

UV Hardened Culvert Slip Lining

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Michigan Department of Transportation

Overview & Housekeeping

- Presentation Outline
- I-75/M-221 Cured In Place Pipe Project (CIPP)
 - Project Location
 - Cost/Schedule
 - Pay Items in Project
 - Special Provision for CIPP
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- Material Properties/Life Expectancy
- Fun Facts!
- Questions?

I-75 & M-221 Cured-In-Place Culvert Lining Project

Chippewa County,
Michigan



Contract ID
17033-M11675

Project Location



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Contract ID
17033-M11675

Cost/Schedule

- Let in August of 2016
- Upper Peninsula Rubber Co had low bid of \$414,957.50
- Contract Awarded September 19, 2016
- Construction began July 11, 2017
- All Work Completed August 9, 2017

Contract ID
17033-M11675

Pay Items in Project

- Bid Items:
 - I-75 in Chippewa County
 - Cured-In-Place Pipe Lining, 15 in...718 Ft
 - Cured-In-Place Pipe Lining, 18 in...282 Ft
 - M-221 in Chippewa County
 - Cured-In-Place Pipe Lining, 57 by 38 in...340 Ft

Contract ID
17033-M11675

Special Provision

12DS401(L080)

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
CURED-IN-PLACE PIPE FOR CULVERTS AND STORM SEWERS FOR JOB
NUMBER M11675

CFS:DMG

1 of 2

APPR:SJU:DBP:07-12-16

a. Description. This work consists of providing all labor, equipment and materials necessary for the design and installation of the cured-in-place resin impregnated felt liner into an existing culvert or storm sewer by hydrostatic inversion or by the direct pulled-in-place method at the locations specified on the plans. Cure the liner in place so that the finished installation is continuous, provides structural support and is tight fitting to the existing pipe. The manufacturer of the liner system must provide the design, installation and inspection of the liner and must have an authorized representative on site during installation.

Provide video inspection of the culverts and sewers before (after cleaning) and after lining. All culvert and sewer cleaning, maintaining flow, bypass pumping, and site preparation is included in this work.

b. Materials. Use tube and resin material that meets the requirements of *ASTM F 1216* and *ASTM F 1743*, as applicable.

Design the liner for HS-20 live loading. Design the required cured-in-place liner wall thickness in accordance with *appendix X1 of ASTM F 1216*. Use the formulas assuming a fully deteriorated pipe condition and the water table at the ground surface.

Provide documentation to the Engineer indicating the proposed design liner thickness for each run of pipe, all component materials and that the liner meets the minimum chemical resistance requirements listed in *appendix X2 of ASTM F 1216* prior to installation.

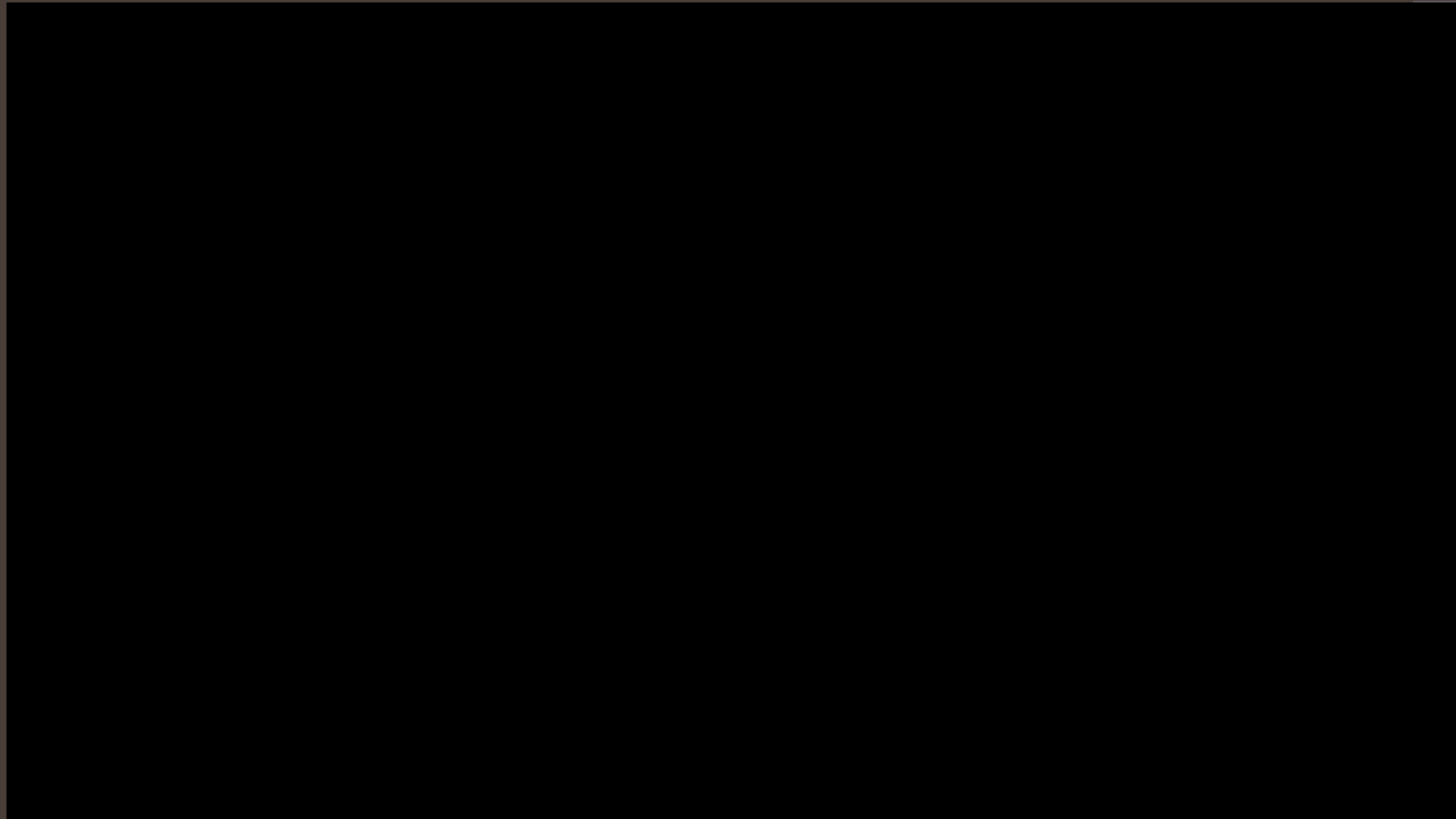
Provide a tube consisting of one or more layers of flexible needled felt or equivalent woven or nonwoven material capable of carrying resin and withstanding installation pressures and curing temperatures. Ensure the tube is compatible with the resin system used. Ensure the tube

Contract ID
17033-M11675

Alpha Liner Animation

Curtesy of:

Mike Burkhard,
RELINE AMERICA



Contract ID
17033-M11675

Delivery: 57 by 38"
liner



Contract ID
17033-M11675

Delivery: 57 by 38"
liner



Contract ID
17033-M11675

Before



Contract ID
17033-M11675

The Light Train



Contract ID
17033-M11675

Packer (End Seal)

Slip Sheet



Contract ID
17033-M11675

After



Contract ID
17033-M11675

After



FINAL REPORT

February 2017

Prepared for
California Department of Transportation

WATER QUALITY OF
FLOW THROUGH
CURED-IN-PLACE
PIPE (CIPP)

The Caltrans Report Regarding UV Environmental Conclusions:

Executive Summary

To conservatively measure the water quality impacts of CIPP methods, a small volume of water was introduced immediately after CIPP installations of 11 pipes. Minimizing the volume of water used to flush the pipes theoretically results in higher concentrations of chemical residuals from the CIPP installation materials. Water quality analysis for volatile organic compounds in samples taken from the induced flows demonstrated that adherence to the Caltrans specification for CIPP installation is sufficient to avoid fish kills. Some measured concentrations were above the no observable effect concentration (NOEC) for algae within 4 days; however, all concentrations were below all other known toxicity thresholds for other test species (e.g., trout). The most protective CIPP curing method was UV, where the concentrations of volatile organic compounds in all samples analyzed were below all known environmental thresholds. Potential specification improvements may be helpful to further reduce the risk to sensitive species such as algae.

Initial styrene
jobsite testing:

2 sites cumulative
reading over 6
hours each
1.2ppm and
1.7 ppm



UV Liners:

Structural, Life Expectancy,
Corrosion Resistance, Hydraulic
Characteristics

Structural Characteristics:

Short Term Flexural Modulus:

1,000,000psi to over 3,000,000psi

Long term Flexural Modulus:

600,000psi to 2,600,000psi

Long term loss over 50 years:

15% to 40%

Life Expectancy:

With the Decreased Long Term Expectations the Life Expectancy is Considered Longer. City of Hamburg, Germany awarded 80 year expectancy after long term evaluations

Fun Facts!

- First Use by MDOT
- Currently largest diameter UV liner in Michigan
- Approaching the Practical Limit in Size
- New MDOT SP Currently Being Developed
- Cost Comparison UV Cured /Steam & Hot Water Cured

Fun Facts!

- Currently 8 UV Manufacturers Worldwide
- 7 Currently Selling Liners in North America
- 4 of Those Actually Manufacture Liners in NA
- 1 Makes Equipment & Liners as a Set In NA
- Worldwide 3 of the 8 Manufacture Equipment & Liners as a Set

Questions?

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