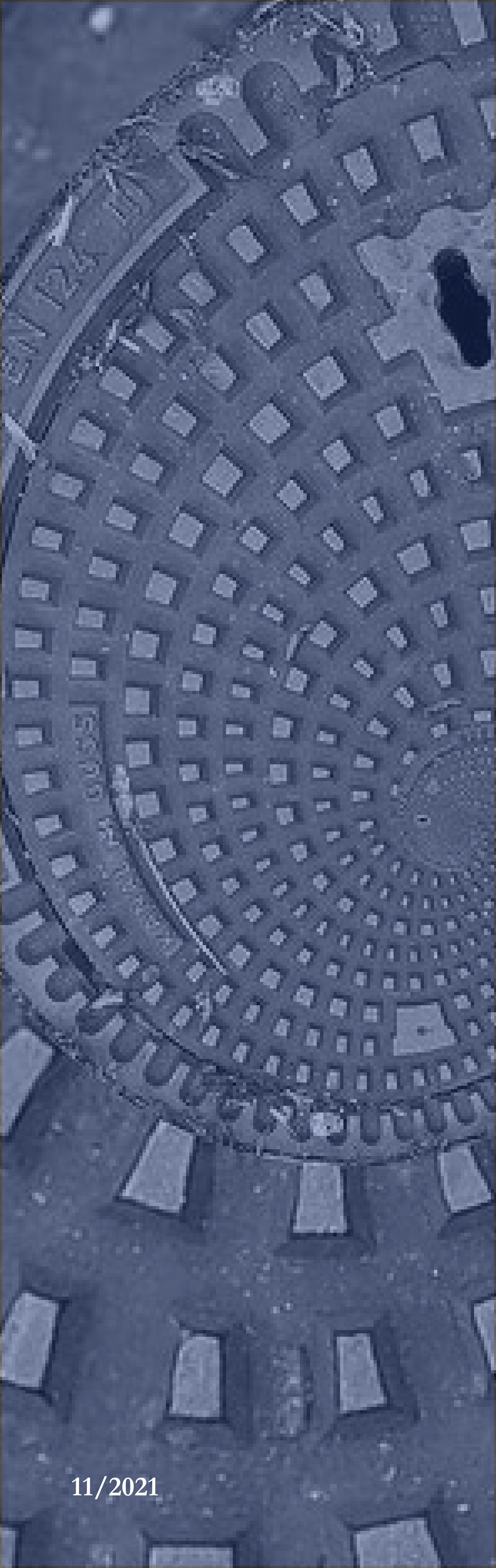

CIPP Sectional Repair

Fiberglass Mat and Silicate Resin In Comparison to Polyester Inversion Liner and Silicate Resin

11/2021

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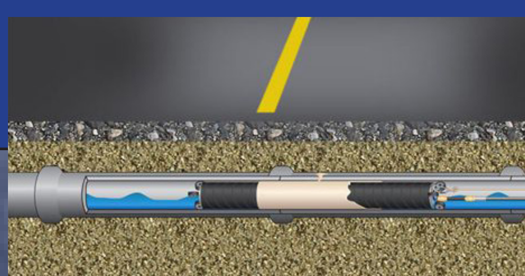


STUDY OVERVIEW

ABSTRACT

Today's most innovative systems for lateral and mainline pipe rehabilitation is CIPP (Cured-in-Place Pipe Lining). Plumbers, Contractors, Municipalities and others have embraced this "trenchless pipe repair" technology. No-Digging of yards or sidewalks, and reducing road closures and traffic backups during repairs is now a cost-saving consideration.

Quality assurance and quality control testing of CIPP installations is required to confirm that the materials used comply with the site and engineering requirements. Since ground and ambient installation conditions as well as crew skills can affect the success or failure of a cure cycle, ASTM F1216 Testing is performed by independent laboratories in normal cases.

HERE'S THE RUB...

There has been a common mis-perception that all CIPP market products meet the ASTM F1216 standard, and this White Paper wishes to expose the findings of two competing products.

In addition, this White Paper will present technical data from an independent accredited laboratory on the results of a CIPP sectional repair utilizing two different methods. The first method will utilize a Fiberglass Mat and Silicate Resin, the second method will utilize a Looped Polyester Inversion Liner and a Silicate Resin to install a CIPP sectional repair.

White Paper Scope

The test samples submitted to an independent third-party laboratory will compare two methods of CIPP Sectional Repair in a piece of 4-inch SDR 35 pipe.

The testing data will disclose the average flexural strength and the average flexural modulus. The findings will also reveal if either CIPP sectional repair method meets, exceeds, or fails to comply with ASTM F1216 standards.

Key Takeaways:

- Comparing Methods and Materials
- American Society for Testing and Materials (ASTM) CIPP Requirements
- Comparing Laboratory Testing - Fiberglass Mat to Looped Polyester Inversion Liner

Testing Laboratory

The independent laboratory has been providing Cured-In-Place Pipe consulting, testing and inspection services to the Pipe Rehabilitation Industry for over 26 years. They have provided services to over 500 clients from the U.S., Canada, Mexico, Guam, Puerto Rico, Germany and Australia. All services are performed in accordance with applicable standards, and it's laboratory and field testing equipment is calibrated on a regularly scheduled basis. All testing work is performed in accordance with our quality assurance program which meets or exceeds the requirements of ISO 17025 and ISO 9001. Conformance testing and flexural and tensile property determinations are conducted in strict accordance with ASTM test standards utilizing regularly calibrated Zwick and Instron computerized testing machines.

COMPARING MATERIALS

Methodology

Both methods of CIPP Sectional Repair were installed properly following the directions as provided, step by step. An example of a Fiberglass Mat and Silicate Resin installation demonstration can be found at this YouTube link: https://bit.ly/2XKLioh

METHOD-A

Fiberglass Mat & Silicate Resin

Two-Part Silicate Resin (Ready to mix bag)

Woven Fiberglass Mat - 2 foot long repair

Protective Plastic Packer Sleeves

Plastic Work Surface

Green Wire Ties – secure patch to packer

Roll of Vinyl Tape

Nitrile Gloves

Installation Instructions

Plastic Resin Spreader

METHOD-B

Looped Polyester Inversion Liner & Silicate Resin

Two-Part Silicate Resin (2 separate bottles to mix)

3 foot long Looped Polyester inversion liner

Protective Plastic Packer Sleeves

Plastic Work Surface

Rubber Bands – secure liner to packer

Roll of Vinyl Tape

Nitrile Gloves

Installation Instructions

Installation Process

Pre-installation inspection and cleaning for the host pipe was completed for both Method A & B to prep for the CIPP sectional repair installation process. Equipment check-list and Packer test inflation was completed to determine proper PSI for both systems. Both Packers were prepared properly according to the installation instructions with plastic protective sleeves. Both A & B Methods followed the "wet-out" process listed step-by-step on the installation instructions. The CIPP section repair for both Method A & B were applied to the 4-inch section of SDR pipe and allowed to cure for approximately 2-hours.

TESTING OUTCOME

Testing was conducted in accordance with ASTM (American Society for Testing and Materials) F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.

METHOD A

Fiberglass Mat and Silicate Resin

One (1) sample of fiber glass pipe was delivered to a the independent laboratory for testing. The sample was tested in accordance with ASTM D790 Method I Procedure A (Flexural Fiber Stress and Modulus of Elasticity). A Support Span-to-Depth Ratio of 16 to 1 was used as specified in the test standard. Thickness measurements, flexural stress and flexural modulus of elasticity tests were performed on the sample. Five (5) specimens were cut and tested from the sample. The results summarized and reported below are averages of the five (5) specimens.

SAMPLE #	MANHOLE to MANHOLE	Maximum Flexural Fiber Stress (psi) ASTM D 790	Flexural Modulus of Elasticity (psi) ASTM D 790
PP W Resin	Fiberglass Mat & Silicate Resin	25,245	841,138

METHOD B

Looped Polyester Inversion Liner and Silicate Resin

One (1) sample of fiber glass pipe was delivered to the independent laboratory for testing. The sample was tested in accordance with ASTM D790 Method I Procedure A (Flexural Fiber Stress and Modulus of Elasticity). A Support Span-to-Depth Ratio of 16 to 1 was used as specified in the test standard. Thickness measurements, flexural stress and flexural modulus of elasticity tests were performed on the sample. Five (5) specimens were cut and tested from the sample. The results summarized and reported below are averages of the five (5) specimens.

SAMPLE #	MANHOLE to MANHOLE	Maximum Flexural Fiber Stress (psi) ASTM D 790	Flexural Modulus of Elasticity (psi) ASTM D 790
Liner3d08122021	Looped Polyester Inversion Liner	4,324	163,159

CONCLUSION

ASTM F1216 *Requirements*

The ASTM F1216* standard titled, "Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube," requires that an installed patch once fully cured meet or exceed a minimum Flexural Strength and Flexural Modulus. It further specifies the test method, ASTM D790, to be used to determine the given Flexural Strength and Flexural Modulus.

For a cured in place sectional point repair to comply with the ASTM F1216 initial structural properties it must have a minimum:

Flexural Strength	**4,500 psi.**
Flexural Modulus	**250,000 psi.**

Results

Method A

Fiberglass Mat and Silicate Resin has an independently verified average:

Flexural Strength	**25,245 psi.**
Flexural Modulus	**841,138 psi.**
ASTM Standards	**EXCEEDS**

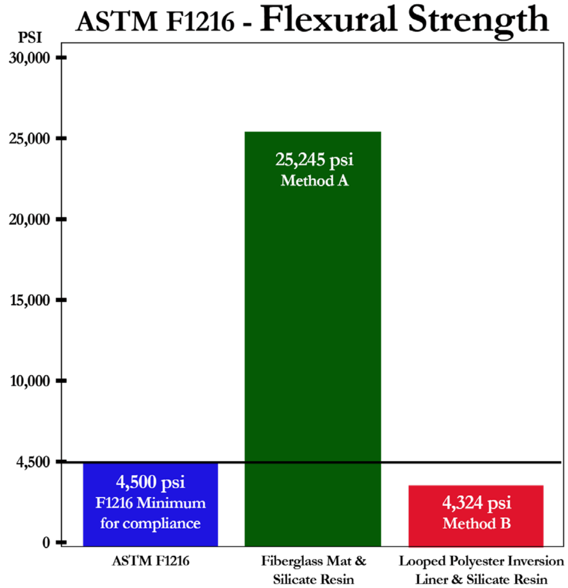
Method B

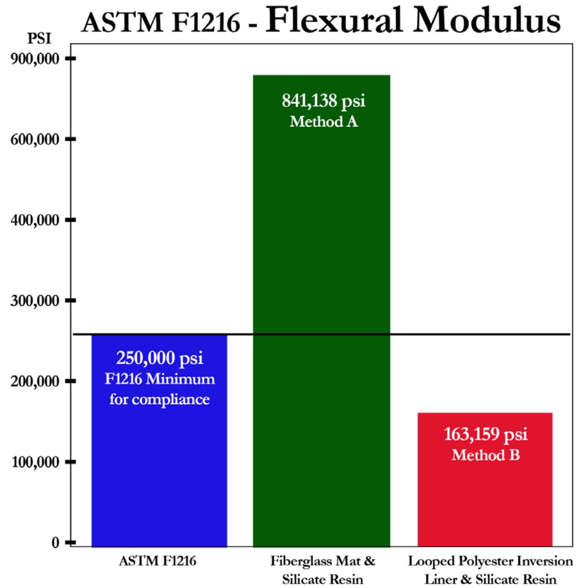
Looped Polyester Inversion Liner and Silicate Resin has an independently verified average:

Flexural Strength	**4,324 psi.**
Flexural Modulus	**163,159 psi.**
ASTM standards	**FAILED**

Summary

The results concluded that Fiberglass Mat and Silicate Resin (Method A) **exceeded** ASTM F1216 requirement, while Looped Polyester Inversion Liner and Silicate Resin (Method B) **failed to comply** to ASTM F1216 requirement.





** ASTM (American Society for Testing and Materials) F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.*