


WWW.SUBSURFACE-INC.COM



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Drainage **SUBSURFACE, INC**

- Modern technology.
- Latest products.
- Solutions for most applications.
- Trenchless is a more convenient and cost effective way to rehabilitate existing structures.
- Not all culverts are the same. Not all solutions are the same.
- Over 125 years combined experience.

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Topics **SUBSURFACE, INC**

- Slip Lining
- RCP Joint Repair
- CIPP (Cured In Place Pipe)
- UV Cure VS. Steam, Hot Water
- Soil Stabilization / Void Filling

SLIP LINERS

- High Density Polyethylene (HDPE)
- Polyvinyl Chloride (PVC)
- Screw or Snap connections between pipe sections, depending on manufacturer
- Corrosion Resistant
- Easy Installation
- Smooth Interior
- Manning
- High Flow
- Cost Effective



SLIP LINERS



INSTALLATION



BULK HEADS



FAILURE



FINISHED PRODUCT



Where Do Our Roads Go?



Where Do Our Roads Go?



RCP JOINT SEALING AND REPAIR

- What is the most common problem with RCP?
 - Broken joints
 - Separated joints
- What have we always done?
 - Dig it up, reset it or replace it.

- ***A Separated joint*** is a RCP structure that has pulled apart as a result of freeze thaw cycles, vibration, piping, weakened bedding, poor installation, and decomposing filter cloths.



Completely Separated Joint



Broken Joint



Misaligned Joint



RCP JOINT SEALING AND REPAIR

- New technologies have created more options at less cost using a three step process.
 - Seal the joint from the inside with a combination of oakum rope and a highly adhesive, flexible polyurethane resin.
 - Then seal the outside of the joint from the inside of the pipe with another flexible, adhesive, long lasting polyurethane resin.
 - Replace lost soils and fill voids with yet another polyurethane product that is light weight, load bearing, highly expansive.
 - All of which have a life expectancy of over 100 years.
- This process can be done on structures 36" and above.
- What about box culverts that have sheared?

Old Habits Die Hard

- Recognize that you have options other than open cutting.
- You are not the first. Trenchless No-Dig technology in surface transportation has come a long way.
- Time has shown us that most drainage structures that have been fully treated have a renewed life expectancy.
- Avoid Detours.

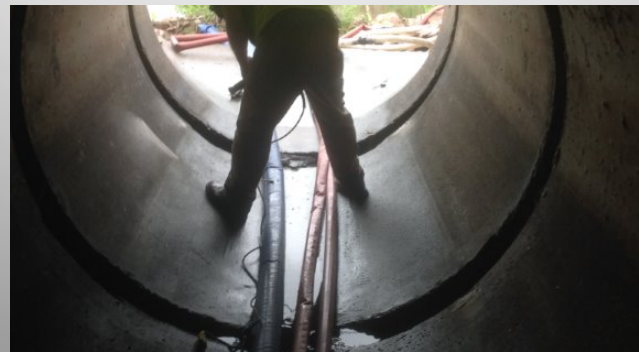
Specification for RCP Joint Sealing

- The spec must be understood by the engineer, the inspector, and the contractor.
- Each step must be performed in order.
- Polyurethane resins have unique characteristics and are designed to function accordingly.

Rebuilding Joint



Drilling Holes



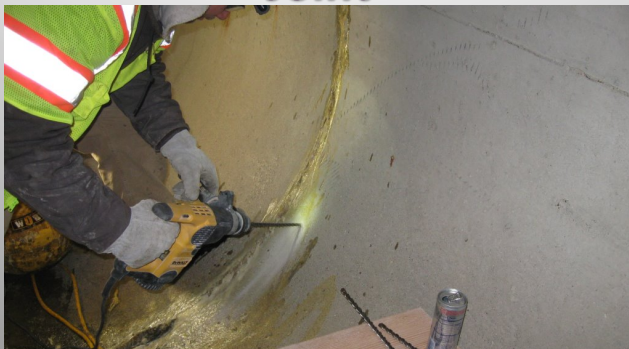
Injection and Observation Ports



Oakum Before Trimming



Drilling the Backside of Joint



Injection



Expanding Grout



Expanding Grout



Gel Coat



Finished Product



Polyurethane Resins

If cost does matter, then the temperature of the grout or resin matters!
Controlling the temperature is important from storage to the point of injection.

Heated storage
Heated drums
Heated hoses

EVERY DAY COUNTS!

- Winter is a good time to work in wetlands and hard to get at sites.





CURED-IN-PLACE PIPE (CIPP)

CIPP is a trenchless rehabilitation method used to repair existing pipelines. CIPP is a jointless, seamless, pipe-within-a-pipe. It has the capability to rehabilitate pipes ranging in diameter from very small to very large (4"-110").

- Each CIPP liner is specifically designed for each individual host pipe and location.
- Starts out as raw felt or fiberglass depending on cure type.
- Made to the thickness and diameter required by ASTM standards.

CURED-IN-PLACE PIPE (CIPP)

- Sent to a wet-out facility where it is impregnated with the resins needed for curing.
- The liner is either refrigerated if steam cured, or crated if UV cured to prevent premature curing.
- Shipped to site in appropriate trailer/reefer.
- Installed and cured on site.
- Does not bond to host pipe.
- Designed to be a load bearing pipe if the host pipe completely degrades.
- Life expectancy of over 50 years.

LINING

Questions to be answered in deciding on a solution;

- What is the “host?” RCP or CMP?
- Is the current pipe properly sized for the drainage area?
- How will this decision affect the hydraulics of the culvert?
- What is the depth to the invert?
- What is the length and grade?
- What kind of surface is above?
- What is the traffic count?
- How will the public be affected by the replace vs. rehabilitate decision?
- How much will a detour cost?
- How much right of way is there on each side?
- Does cost matter?

WHY CONSIDER CIPP?

- Good option when hydraulics are important in the decision.
- In a RCP host you can maintain 100% of the existing flow rate, and in most cases gain a few points.
- Good for small diameter culverts.
- Farming and Ranching community like it because of flow characteristics.

Steam Cured CIPP

- Liner must be kept refrigerated to prevent premature curing.
- Shelf life is approximately 30 days if wet-out liner has been kept at the proper temperature.
- Insert liner into pipe and pressurize to obtain snug fit with host pipe.
- Cured by blowing steam into liner

Steam Cured CIPP



Refer Truck



Boiler Truck



Boiler House





Bladder Bag



CONTROL STRUCTURE



Liner Snug Fit



Finished Steam Liner



Designation: F2010 - 11

An American National Standard

Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled-in-Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)¹

This standard is issued under the brand designation F2010; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last revision. A superscript letter (s) indicates an editorial change since the last revision or reapproval.

1. Scope²

1.1 This practice covers the procedures for the rehabilitation of existing pipelines and conduits (4 to 48 in. (100 to 1200 mm) diameter) by the pulled-in-place installation of a resin-impregnated, flexible fabric tube into an existing conduit followed by inflation with compressed air (see Fig. 1). The resulting tube can be cured by either the flow through the fabric tube of mixed air and steam or hot water or by use of ultraviolet light. When cured, the finished cured-in-place pipe will be continuous and tight fitting. This reconstruction practice can be used in a variety of gravity-flow applications such as sanitary sewers, storm sewers, process piping, electrical conduits, ventilation systems, and pressure applications.

1.2 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.3 This standard does not purport to address all of the safety hazards, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety and health practices and determine the applicability of regulatory limitations prior to use.

2. Referenced Documents

- 2.1 ASTM Standards:³
- D543 Practice for Evaluating the Resistance of Plastics to Chemical Reagents
 - D578 Specification for Glass Fiber Standards
 - D583 Test Method for Tensile Properties of Plastics
 - D709 Test Method for Flexural Properties of Unreinforced

This practice is under the jurisdiction of ASTM Committee F17 on Plastic Piping Systems and is the direct responsibility of Subcommittee F17.07 on Pipeline Rehabilitation Systems. Previous editions are 1995, 1997, 1999, 2001, 2003, 2005, 2007, 2009, 2011, 2013, 2015, and 2017. Copyright 2018. All rights reserved. This standard is copyrighted by ASTM International, 1000 Bldg. 1800, 100 Brook Hill Drive, West Conshohocken, PA 19380. This standard is part of the F17.07 subcommittee on Pipeline Rehabilitation Systems. For more information on this standard, contact ASTM Customer Service at service@astm.org. For Annual Book of ASTM Standards volume information, visit the website: www.astm.org or call 610-855-7100.

¹A Summary of Changes section appears at the end of this standard.

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UV Cured CIPP

- Liner must be kept out of the light, natural or artificial, to prevent premature curing.
- Can be stored at room temperature for up to 12 months.
- Wall thickness can be standardized.
- Cured by pulling a “light train” with special UV light bulbs through pressurized liner.
- Temperature can be monitored and controlled throughout entire curing process.
- Extra material on the ends cut off with diamond tipped blade.

Pipe Preparation

- Host pipe needs to be cleaned, CCTV'd, and glide foil installed.



Installation

- Liner is then pulled through the host pipe.



Installation

- Liner is then pulled through the host pipe.



UV Truck

- Carbon footprint is approx. 90% less compared to steam cured.



UV Truck Curing Unit



UV Light Train



Installation

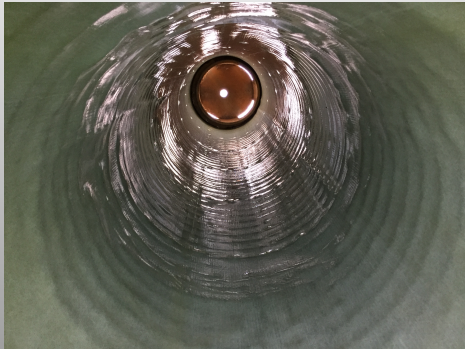
- Liner inflated and UV Light Train inserted.



UV Curing



Cured UV Liner



Finished UV Liner



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