condition of pipe. |



# Step 2 : Installing Liner

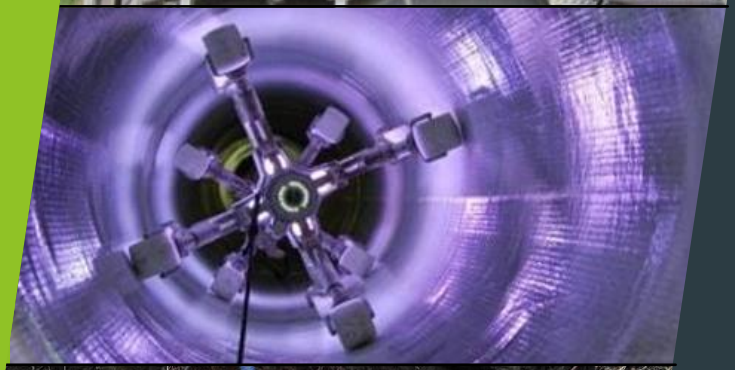
| | |
|---|---|
| Setup | Move liner in the crate to the end of the pipe, or spool liner on patented installation reel (Omega Liner Co.). |
| Glide Foil | Install plastic gliding foil through pipe. |
| Begin | Begin un-reeling liner, continuously folding liner upon entering host pipe. Ensure the liner remains on the gliding foil. |
| Inspect | Inspect Liner for any defects during un-reeling. |
| Pull | Pull liner completely through host pipe using a cable winch or other means. |

# Step 3 : Installing “Cans” and Inserting Light Train

| | |
|---|---|
| Open Liner | Cut the liner end open to install the aluminum “cans”. |
| Install Can | Place can into liner and secure. |
| Sluiceway | Remove bolted lid and install plastic sluiceway containing the light train. |
| Temporarily Inflate | Partially inflate. |
| Insert Light Train | Insert light train, remove sluiceway, and replace lid. |

# Step 4 : Preparing “Cans” and Light Train

| | |
|---|---|
| Assemble | Attach blower hose, cable guide, and light train cable. |
| Expand to Fit | Pressurize in steps to get best fit. |
| Inspect Fit | Light train is pulled through with camera on (no UV light) to the opposite end. |

# Step 5 : Full Pressure and Curing Liner

| | |
|---|---|
| Full Pressure | Slowly reach full pressure.<br>Full Pressure = 2.9 to 4.4 (PSI) |
| Activate Light Train | Activate the light train and begin computer-controlled pull. |
| Monitor | Monitor the pressure, temperature, and rate of pull. Adjust rate based on temperatures being achieved.<br>Curing temp = 200-250 (Fahrenheit). |

**CMP with an invert that is completely deteriorated. A new concrete base was poured and the structure was lined with an Omega Liner Company UV CIPP liner.**

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Drainage Structure Maintenance & Repair

Many different configurations going on here.  42” inlet pipe going into the 60” UV lined vertical pipe then going to a 48” UV lined outlet pipe.

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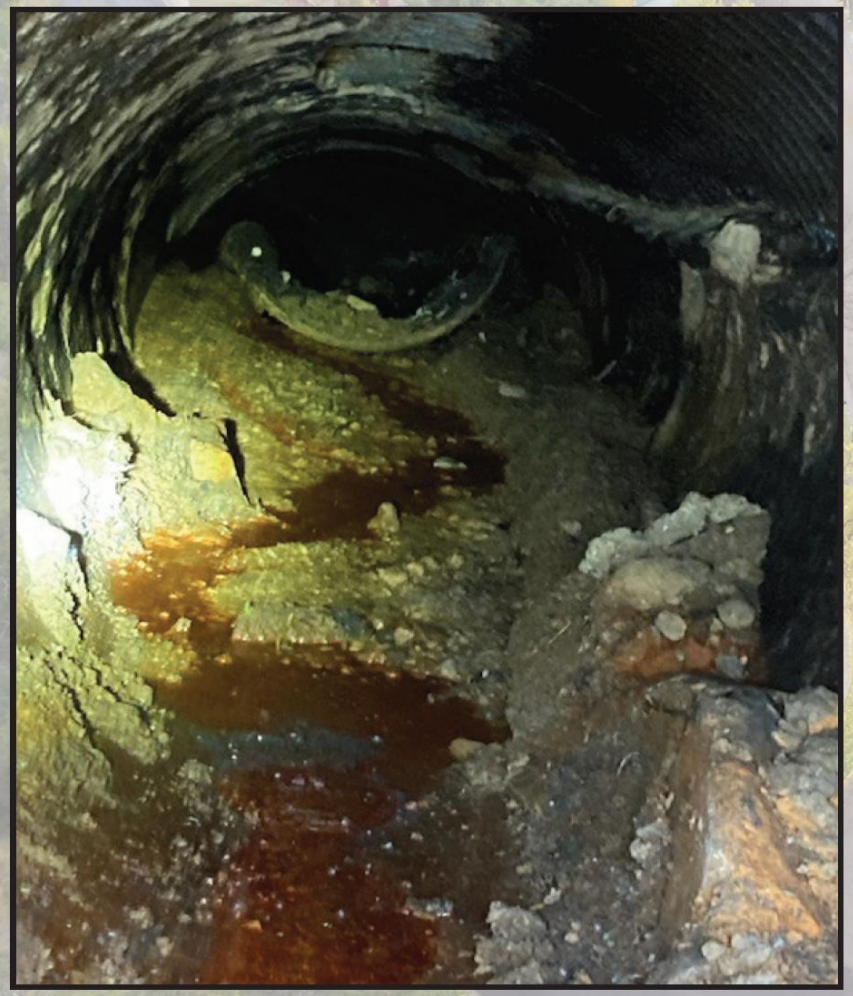
CAT


CAT

This slipliner failed due to poor installation practices as well as catching fire when the nearby ditch was burned.



The image above shows a lack of grout filling the annular space in the upper right quadrant of the structure.

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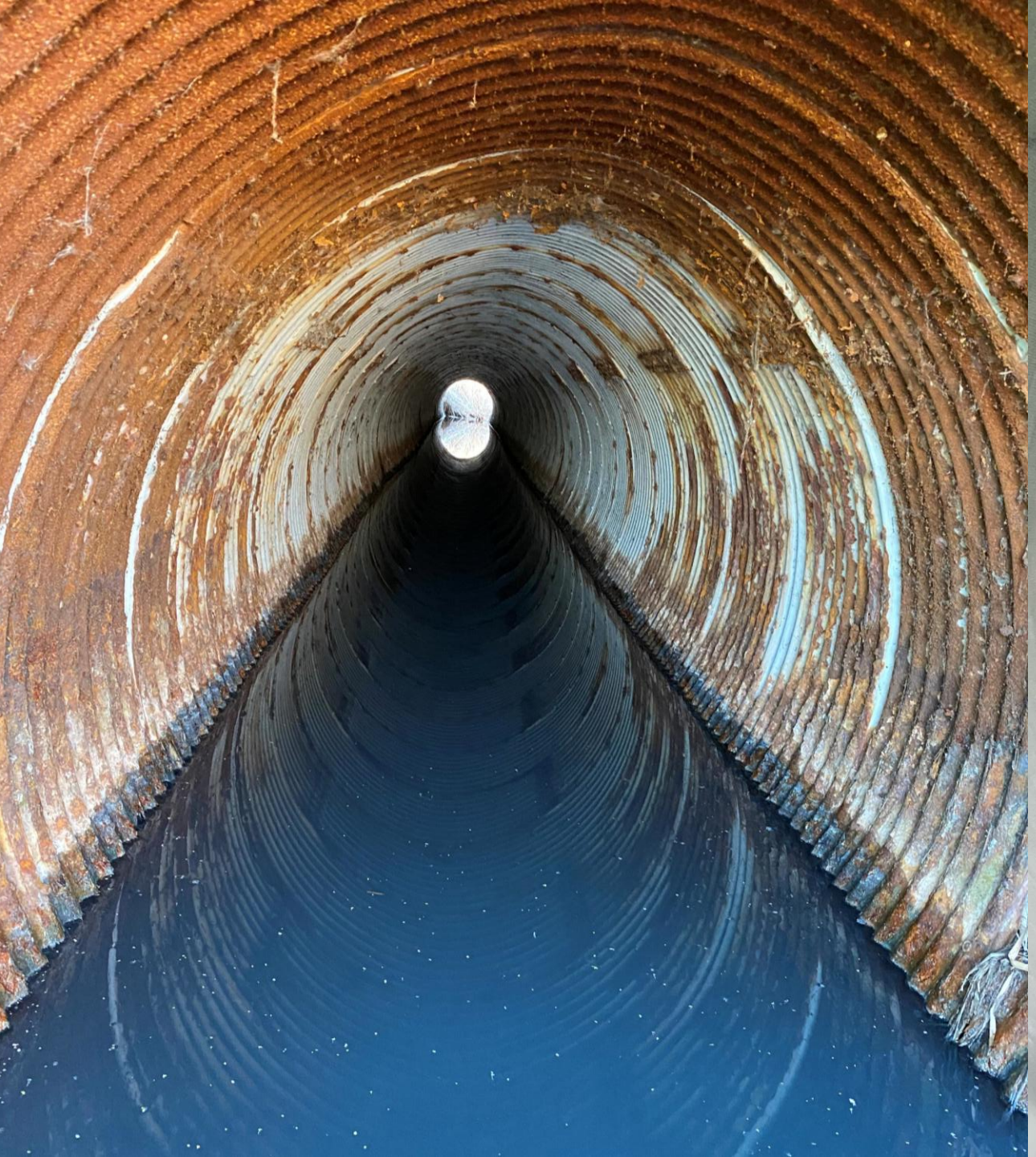
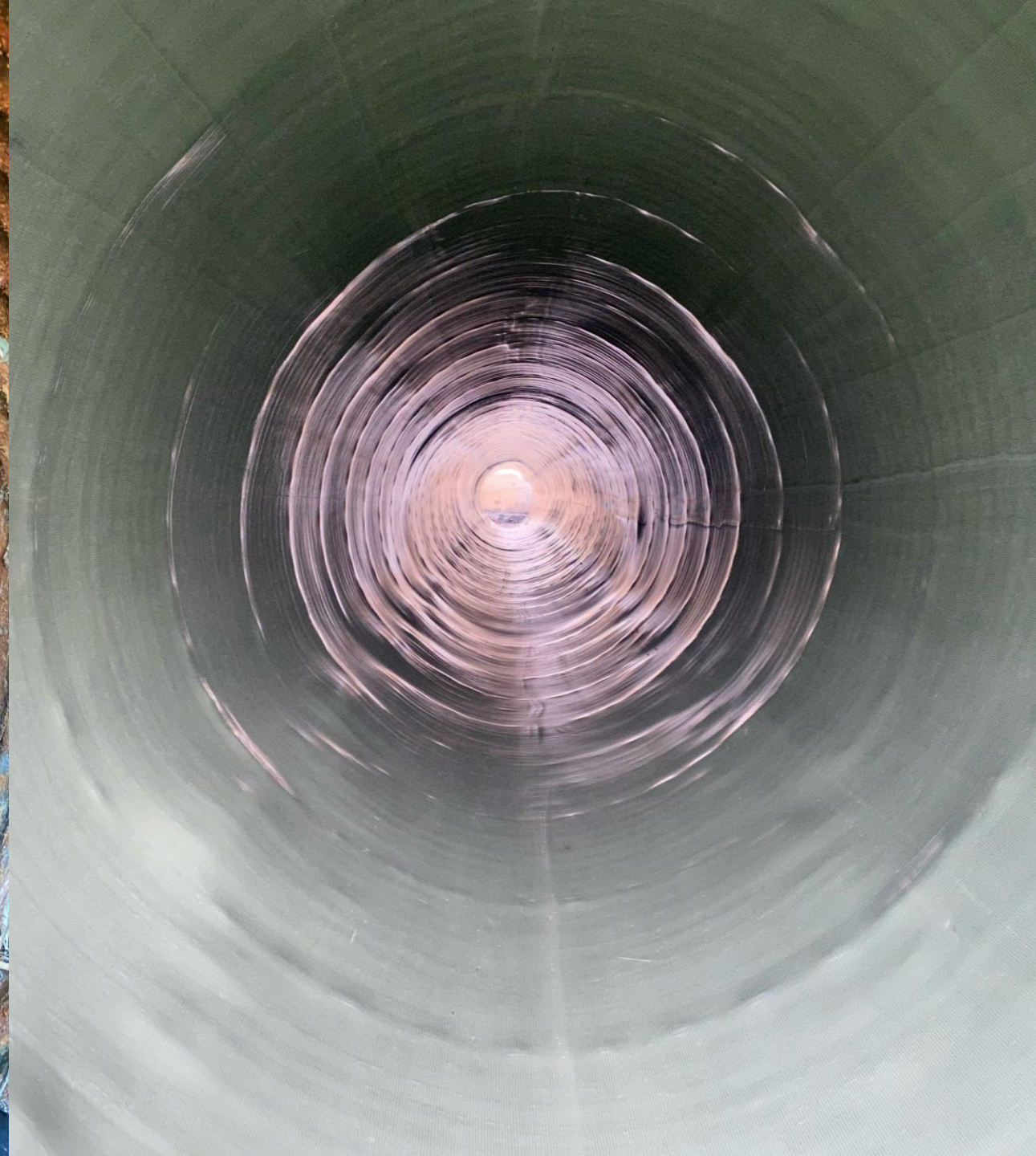




# Why Consider UV CIPP over Slip lining?

**Flexible**
- Can conform to the shape of the host pipe.

**Technologically Advanced**
- Slip line : 1940's
- UV CIPP : 1997

No bulk heads or grouting

Size, Thickness, Volume

Work Area

No Joints

No change in end sections

# Joint Repair & Void Grouting

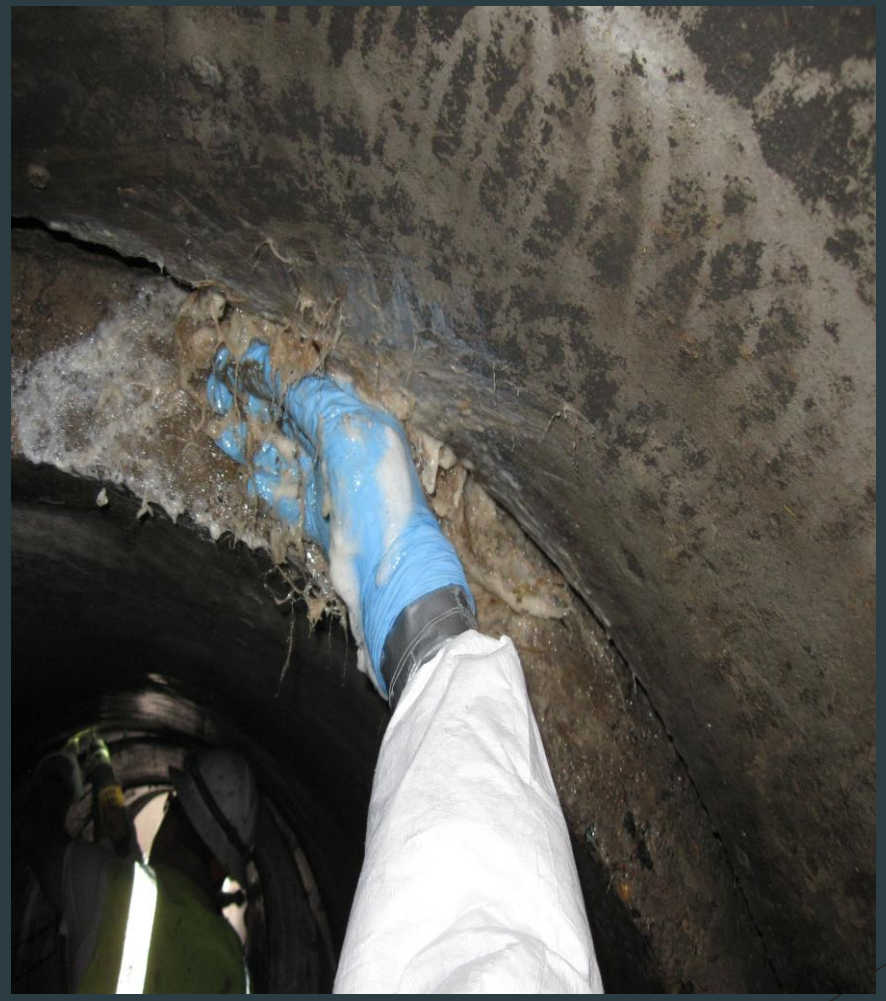
# Joint Repair & Void Grouting

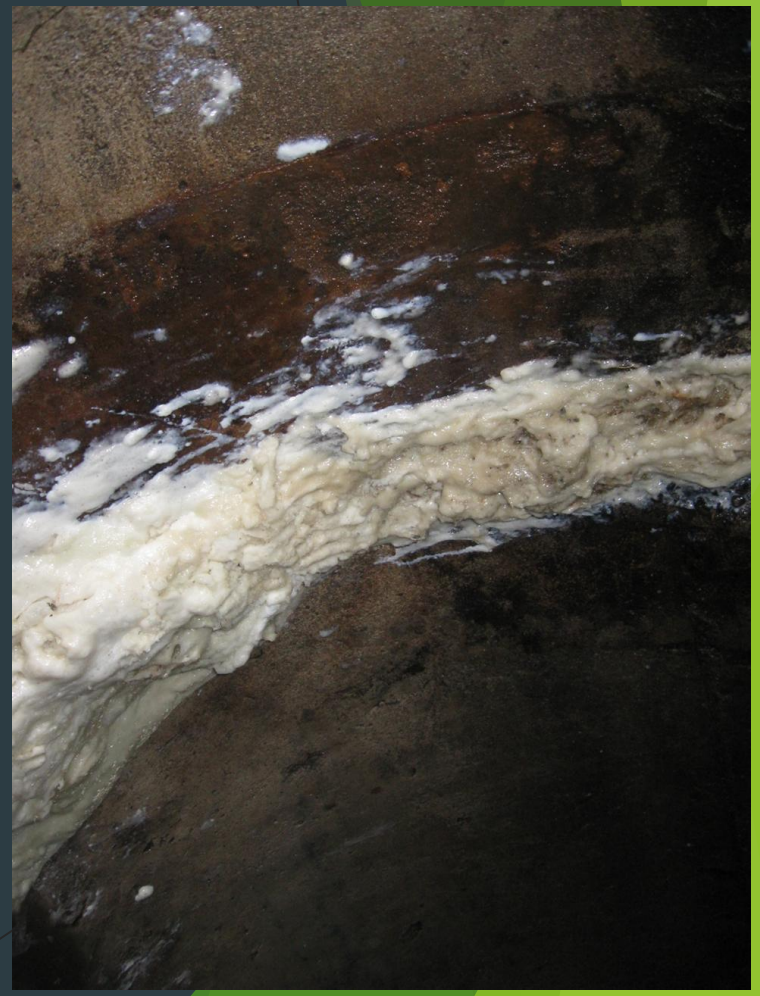
- When to consider :
  - Joint Separation
    - When a joint begins to pull apart from freeze thaw cycles, vibration, piping, weakened bedding, poor installation.
  - Joint Displacement
    - After joint separation occurs, often times, the separated pieces will begin to displace vertically.
  - Joint Damage
    - Can occur during installation and be covered up by grout. Also, materials going through culverts can cause damage to joints.
  - Joint Decay
    - Over time, erosion of the concrete can begin to occur. This exposes rebar, aggregate and accelerates joint damage.

# Step 1: Cleaning the Culvert and Joints

- If there is standing water or flowing water, patented steel coffer dams coffer dams can be placed, and water can be either be diverted or pumped through/around the structure.
- In order to properly fix the joints, we begin by cleaning the culvert as well as the joints.

# Step 2: Install Oakum Rope Soaked in Gel Foam to Seal the Joint



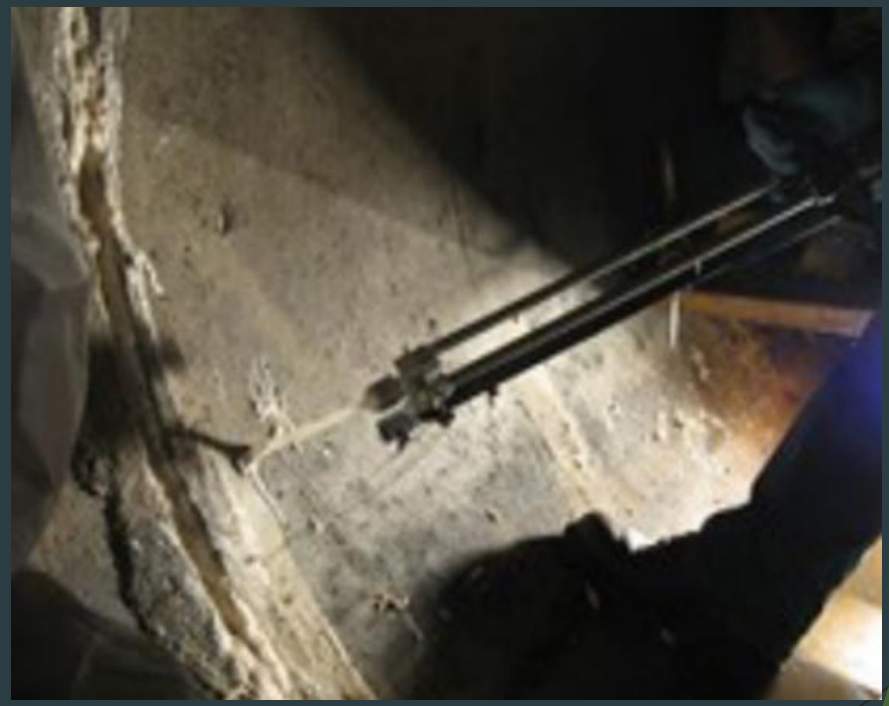


# Step 3: Drill Injection and Observation Ports

- Multiple locations on both sides of the joint and from top to bottom are drilled through the thickness of the concrete. This will ensure the polyurethane fills the back side of the joint.

# Step 4: Injection of the Polyurethane Resin on the Backside of the Joint

- The outside of the joint is filled through the drilled injection holes to seal the joint from the backside of the structure.
- The polyurethane resin used is flexible, adhesive, and long lasting.



# Step 5: Void Filling Outside of the Structure

- Often, severe voids typically form at the joints once they have separated causing the infiltration of water and sediment, leaving behind lost soils and voids.
- Voids can also form due to inadequate compaction during installation, ground water pockets dissolving, and decomposition of organic soils.
- This process replaces lost soils and fills voids with another dual component polyurethane product that is light weight, load bearing, and highly expansive.

# Step 6: Trim the Excess Oakum and Apply Final Gel Coat

- The final Gel Coat provides a flexible, water resistant seal to the joint as well as UV light protection for the polyurethane grout.
- Retrofitting the joint with tie bars is recommended to provide additional protection against future separation.

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**The images on the following pages highlight our joint repair and grout procedures.**

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**Please contact your Subsurface Sales Professional for more information on our products and services.**

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# Point Void Grouting

- As an alternative to injection grouting, point grouting is achieved from the surface.
- Holes are drilled at the surface. Hollow tubes are driven to desired injection point.
- Chemical grout is injected through injection tubes to fill all voids. Voids continue to fill as tubes are pulled to the surface.

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