



C.o.M. Engineering and Water Utility Cured-in-Place Pipe (CIPP) Programs

City of Madison Board of Public Works Presentation
February 7, 2024



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Summary

- What is CIPP
- Types of CIPP
- CIPP Lining Process
- Replacement Vs CIPP
- Engineering CIPP Program Overview
- Water Utility CIPP Program Overview

What is CIPP?

- Stands for CURED-IN-PLACE PIPE
- Resin saturated fabric liner that is installed into a deteriorated pipe and then cured using a heat source or UV light
- Typically, installed through existing access points
- Final product is seamless pipe within a pipe



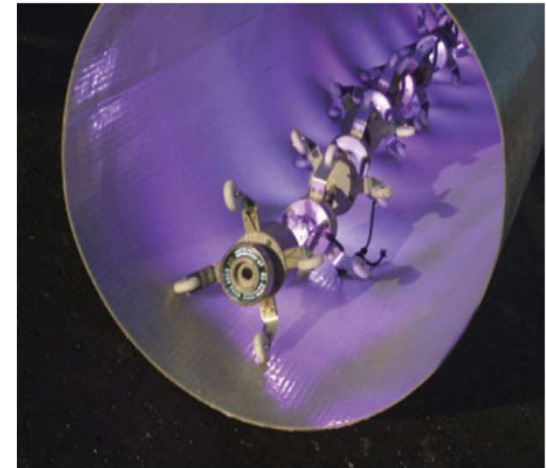
Types of CIPP

- Thermal Cured CIPP
 - Liner is made of needle woven polyester felt
 - Epoxy or polyester thermoset resin
 - Stored in refrigerated trucks to prevent premature curing
- UV Light Cured CIPP
 - Liner is woven fiberglass
 - Polyester resin
 - Store in ambient temps and has extended shelf life



CIPP Lining Process

1. Liner is fabricated and delivered to site
2. Liner is inserted into existing pipe
 - a) For Sanitary, use existing access structures to insert liner
 - b) For Water, excavations are made to reach pipe and liner inserted directly
3. Liner is inflated with air to expand to diameter of existing pipe
4. Liner is cured
 - a) Thermoset resin – Steam or Hot Water
 - b) UV Light – A train of lights are dragged through pipe
5. Service connections are cut out with robotic drilling system to reopen connections



Replacement vs CIPP Cost - Sewer

- CIPP has always been more cost effective than open trench replacement
- Steam cure remains more cost effective than UV Light cure
- UV Light cure become more cost effective on CIPP larger than 18" diameter pipe

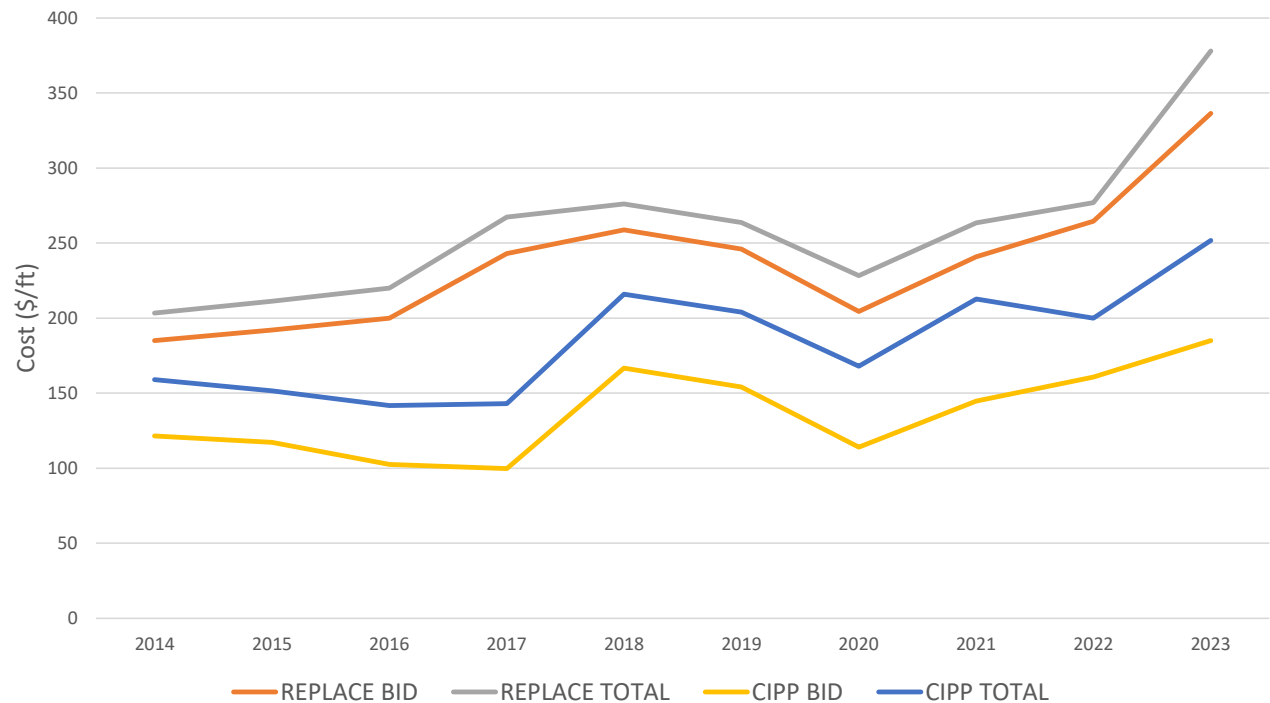
CURE METHOD	PIPE DIAMETER				
	6"	8"	10"	12"	15"
Steam Cure \$ per LF (2019)	\$34.67	\$21.76	\$30.29	\$32.00	\$48.70
Steam Cure \$ per LF (5% Inflation)	\$42.14	\$26.45	\$36.82	\$38.90	\$59.20
UV Cure \$ per LF (2023)	\$95.00	\$58.43	\$64.25	\$87.75	\$89.00
Replacement \$ per LF	N/A	\$165.00	\$200.00	\$210.00	\$220.00

While costs are higher than steam cure, UV Cure still provides a large cost savings in comparison to replacement

Replacement vs CIPP - Water

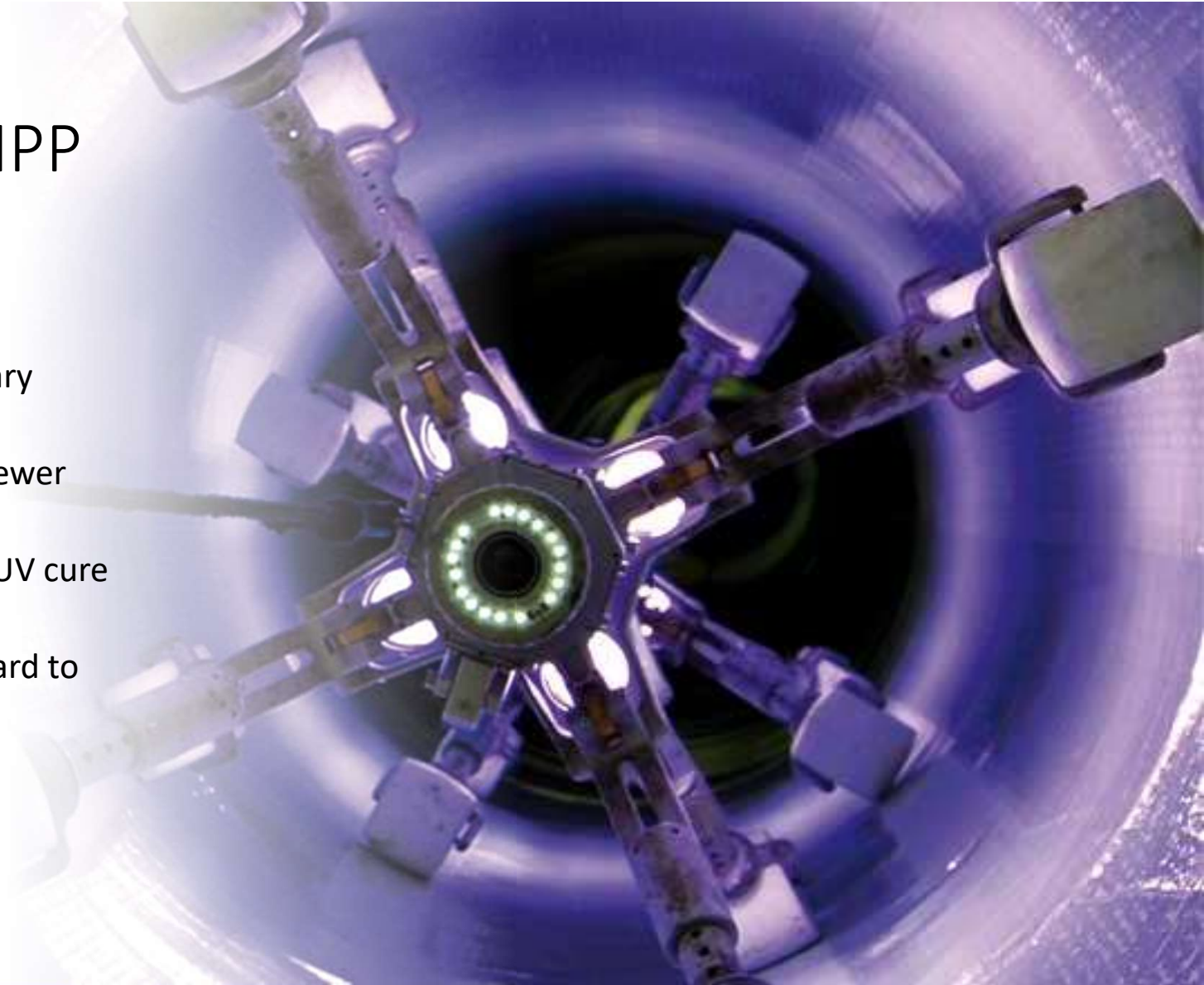
- CIPP has been more cost effective than open trench replacement, however not all water pipes are CIPP candidates
- CIPP projects also include costs for MWU crew time (30% of project cost).
- Nearly 11 miles of pipe now lined in Madison.
- No structurally CIPP in Madison water pipes has required additional maintenance.

CIPP WATER MAIN REHABILITATION vs. OPEN TRENCH RECONSTRUCTION COSTS
(Madison, WI)



Engineering CIPP Program

- Approx. 42 miles of sanitary sewer CIPP lined
- Approx. 1 mile of storm sewer CIPP lined
- Program moved to using UV cure CIPP exclusively in 2020
- Program targets I/I and hard to access areas



Engineering CIPP Program – Why the Switch?

PROS of UV

- Watertight
- No styrene exhaust = Less resident disturbance
- Less equipment needed = Smaller footprint
- Much stronger end product with thinner wall liner – roughly 4 times more flexural strength

CONS of UV

- Higher cost compared to steam
- Can't use on pipes with large bends or large offsets – which can be achieved with steam
- Initially fewer qualified Contractors – Has changed lately

Water Utility Program

- Madison was the first city in Wisconsin to rehabilitate aging water mains using CIPP methods beginning in 2011
- CIPP allows for rehabilitation of deteriorated pipes, with minimal excavation in both a cost effective and less invasive/disruptive method
- The structural liner is designed to meet physical strength properties of a new pipe and adhere to the National Sanitation Foundation (NSF) Standard 61 for drinking water health and safety
- During construction, residents provided clean water through an above ground, temporary water main system



Questions?



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