MIDWEST JOURNAL OF

TRENCHLESS TECHNOLOGY 2019

OFFICIAL PUBLICATION OF THE MIDWEST SOCIETY FOR TRENCHLESS TECHNOLOGY

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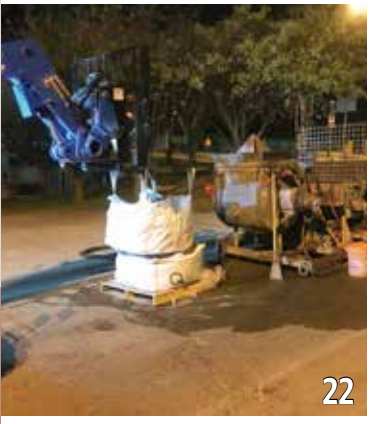

Features:

Also:

Departments:

Leonard Ingram
334.872.1012
leonard@engconco.com

Jeff Boschert
314.229.3789
jboschert@ncpi.org

PUBLISHER

A to B PUBLISHING INC.

662 Dudley Avenue
Winnipeg, MB CANADA
R3M 1R8

EDITORIAL
Andrew Pattison
204.275.6946
marcomap@shaw.ca

ADVERTISING SALES
Bert Eastman
204.997.6371
bert@atobpublishing.com

PRODUCTION TEAM

harper media
your social media strategy & web marketing partner

700 - 200 Main Street
Winnipeg, MB
R3C 1A8

DIRECTOR
Aaron Harper
204.318.1121 xt. 101
aharper@harpermedia.ca

LAYOUT & DESIGN
Joel Gunter
204.318.1121 xt. 108
joel@harpermedia.ca

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MESSAGE FROM THE PRESIDENT

THANKS FOR YOUR SUPPORT OVER THE YEARS

Jeff Boschert, P.E., MSTT President

Thanks to your support over the years, we are now celebrating the seventh annual publication of *Midwest Journal of Trenchless Technology*. We couldn't do it without the continued involvement and support of the many companies and individuals in the MSTT community.

About MSTT: Established in 1998, MSTT is the oldest of the eleven NASTT Regional Chapters. MSTT encompasses the 9-states of Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio and Wisconsin.

2019 Seminars: MSTT conducted a successful two-day Trenchless Technology seminar June 26 – 27, at the Miller Pipeline Training Facility in Indianapolis IN. This seminar consisted of 20 presentations/ speakers with topics ranging from condition assessment to new installation methods. We featured a presentation on "Trenchless Technology in Indianapolis" presented by Mr. John Trypus, Director, Underground Construction & Engineering, Citizens Energy Group. Special thanks to MSTT Vice Chairman Chris Schuler, and the staff at Miller Pipeline for hosting this excellent outreach and networking event and promoting trenchless technology in the Midwest!

On December 4, MSTT will conduct a Trenchless Technology, SSES and Buried Asset Management Seminar in Council Bluffs, Iowa. To learn more about the program visit mstt.org or contact Leonard Ingram, MSTT Executive Director, at leonard@engconco.com or (334)-327-7007.

2020 No-Dig Show: The No-Dig Show represents an annual opportunity for education, professional development and industry engagement. I encourage you to attend the upcoming show, scheduled for April 5 - 9, 2020 at the Colorado Convention Center in Denver, CO. For more information on the annual No-Dig Show, education & training programs and membership see pages 12 and 13 or visit their website at nodigshow.com.

Municipal Scholarships Available. The No-Dig Show Municipal & Public Utility Scholarship Award Program was established in 2013 to provide education and training for approximately one hundred employees of North American municipalities, government agencies and utility owners who have limited or no training funds. Selected applicants are eligible to receive full access to all exhibits and technical paper sessions as well as overnight accommodations. The 2020 No-Dig Show scholarship applications are now being accepted (**Application Deadline is November 1, 2019**), to apply see nastt.org/no-dig-show/municipal-scholarships/

NASTT Member Benefits: Join the NASTT/ MSTT and get involved with one of the committees. Your support makes all that we do possible. NASTT members receive complimentary access to over 2,000 technical papers presented and published at past No-Dig Shows, glossary of terms, plus access to the Trenchless Resource Center available on the ISTT website (istt.com).

MSTT is your organization, and this is your publication, so please support us and let us hear what you think. To provide feedback, suggest a location for future events, place an ad or submit an article in next year's journal; please contact Leonard, me, or one of our directors.

Your support is critical to our success.

MSTT:

Advancing the science and practice of Trenchless Technology for the public benefit, to promote and conduct education, training, study and research in said science and practice for the public benefit.

Sincerely,

Jeff Boschert, P.E.
President, MSTT
(314) 229-3789
jboschert@ncpi.org

MSTT SITE

NASTT™ MIDWEST CHAPTER

GREETINGS FROM THE MSTT EXECUTIVE DIRECTOR

Leonard E. Ingram, Sr., PWAM, Executive Director, MSTT

First, I would like to thank our article writers and advertisers for their support of the MSTT Journal and helping to make it so successful though the years. We have continuously had great articles, pictures and publications. ***Thank You!***

MSTT had a successful "Trenchless Technology, SSES and Buried Asset Management seminar in downtown Minneapolis MN on Tuesday, November 28, 2018. The guest presenter was Ms. Katrina Kessler, P.E., Director, Surface Water and Sewers Division, Minneapolis MN with the presentation "Trenchless Technology in Minneapolis.

MSTT conducted a well-attended highly successful two day Trenchless Technology seminar on June 26 – 27 at the spacious Miller Pipeline Training Facility in Indianapolis IN. The seminar was co-sponsored by the local ASCE and APWA Chapters. The guest presentation was "Trenchless Technology in Indianapolis" by Mr. John Trypus, Director, Underground Construction & Engineering, Citizens Energy Group. The learning and networking was terrific! Special thanks to MSTT Vice Chairman Chris Schuler and the staff at Miller Pipeline, for being such gracious hosts for an excellent outreach and networking seminar, promoting trenchless technology in the Midwest! (See MSTT Seminar coverage pgs 16-17)

On December 4, 2019 MSTT will conduct a Trenchless Technology, SSES and Buried Asset Management Seminar in Council Bluffs, Iowa. Please place this date on your calendar and plan to participate. To learn more about the seminar program or the MSTT Chapter, visit **www.mstt.org** or contact Leonard Ingram, MSTT Executive Director, at **leonard@engconco.com** or (334)-327-7007.

The North American Society for Trenchless Technology No Dig Show will be held next year on April 5-9, 2020 in Denver CO. Please go to **www.nastt.org/no-dig-show** to register and learn more about the show. The hall is fantastic, the course tracts are very educational and the network and learning is unbelievable. Please plan to attend.

Thanks for your support!

Thanks for your support!

Leonard E. Ingram, Sr., PWAM
Executive Director, MSTT

NASTT MIDWEST CHAPTER ™

MESSAGE FROM NASTT CHAIR

Craig Vandaelle, NASTT Chair

Thank you again for your support of our society and the trenchless technology industry.

Hello Midwest Members! As the year marches along we're looking forward to the continued growth of the trenchless industry and our Society. It was exciting to host the NASTT 2019 No-Dig Show right here in this region in the Chicago area. The conference was a huge success. The exhibit hall featured over 200 exhibitors which is a new record! We also welcomed over 2,000 attendees from all over the globe, who came to experience the world class technical sessions and networking events that our Show is known for.

NASTT exists because of the dedication and support of our volunteers and our 11 regional chapters. Plans are now underway for the 2020 conference being held in Denver, Colorado, April 5-9. Our No-Dig Show Program Committee members volunteered their time and industry knowledge to peer-review the 2020 abstracts. These committee members ensure that the technical presentations are up to the standards we are known for. Thank you to the Midwest Chapter Members who have volunteered for this important task this year: Amana Arayan, Alan Atalah, Rory Ball, Bernie Krzys, Craig Larson, Marc Lehmann, Greg Marker, Robert Martin, John Milligan, Cathy Morley, Kevin Nagle, Ryan Otto, David Rosenberg, Jason Schiro, Firat Sever and Aswathy Sivaram.

We are looking forward to the first annual No-Dig North conference in Calgary this October. In recognition of the need for quality trenchless education in Canada, all three Canadian NASTT Chapters have joined forces for the first time to host a combined trenchless technology conference.

The inaugural No-Dig North conference will offer a variety of learning and networking opportunities for trenchless professionals as well as those new to the industry. The conference includes four NASTT Good Practices Guidelines Courses offered as pre-event options. These full day courses include: HDD Good Practices, New Installation Methods Good Practices, Introduction to Trenchless Technology – Rehabilitation Good Practices, and CIPL Gas Good Practices. The courses include continuing education units as well as course materials to take back to the office for use on your next trenchless project.

The No-Dig North conference offers two full days of technical presentations and an exhibit hall bringing you industry innovations for trenchless products and services. The exhibit hall has already sold out – twice! This is an amazing opportunity to experience the latest and greatest in our growing industry and to network with your peers. If you do business in Canada, you owe it to yourself to attend.

Our continued growth relies on the grassroots involvement of our regional chapter advocates. Thank you again for your support and dedication to NASTT and the trenchless technology industry.

Craig Vandaelle

NASTT Chair

MEMBERSHIP IN NASTT

Carolyn Hook, NASTT Membership Outreach & Database Manager

MEMBERS TALK NASTT MEMBERSHIP

As the Membership Outreach and Database Manager at the North American Society for Trenchless Technology (NASTT), it's my job to be able to speak about the value of NASTT membership and all it offers beyond professional credibility and information. NASTT is a community of peers where members are connected to go-to people in the trenchless industry – innovators, experts and a network of students and future trenchless professionals.

At every stage of their career, NASTT members have access to a comprehensive set of tools ensuring success.

- **Engage in learning**. NASTT member-only pricing for top-notch training courses, conferences and webinars.
- **Expand your knowledge set**. Largest online trenchless library of technical papers.
- **Increase your visibility**. Opportunities to speak at conferences, write for publications, volunteer to serve and give back.
- **Propel your career**. Career resources, including NASTT's Job Board.
- **Empower your position**. *NASTT's No-Dig Show* - North America's premier Trenchless Technology Conference and Trade Show.
- **Connect locally**. Regional educational and networking events.
- **Find answers at your fingertips**. Subscriptions to *NASTT's Trenchless Today, NASTT's Regional Chapter magazines, ISTT's Trenchless International* and *Trenchless Technology*.

NASTT is the largest community of trenchless professionals in USA and Canada committed to promoting better and more responsible ways to manage underground infrastructure and advance trenchless technology for the benefit of the public and the natural environment.

That's what I would say. But what about NASTT members, do they agree? It's also my job to know what NASTT members think about membership. So, I asked a few to share their insights. Here's what I found out.

NASTT Transforms Careers

"Having come from an entirely different industry focusing on natural gas, the common link of construction bonds the two industries closely together. Membership has made me a well-known nationally recognized expert in the use of trenchless and its applications in two industries. When I do not know the answer, I can call on an established network of key contacts and access a library of technical papers. Membership allows me to maintain a current and state-of-the-art awareness of trenchless methods and potential improvement areas that I address through my R&D activities." – *George Ragula, Distribution Technology Manager, PSE&G*

NASTT Provides Leverage for Corporations, Municipalities, Educational Institutions and More

"NASTT is far and away the leading educator and networking pool in the trenchless industry. If your company plays a part in the trenchless industry, you will benefit from NASTT membership much more than you realize." – *Joe Lane, Vice President, International Operations, Infrastructure, Aegion Corporation*

"We advertise that our staff are members of NASTT for RFPs and on Trenchless resumes." – *David Crowder, C.E.T., C.D., Senior Associate, Trenchless Practice Leader, R.V. Anderson Associates Limited*

"I get to network and share ideas with other like-minded professionals. I've learned about new technologies that make us work more efficiently." – *Tayo Olatunji, PE, PMP, CCM, Supervisor Construction Projects, DC Water*

"The bottom line is that active membership benefits me professionally and, in turn, my company can provide unique and cost-effective solutions to challenging projects." – *George Ragula*

Regional Chapters Bring NASTT to Your Backyard

"The quality and dedication of local volunteers makes working in the industry much easier, more fun and extremely fulfilling." – *Joe Lane*

"Regional chapters make it easy to meet locally with engineering consultants and municipal staff who share the same passion for trenchless technology, learn new ideas and discuss other trenchless topics." – *David Crowder*

"Seeing the impact that trenchless technology has on our communities and the country makes chapter participation worthwhile." – *Alan Goodman, Strategic Accounts Sales Manager, HammerHead Trenchless Equipment*

What about you? How has NASTT membership made a difference in your career? Email me at chook@nastt.org and let me know. You Belong in NASTT!

You Belong in NASTT!

MSTT BOARD EXECUTIVE

Jeff Boschert - *President*

Jeff Boschert, P.E. is the President of the National Clay Pipe Institute (NCPI), a one-hundred-year-old technical resource for sewer system decision-makers and designers of gravity sanitary sewer lines. Jeff joined NCPI from Missouri DOT in 2004 to serve as the leader of the organization's trenchless initiatives. His initial research projects began almost immediately with CLSM bedding research. Jeff has become a leading expert in the pilot tube method of guided boring. In 2012 he took on the added responsibility of leading the organization and conducting educational outreach as the new president. In addition to his work with MSTT, he represents the industry on multiple ASCE and ASTM committees. Jeff was one of the principal authors of the *ASCE/ UESI Manual of Practice (MOP No. 133) on Pilot Tube and Other Guided Boring Methods* and was recently appointed to serve a 5-year term on the ASCE/ UESI Pipelines Division Executive Committee (EXCOM). As President of NCPI, Jeff has completed comprehensive updates of the *Vitrified Clay Pipe Engineering Manual* and the *Vitrified Clay Pipe Installation & Inspection Handbook* and is currently leading development of a *VCP Operations & Maintenance Handbook*. He holds a BSCE from Missouri University of Science and Technology.

Chris Shuler - Vice *President*

Chris Schuler joined Miller Pipeline in 1984 as a laborer in Indianapolis, Indiana. Over the next few years he served the company in many capacities, assuming the role of equipment operator in 1989 and foreman the following year. In 1998 Chris stepped into the role of superintendent over Kansas City and Indianapolis until 2005 when he was promoted to project manager. In 2009 he assumed his current role as general manager of the Municipal Services Division where he oversees Miller Pipeline's water/wastewater trenchless rehabilitation operations.

Chris attended Indiana University from 1983-1986 focusing on Economics and Business. He graduated from the University of Missouri with a B.A. in Commercial Economics in 2001. Chris serves as the current Miller Pipeline Representative for the Indiana Chapter of NUCA. He is also a member of the NASTT Program Committee in addition to his role as Vice President of the MSTT Board of Directors.

John Milligan - *Secretary*

John Milligan began his career with Vermeer in 1992 as a sales liaison with Latin America and eventually the Asia Pacific region, spending his first 15 years in various international and domestic sales-management positions. After leading the quality team within the trenchless and utility product segments at Vermeer, John took over as Business Manager for the Water & Sewer Segment, responsible for coordinating and executing the sales, engineering and manufacturing efforts related to the AXIS® guided boring system. He has been with the AXIS program since before its market launch in 2009. John was born and reared in São Paulo, Brazil, and earned a double major in Business Management and Business Marketing from Cedarville University in Ohio.

Ryan Poertner - *Treasurer*

Ryan Poertner is a General Manager of Ace Pipe Cleaning, Inc. and lives in St. Louis, MO. Ryan manages the St. Louis office, as well as the Cured-In-Place-Pipe (CIPP) division within APC. Ryan is directly responsible for the safety and quality of work for these divisions. His main focus is on the growing market involving lateral rehabilitation. APC is a leader in the industry providing all types of investigation and rehabilitation solutions for municipalities in need. Ryan has spent his entire professional career working in the water and wastewater rehabilitation fields. Prior to the 8 years currently with APC Ryan spent 8 years working for Insituform Technologies, Inc. in roles as Engineer, Trainer, Estimator, and Project Manager. Ryan is an active member of NASTT, NASSCO, WEF and local engineering organizations.

MIDWEST SOCIETY FOR TRENCHLESS TECHNOLOGY
BOARD OF DIRECTORS 2019 - 2020

President – Jeff Boschert
National Clay Pipe Institute
St. Louis, Missouri
jboschert@ncpi.org

Vice President – Chris Schuler
Miller Pipeline Corporation
Indianapolis, Indiana
chris.schuler@millerpipeline.com

Secretary – John Milligan
Vermeer Corporation
Pella, Iowa
jmilligan@vermeer.com

Treasurer – Ryan Poertner
Ace Pipe Cleaning Inc.
St. Louis, Missouri
rpoertner@acepipe.com

Rory Ball
Brierley Associates
Cleveland, Ohio
rball@brierleyassociates.com

Joe Cherry
AP/M Permaform
Johnston, Iowa
joecherry@permaform.net

Rick Gage
LMK Technologies LLC
Ottawa, Illinois
rgage@lmktechnologies.com

Lee Haessig
Cretex Specialty Products
Waukesha, Wisconsin
lhaessig@cretexseals.com

Nate Hrabosky
Hammerhead Mole
Oconomowoc, Wisconsin
nhrabosky@hammerheadmole.com

Shane Jacobson
Central Iowa Televising
McCallsburg, Iowa
smjcit@outlook.com

Ed Kampbell
Rehabilitation Resource Solutions
Hillard, Ohio
ekampbell@sbcglobal.net

Kerry Koressel
IPEX America
Newburgh, Indiana
kerry.koressel@ipexamerica.com

Sarah Mahlik
TT Technologies, Inc
Aurora, Illinois
smahlik@tttechnologies.com

Robert Martin
CH2M HILL
Milwaukee, Wisconsin
robert.martin18@ch2m.com

Steve Matheny
Logan Clay Products
West Bloomfield, Michigan
stevem@loganclaypipe.com

Tod Michael
Vermeer Corporation
Pella, Iowa
tmichael@vermeer.com

Catherine Morley
RJN Group
Wheaton, Illinois
cmorley@rjn.com

Kevin Nagle
TT Technologies, Inc
Aurora, Illinois
knagle@tttechnologies.com

Steve Peterson
SEH, Inc
Sheboygan, Wisconsin
speterson@sehinc.com

David Rosenberg
Michels Corporation
Brownsville, Wisconsin
drosenbe@michels.us

John Schroeder
CDM
Columbus, Ohio
schroederjp@cdm.com

Bill Shook
AP/M Permaform
Johnston, Iowa
bill@permaform.net

Gary Smolinski
OHM Advisors
Livonia, Michigan
gary.smolinski@ohm-advisors.com

2019 – 2020 UPCOMING TRENCHLESS EVENTS

October 23 - 24, 2019
RM-NASTT 9th Annual Regional Conference: Trenchless Elevated!
Mountain America Exposition Center
Sandy, Utah
Information: www.nastt.org/events

October 28 - 30, 2019
NO-DIG NORTH
Telus Convention Centre
Calgary, Alberta
Information: www.nodignorth.ca

November 11 - 12, 2019
2019 NASTT Northeast Trenchless Conference
Embassy Suites by Hilton Syracuse
Destiny USA
Syracuse, New York
Information: www.nastt-ne.org/seminar-2019.html

November 20 - 21, 2019
15th Annual Western Regional No-Dig Show
Ko'olau Ballrooms & Conference Center
Kaneohe, Hawaii
Information: www.westt.org

December 4, 2019
MSTT Trenchless Technology, SSES & Buried Asset Management Seminar
Council Bluffs, Iowa
(Date may change)
Information: Leonard Ingram, mstt@engconco.com

April 5 - 9, 2020
NASTT 2020 No-Dig Show
Colorado Convention Center
Denver, Colorado
Information: www.nodigshow.com

2019 SEMINAR & JOURNAL SCHEDULE

MASTT - MID ATLANTIC SOCIETY FOR TRENCHLESS TECHNOLOGY
MSTT - MIDWEST SOCIETY FOR TRENCHLESS TECHNOLOGY
SESTT - SOUTHEAST SOCIETY FOR TRENCHLESS TECHNOLOGY

SOCIETY	PROPOSED DATE	LOCATION	STATUS
MASTT SEMINAR	APRIL 3, 2019	MT. LAUREL MD (PHILADELPHIA)	CONDUCTED
SESTT SEMINAR	MAY 22, 2019	CHARLESTON SC	CONDUCTED
MASTT JOURNAL	JUNE 25, 2019	PUBLISH DATE	PUBLISHED
MSTT SEMINAR	JUNE 26,-27 2019	INDIANAPOLIS IN	CONDUCTED
MASTT SEMINAR	AUGUST 14, 2019	ARLINGTON VA	CONDUCTED
MSTT JOURNAL	SEPTEMBER 25, 2019	PUBLISH DATE	PUBLISHED
SESTT SEMINAR	OCTOBER 8, 2019	CHARLOTTE NC	CONDUCTED
SESTT JOURNAL	NOVEMBER 15, 2019	PUBLISH DATE	PROPOSED
MSTT SEMINAR	DECEMBER 4, 2019	COUNCIL BLUFFS IA (OMAHA)	PROPOSED

For registration and updated information on the 2019 "Trenchless Technology, SSES and Buried Asset Management" Seminars and Trenchless Journals, please visit:

Mid Atlantic: www.mastt.org | Midwest: www.mstt.org | Southeast: www.sestt.org

MSTT CHAPTER MEMBER MAYNARD AKKERMAN INDUCTED INTO 2019 NASTT HALL OF FAME CLASS

Maynard Akkerman thanks audience members at 2019 NASTT No-Dig Show Gala in Chicago

At the NASTT 2019 No-Dig Show in Chicago, March 17 - 21 MSTT Chapter member Maynard Akkerman, President CEO and Owner of Akkerman Inc., was inducted into the 2019 NASTT Hall of Fame for a lengthy career dedicated to the principles of the NASTT mission.

Maynard began full-time employment in his father's sewer and water construction company 46-years ago. His father, D.H. Akkerman developed his own line of pipe jacking equipment and in 1973 launched Akkerman Manufacturing. From 1973-1987 Maynard was part of the construction crew on numerous tunneling and pipe jacking projects and in the plant involved with various phases of equipment fabrication.

In 1987, Maynard purchased the manufacturing business and renamed it Akkerman, Inc. Under his leadership, in 1995, Akkerman successfully introduced the first US-based microtunneling system, a distinction which still stands. Throughout his career, Maynard has cultivated many relationships in the tunneling industry and has been a strong promoter of trenchless methodologies.

He was an original member of NASTT, joining just a few months after its incorporation in 1990. Maynard served two terms on the NASTT Board of Directors from 1995-1998. He was a contributing member to the Microtunneling Standards Committee for the ASCE for the first microtunneling standard in 2001. He was named the 2003 Underground Construction MVP by the Gulf Coast Trenchless Association and the 2008 Person of the Year by Trenchless Technology Magazine. He was nominated to The Moles in May 2009, and has held longstanding memberships with the National Utility Contractor's Association and the Underground Construction Association, and the Society of Mining, Metallurgy, and Exploration. In 2015, he was on the Blue Ribbon Review Committee for the ASCE's Pilot Tube and Other Guided Boring Methods standard.

Lifelong resident of Brownsdale, Minnesota, Maynard is an active member of the Minnesota and Austin Chambers of Commerce, member and past chair of the Development Corporation of Austin's executive committee and Enterprise Minnesota's Manufacturing Advisory Group.

Maynard and his wife Robin, have three sons, two who have joined Akkerman and six grandchildren. Outside of family activities and travel, Maynard is enthusiastic about classic Mopar car restoration and collecting, is an amateur drag car racing competitor, hunter, fisherman, and golfer.

Congratulations Maynard on your induction into the 2019 NASTT Hall of Fame in recognition of lifelong achievement in trenchless underground construction equipment innovation and advocacy!

Maynard Akkerman accepts NASTT 2019 Hall of Fame Induction from Craig Vandaelle, NASTT Chair (l), and Mike Willmets, NASTT Executive Director (r)

MSTT MEMBER ROBERT WESTPHAL INDUCTED INTO 2019 NASTT HALL OF FAME CLASS

Robert Westphal receives the NASTT Hall of Fame pin from NASTT Executive Director Mike Willmets (l) and NASTT Chair Craig Vandaelle (r) as family members and colleagues look on

Robert H. Westphal, Senior Advisor of Operations, Michels Corporation, was inducted into the 2019 NASTT Hall of Fame at the NASTT 2019 No-Dig Show in Chicago, March 17 – 21. Throughout a career spanning over 53 years in the underground and trenchless construction industries, Bob has provided a strong example to follow of vision in the trenchless construction industry and personal integrity in business.

He began his career at Michels Corporation in 1965 as a pipeline laborer and steadily advanced through the ranks as foreman, superintendent, project manager, vice president, and senior vice president. Bob's hard work and strategic guidance have contributed to the noteworthy growth of both Michels Canada and Michels Corporation in the trenchless technology industry.

In 1986, Bob led his company's entry into horizontal directional drilling. With his vision, Michels is now regarded as a leader in the HDD industry across the United States and around the world. Today, Bob continues to champion advancements in HDD, direct pipe, tunneling, micro-tunneling, pipe rehabilitation, and pipeline construction.

Bob's vision and personal integrity have been critical to the widespread adoption of HDD construction solutions by virtually every major utility company in the United States.

A pioneer in forging the acceptance of the many benefits of trenchless HDD construction, Bob has safely accomplished some of the most challenging directional crossings in the world.

Regarded by colleagues as a true statesman in the construction industry, in 2011, Bob was named NASTT's Trenchless Technology Person of the Year. He remains active in the Pipe Line Contractors Association (PLCA) and has served on its Board of Directors, Labor Committee and Pipe Line Industry Advancement Fund. He was elected as President of the PLCA in 2005, and named Honorary Member in 2018 in recognition of his contributions to the pipeline industry. Bob continues to serve on the Board of Trustees of the Laborer's National Pension Fund.

Bob's impact and lasting influence on the trenchless industry and to the world of construction does not end with his tireless service on boards and other industry causes.

Bob, and his wife Jone, are both involved with several civic and charitable causes. They reside in Fond du Lac, Wisconsin and have four sons and 12 grandchildren.

Congratulations Bob on your induction into the NASTT Hall of Fame in recognition of your lifetime contributions to the advancement trenchless technology.

Robert Westphal was inducted into the NASTT 2019 Hall of Fame at the No-Dig show gala

Robert Westphal accepts NASTT 2019 Hall of Fame Induction

PROMOTING TRENCHLESS TECHNOLOGY IN THE MIDWEST!

MSTT Seminars Growing as Popular Networking & Outreach Events

Special thanks to Miller Pipeline Corporation hosts of the MSTT Seminar June 26-27 at their spacious training facility in Indianapolis. Great venue to learn about the latest trends and technologies in trenchless underground construction

Trenchless Technology, SSES and Buried Asset Management Seminars hosted by MSTT in locations across the Midwest have a solid reputation as premier educational events, with knowledgeable industry presenters on a wide range of trenchless technology topics.

As part of the MSTT mandate to "promote Trenchless Technology through education for the public benefit", the seminar programs are designed to inform public officials, engineers, utility company personnel, designers, and contractors involved with the construction, rehabilitation, and management of underground infrastructure assets, in the Midwestern states.

In keeping with a solid track record of facilitating direct networking between industry and owner groups, and accommodating growing interest in the seminars, Miller Pipeline generously hosted a very successful two-day

MSTT Trenchless Technology seminars are excellent networking and educational opportunities

MSTT Executive Director Leonard Ingram, PWAM welcomes seminar attendees

"Miller Pipeline is an excellent supporter of trenchless technology. We appreciate their hospitality!"

- Leonard Ingram, PWAM, MSTT Executive Director."

Mr. John Trypus, Director, Underground Construction & Engineering, Citizens Energy Group, Indianapolis gives guest presentation on "Trenchless Technology in Indianapolis"

Trenchless Technology seminar June 26 – 27, at the Miller Pipeline Training Facility in Indianapolis IN. Consisting of 20 presentations featuring topics ranging from condition assessment to new installation methods, a highlight of the event was an address on "Trenchless Technology in Indianapolis" presented by Mr. John Trypus, Director, Underground Construction & Engineering, Citizens Energy Group, Indianapolis.

Special thanks to MSTT Vice Chairman Chris Schuler, and the staff at Miller Pipeline for hosting this excellent outreach and networking event. The Miller Pipeline Training Facility was an excellent venue for educating decision-makers on the many social and economic benefits of using trenchless technology in their infrastructure renewal and new construction programs.

MSTT also conducted a well-attended single-day seminar November 28, 2018 in Minneapolis MN, which featured Ms. Katrina Kessler, P.E., Director, Surface Water & Sewers Division, Minneapolis MN, giving a Guest Presentation on "Trenchless Technology in Minneapolis".

MSTT **Trenchless Technology, SSES and Buried Asset Management Seminars** are excellent opportunities to learn about the latest trends and technologies in trenchless underground construction. With educational and informative trenchless presentations, product demonstrations, industry exhibits, networking and ideas, the seminars provide relevant technical knowledge with immediate value and application. There is a draw for two 100 dollar bills at the end of the session, and also draws throughout for door prizes donated by the exhibitors.

Ms. Katrina Kessler, P.E., Director, Surface Water & Sewers Division, Minneapolis MN, delivers presentation on "Trenchless Technology in Minneapolis at MSTT seminar November 28, 2018 in Minneapolis MN

Special also to food sponsors at both seminars: **Akkerman, Electro Scan Inc., Interplastic Corporation, LMK Technologies LLC, Miller Pipeline Corporation, National Clay Pipe Institute, Pipeline Inspection Partners Corporation, Plastics Pipe Institute, SAK Construction LLC, Vermeer Corporation.**

*****PLAN TO ATTEND MSTT COUNCIL BLUFFS IOWA SEMINAR*****

Wednesday December 4, 2019 LOCATION TBD

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CALUMET INTERCEPTING SEWER 19F REHABILITATION

By: Frederick Wu, Metropolitan Water Reclamation District of Greater Chicago
Carmen Scalise, Metropolitan Water Reclamation District of Greater Chicago
Kevin Fitzpatrick, Metropolitan Water Reclamation District of Greater Chicago
Kevin Coburn, Insituform Technologies USA, LLC

1. BACKGROUND INFORMATION

The Metropolitan Water Reclamation District of Greater Chicago (District) is located primarily within the boundaries of Cook County, Illinois. The District serves an area of 883.6 square miles which includes the City of Chicago and 125 suburban communities. The District serves an equivalent population of 10.35 million people; 5.25 million real people, a commercial and industrial equivalent of 4.5 million people and a combined sewer overflow equivalent of 0.6 million people. The District's 560 miles of intercepting sewers and force mains range in size from 8 inches to 27 feet in diameter, and are fed by approximately 10,000 local sewer system connections.

2. INTRODUCTION

Calumet Intercepting Sewer 19F (Cal-19F) was constructed in 1970 by the District to provide an outlet to sanitary sewers serving parts of the Villages of Tinley Park and Oak Forest. The sewer was constructed in anticipation of the rapid suburban expansion of the southwest side of Cook County. The sewer consists of 14,051 feet of 60-inch diameter concrete pipe, 24 manholes and 1 connecting structure (Figure 1). The interceptor receives industrial, commercial and residential flow from approximately 15.69 square miles in the southwest suburbs of Chicago with a design population of 110,000.

Video inspection and surface inspection of the sewer, manholes and structures was performed by the Maintenance and Operations Department in 2008, 2011 and 2014. The inspection of the MWRD facilities revealed concrete erosion had occurred extensively due to the action of the hydrogen sulfide and high flow velocity in the sewer. Due to the depth of the sewer (35-70 feet below grade) and high flows, physical inspection of Calumet 19F was not feasible without extensive safety precautions and bypass operations.

3. DESIGN

The initial inspection provided by the Maintenance and Operation Department led the District to initiate a contract to rehabilitate the sewer, manholes and structure.

The District reviewed as-built drawings, construction documents, flow data, sewer layouts and surrounding sewer systems. As-built drawings show the sewer depth between 30 and 70 feet below grade and the sewer was originally constructed by tunneling. Flow data was collected over a 5-month period and the

Figure 1. Calumet 19F Location Plan

data showed maximum flows that exceeded 30 MGD. Review of the MWRD sewer atlases and local municipal sewer atlases didn't reveal any viable diversion route for flow entering into the sewer.

In anticipation of the large expenditure associated with a bypass system, the District specified that any lining be designed for fully deteriorated conditions to ensure maximum longevity. Since the sewer was originally constructed by tunneling, the district specified tunnel-loading conditions. By specifying a tunnel-loading condition, the total calculated design load would be reduced and the resulting liner would be thinner.

Based on the information collected, the District realized that a bypass system would be required to perform lining of the sewer. The District specified two different technologies for the lining of the sewer; cured-in place pipe lining and slip lining, with the understanding that CIPP would require a full flow bypass system for the entire duration of the lining process and slip lining would require a partial bypass system during lining. However any cost savings with the reduced bypass system for slip lining had the potential to be offset with the installation of multiple insertion shafts greater than 30 feet deep.

Based on the length of the sewer being rehabilitated, many stakeholders were going to be impacted by lining. The District acquired right of way from the following entities: Cook County Department of Transportation, Bremen Township, City of Oak Forest, Village of Tinley Park and Forest Preserve District of Cook

County. The District also contacted directly impacted entities like local residents, Panduit Corporation, Tinley Park High School and Morton-Gingerwood Elementary.

4. CONSTRUCTION

Insituform Technologies USA, LLC (Chesterfield, MO) was awarded the contract for $12.4M. The scope consisted of installing cured-in-place pipe (CIPP) to rehabilitate 14,051 feet of 60-inch pipe, rehabilitating 24 manholes and one junction chamber. The CIPP installation plan was a hybrid approach using both traditional CIPP and composite CIPP, offering several advantages. Before construction began, much time was spent planning the bypass capacity, design and layout. This extensive bypass system necessitated good communication with the many entities where the pipe would be laid and the impact to their daily routines.

Bypass

Roughly one-third of the bid cost was associated with an extensive bypass system. The challenge to this bypass system was an invert depth of 45 feet at the suction point, a discharge length of 14,000 feet and meeting a dry weather flow volume of 15 MGD daily with peak flows in excess of 30 MGD which primarily comes from a 20-inch force main. A benefit of bypassing the entire 14,000 feet of 60-inch in one long set up meant there was no downtime between CIPP installations while waiting to shift the bypass. When considering heavy residential traffic, road bores, railroad track easements, business driveways and a school, it becomes clear why the bypass was a controlling factor for this project. To meet these demands, Mersino (Davidson, MI) installed twin 18-inch vertical turbine pumps at the bypass pumping station near 175th and Ridgeland in Tinley Park (Figure 2). These turbines pumped through 2,700 feet of twin 32-inch HDPE pipes to a booster station with two 24-inch global 10,000 GPM high head trash pumps. From the booster station (Figure 3), the flow continued another 11,300 feet to the discharge point.

Figure 2. Bypass Routing

Lining of large diameter sewers that are 35-70 feet below ground creates problems that aren't present in typical 10-foot deep sewers.

At the bypass pumping station, a new electric service drop was installed to save money on fuel costs. Generators were on site as a back-up measure and they were only used twice during the duration of bypass. From the bypass pumping station, the bypass route runs along the south side of the Panduit property and the twin 32-inch HDPE pipes were to lay just behind the fence line. Due to the timing of a pond beautification project taking place on the property, there wasn't room to lay the pipe behind the fence. The sidewalk in front also wasn't available due to foot traffic from students walking to their school that was ¼ mile away. Tinley Park agreed to build a new sidewalk on the other side of the street for students to utilize. The new sidewalk had been in planning for a while, however this work was the impetus needed. This new sidewalk on the south side of the street cleared the way for the bypass piping to be laid on the sidewalk on the north side of the street. The bypass pipe then turns north and runs along the east side of Panduit to the booster station.

Figure 3. Booster Station

The booster station was designed to take the pressure off the amount of work the vertical turbines needed to do. The booster pumps were originally designed to be used during dry weather flows, but the turbines performed so well, the boosters were only used 3-4 times during wet weather events. After the flow travelled through the booster station, there was a 400-foot stretch

along the forest preserve and the original plan was to set the twin 24-inch HDPE pipes on the walking path. The permit by the forest preserve wouldn't allow any bypass material on the walking path. To get the pipes through, Airy's Inc. (Tinley Park, IL) made 26 cantilevered "H" beams and hydro excavated 5 feet into the ground in the narrow space between the wooden fence and the road (Figure 4). Once installed, they poured flowable fill around the beam to stabilize it. The HDPE pipes were then stacked vertically and secured to the "H" beams to get through this narrow area. The existing structure for a discharge point was in a protected wetlands area and couldn't be used. Instead, a 50 foot deep cast in place concrete structure was installed in the forest preserve parkway. This structure is available as a future access point, but it was buried at the conclusion of the project.

Figure 4. Cantilevered "H" beam used to stack 24" HDPE for bypass

The Village of Tinley Park requested that the water level in the bypass structure (which contained the turbines) would dictate how many pumps would run at the Tinley Park pump station with the 20-inch force main. Sensors and transducers were installed at the bypass pumping structure and were tied in with a control panel which then controlled the pumps at the Tinley Park pump station. This allowed the system to slow down if the bypass wasn't keeping up and would also send an alarm. This bypass system was set up for a total of 10 months and proved to be well designed and built. During one rain event this bypass system pumped a flow of 23,000 GPM (33 MGD) without issue. Roughly 85 per cent of the time just one vertical turbine would take care of the daily flow and push it nearly 3 miles with no help from the second turbine or the booster station. The system allowed the work to continue even when flows were well beyond dry weather volumes and for extended periods of time.

CIPP Design – Composite Technology

Due to the large diameter and depth of this sewer, the ASTM F 1216 formulas yielded thick liner designs. If traditional CIPP was used for the entire project, many of the 24 installations would have been too heavy to transport the wetted out tube to the jobsite. Therefore, it would have required the felt liner to be wet out onsite as it was being installed. To eliminate any need for on-site wet out for the deeper and longer installations, composite technology was utilized. A fiber-reinforced CIPP liner resulted in a thinner design which allowed the liner to be transported direct from the wet out facility to the jobsite. The improved physical properties of fiber-reinforced composites applied to cured-in-place pipe reduce the wall thickness required to withstand the design loads.

Cured-in-place composite pipes with thinner walls require less resin and weigh less. Thinner tubes also reduce the difficulties associated with handling the dry tube during manufacturing. Further, the logistical challenges during resin impregnation are reduced due to the smaller volume of resin to be processed and the reduced weight to be handled at a wet out facility.

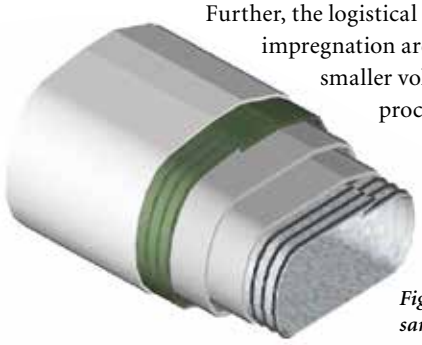

Figure 5. Fiber reinforced sandwich technology

Fiber-reinforced products have been engineered to take advantage of the material properties offered by fiber-reinforced plastics. The stiffness of a laminated, or sandwich beam, is determined by the material properties and second moment of inertia of each layer - its area times the square of the distance from the neutral plane (Figures 5 & 6). A sandwich composite beam is constructed by bonding a layer of very stiff material to each side of a "core" layer with relatively low material properties. (Hahn, 2007)

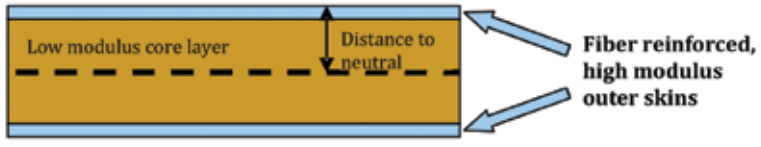

Figure 6. Composite "Sandwich" Technology

In fiber-reinforced CIPP, the core material is most commonly polyester resin and felt, with a flexural modulus of 250,000 to 400,000 psi, similar to that or a standard CIPP liner. Layers of a cured-in-place pipe with increased strength are produced by incorporating reinforcing fiber into the polymer matrix. Glass or

carbon fibers are commonly used as reinforcement in sandwich composite beams. To compare the two options, a layer reinforced with glass fiber may have a flexural modulus as high as 10 million psi, and one with carbon fiber flexural modulus may be 20 million psi. In practice, the optimum amount of fiber is designed into the composite beam to achieve the desired design stiffness.

The fibers are incorporated by layering them with polyester felt. These fabrics are added to the construction of the tubes during the normal manufacturing process. One layer of reinforcement is situated close to the surface of the host pipe with the other layer close to the inner surface of the CIPP (Figure 7) for a cross-section view of the fiber reinforced pipe.

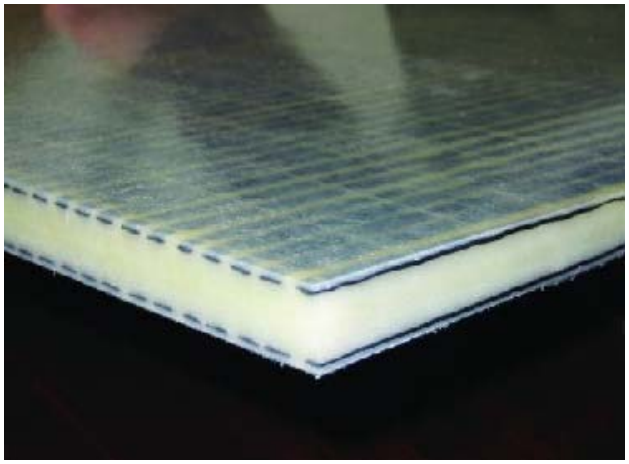

Figure 7. Cross-section view of fiber reinforced pipe

CIPP Installation

It took 24 separate installations to complete the 14,051 feet of 60-inch lining. This meant a minimum of 12 manholes would be required to perform the 24 installations if the liners were "shot" both directions from each manhole. Due to site conditions, 14 manholes were used to install the 24 liners. Each of the manholes are 48-inch diameter, which made the 60-inch liner a tight fit. In order to invert the liner thru the existing manhole, the steps, rest platforms and frame and cone were removed. A 48-inch barrel section was then installed to bring the manhole back to grade. Finally, a stone landing pad with wood planks was built to ensure there was a level installation platform at all 14 manholes to allow for proper installation.

5. CONCLUSION

A few lessons were learned during the planning and execution of this contract. Providing flow data during the bidding phase allowed the contractor to properly size bypass pumps. This resulted in lower bid price that more accurately reflected the true cost associated with flow bypass.

We also learned that the use of a temperature sensor for larger diameter CIPP lining jobs can be beneficial. The additional cost of a temperature sensor for a large diameter CIPP installation is minimal compared to the data provided to both the owner and the contractor. A temperature sensor can help the contractor know exactly when the exothermic reaction has occurred, which allows the official cure cycle timer to begin. This knowledge can result in valuable savings and provide the owner with live objective data to ensure the liner has properly been cured.

Additionally, lining of large diameter sewers that are 35-70 feet below ground creates problems that aren't present in typical 10-foot deep sewers. The bypass required on this project was a massive undertaking. This project shows that good engineering, proper planning and communication between all parties during the build out of a project can produce successful results on a difficult project.

6. REFERENCES

Hahn, D. (2007) – Risk Mitigation of Large Diameter Cured-In-Place-Pipe Rehabilitation Work Utilizing Fiber-Reinforced Composite Sandwich Technology, No-Dig Conference, San Diego, California, USA.

ASTM International (2009) – ASTM F 1216: Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube, West Conshocken, Pennsylvania, USA.

ABOUT THE AUTHORS:

Frederick Wu *is a Senior Civil Engineer for the MWRDGC engineering department. Frederick specialized in design, rehabilitation and management of the District's collection system. Frederick holds a M.S. in Environmental Engineering from Illinois Institute of Technology and a B. S. In Civil and Environmental Engineering from University of Illinois Urbana Campaign.*

Carmen Scalise, P.E. *is a Principal Civil Engineer with MWRDGC serving as project engineer for the McCook Reservoir and other TARP related projects. He also oversees the District's collection systems asset management plan and associated sewer rehabilitation design projects. He has a Bachelor of Science in Civil Engineering and a Masters of Public Works from the Illinois Institute of Technology.*

Kevin M. Fitzpatrick, P.E. *is Managing Civil Engineer for the MWRDGC overseeing engineering for all of the District's collection facilities projects, which includes the $3.8 billion Tunnel and Reservoir Plan (TARP), as well as intercepting sewer rehabilitation work. He has a Bachelor of Science in Civil Engineering from the University of Illinois and a Master of Science in Environmental Engineering from the University of North Carolina.*

Kevin Coburn *has been a business development manager for Insituform Technologies for the past 19 years. He works with customers to find solutions to their challenges in both sewer and water pipelines. Insituform invented Cured in Place Pipe in 1971 and their process is used worldwide to rehabilitate gravity and pressure pipes from 6" to 96" diameter. Kevin is based out of Orland Park and covers Illinois.*

FIXING A 19TH CENTURY SEWER WITH A 21ST CENTURY SOLUTION:

A Case Study for Geopolymer Sanitary Sewer Rehabilitation

By: Joseph Sullivan, RJN Group, Inc.
Allison Swisher, P.E., City of Joliet
Owen Dean, P.E., City of Joliet

1. INTRODUCTION

In 2014, the City of Joliet embarked on sewer program that was largely intended to catch up on sewer repairs that had been neglected for decades. To assist with this program, the City selected RJN Group to be its trusted advisor for their collection system engineering needs. Prior to this program, a reactionary approach was taken to sewer maintenance in that if there was a failure, the City would fix it and if there was a blockage, the City would clear it.

Over time, a few areas in the City reached critical status where deterioration was so far along that repair work had to be fast-tracked. In some cases, it became clear that should there be a failure along certain reaches of sewer, there would be massive disruption in service to customers, businesses and commuters and the extensive repair efforts would be costly.

One such stretch of sewer was in the downtown central business district. This combined sewer, nearly 2,200 linear feet in length, receives surface water from storm inlets as well as sewage from nearby buildings. This roughly 150-year-old limestone archway sewer was in such poor condition that it became its own specialty project in a larger 5-year system wide rehabilitation program, funded through IEPA's state revolving fund for sewer and water. Sewer televising in 2016 showed the structural integrity of this old limestone archway sewer was compromised and that the sewer was falling apart. Due to its many years in service, washout along the wall invert edge was apparent and visible failures were starting to appear.

Figure 1. The limestone archway sewer before rehabilitation in the City of Joliet; constructed in the 1860s

It's not every town that has a sewer constructed of this size, shape, material and age, but a few of the older cities and towns that were built up along rivers and have combined sewer systems do. We felt it was important to tell our story of how we investigated and selected the appropriate technologies for repair and to share some of the unique challenges though the process and the lessons learned while rehabilitating a critical stretch of sewer dating back to the 1860s.

2. HISTORY OF THE ARCHWAY SEWER

The Joliet downtown archway sewer was constructed in the 1860s and consists of roughly 2,200 linear feet of limestone block arch sewer ranging in size from 48 x 24-inch to 54 x 31-inch. There were 10 manholes and approximately 280 service connections along this stretch of sewer that extends from Chicago and Cass St. to Jefferson where it makes a 90-degree bend and flows west to Des Plaines St. The arch sewer is in a high-profile downtown business district location with critical customers such as the Will County Courthouse, the historic Rialto Theater and other multiple story buildings. This sewer also handled storm runoff from the IDOT road above and was adjacent to the City of Joliet Municipal Building.

Figure 2. The extents of the archway sewer from Cass St & Chicago St to Jefferson St and Des Plaines St.

This archway sewer was one of the first sewers built in Joliet to service the growing downtown area. This critical piece of infrastructure was inspected in 2016 as part of an annual sewer cleaning and televising program. After review, this sewer became part of the City's five-year priority rehabilitation program. During cleaning and televising operations, several large voids were identified under US Route 30 (Jefferson St). In addition, other locations showed the structural integrity of the sewer was compromised and falling apart. Rehabilitation was needed to address the following:

- Restore structural integrity to the arch sewer and manholes
- Reduce Inflow and Infiltration
- Investigate and fill side chambers
- Remove dead services and locate storm connections for future separation

3. SELECTION OF REHABILITATION TECHNOLOGY

Several different rehabilitation methods and technologies were considered for Joliet's archway sewer. The four considered were:

1. Spray Rock- Polyurethane Coating
2. Large Diameter CIPP- Polyester fiber tube & cured resin
3. Spiral Winding- Locking PVC
4. Geopolymer Mortar- Engineered Cementitious Coating

Spray Rock - Is a structural rehabilitation that would typically be good for arch sewer rehabilitation. However, the polyurethane needs a completely dry surface to be applied to, which causes extensive preparation work. There was also no direct competition for this product in our region to allow for a competitive bid. These facts, plus cost, caused us not to select Spray Rock for this project.

Large Diameter CIPP - The liner evaluated was a circular liner with the same effective diameter as the arched sewer. This product while originally ranked high, was not selected for several reasons. First, there were obstructions that protruded through the top of the sewer, which would have required transition liners to accommodate size changes. Next was the longer curing times required for large diameter liners and the difficulty this would impose on customers such as the courthouse, who could not have their service closed off very long. Finally, CIPP liners do not form well to the sharp 90-degree bend at the bottom, as was the case in this sewer. This last detail was of concern because many of the 280 lateral connections were stacked upon one another at that wall bottom edge. One method proposed to locate these laterals for reinstatement was to anchor 2x4 pieces of lumber to each service, marking their location with a protrusion into the CIPP liner. This method although typically fine for this type of rehabilitation, was deemed not the best fit for these reasons.

Spiral Winding- or Spiral Wound PVC (SPR), is a patented technology from Sekisui of Japan, for the rehabilitation of pipelines, often those with odd shapes, difficult access, and live flow conditions. SPR is a preferred large diameter pipeline renewal method in Japan, with over 25 years of installation history. While this option was considered briefly, it was not selected as there weren't any local installations known of and limited research indicated that some installations of this type were subject to root intrusions.

It's typical, that the first time you do something, you learn the most about it...

Geopolymer Mortar - This option was selected for the project. A Geopolymer mortar is a network of mineral-based elements linked with covalent bonds, typically they are aluminosilicates with greater than 70% pozzolanic material such as fly ash, rice husk or silica flume. The estimated costs for Geopolymer were comparable to CIPP. Anticipated benefits to this product were, no cold joint, resistance to H2S corrosion, molecular bonds like that of quartz (Engineered Rock), flow through plugs for large water users could be used and quick cure times (flow was reinstated a few hours after application). Other advantages of geopolymer include self-bonding properties, renewed structural integrity, and a small footprint during construction.

Figure 3. The small footprint of the geopolymer lining operation in a tight downtown business district

4. UNIQUE CHALLENGES DURING REHABILITATION

Inspection sequencing - A challenge during lining operations was CCTV inspection sequencing. Although pre & post televising were required by the contract, these operations needed traffic control and each time a defect or punchlist item was identified, a new final video was required to show all punchlist work was completed. One problem with sequencing was that a jetter nozzle was needed to pull water levels down to see the flat bottom of the arch sewer, but the spray from the jetter nozzle also wetted the periphery of the pipe, making it difficult to see if leaks were active or if they had been sealed. To accommodate this punchlist review process, the Contractor did multiple video runs with a "GoPro" camera mounted to a hard hat, while walking through the sewer and looking at defects repaired. If the project were done over, we'd require that all final video be performed when there was no flow in the pipe, it was completely dry, and before any flow was reinstated.

Another realization was to have minimum cure times in the specification allowing for the proper sequencing of videos in dry pipe conditions. This was noted during bypass pumping operations when the dam overtopped while geopolymer was curing, and the affected area had to be removed and reapplied after the pipe was thoroughly dried.

Figure 4. A dam was constructed and used to control flow during bypass pumping operations within the arch sewer

Pipe Plugs & Chamber Abandonments - It was unknown how many of the 280 services were not live, but after inspections, dye testing and review by the City and engineer, it was decided to close 230 connections that were considered dead. These dead services were closed off using a mechanical wing plug capped by bricks and mortar and top-coated with geopolymer. In only two cases did closing a service come back to haunt the City with basement backups; but in both circumstances, it was the Contractor plugging the wrong service that led to the backup. This meant the City had a 100 per cent success rate when abandoning 230 out of 280 services. The City's plumbers also entered almost every building in the vicinity of the arch sewer for lateral televising, locating and dye testing to assist in the determination of live and dead services.

There were also sewer side chambers, whose original purpose were unknown, but were determined to be filled during the design phase so there would be no voids under roadway and sidewalks in the central business district. These side chambers were abandoned by bulkheading them with brick and mortar and filling them at the connection to the arch sewer with a flowable fill. The purpose of this was for public safety and to protect the roadway above.

Figure 5. A cave-in during pipe plugging operations caused a void to form under the roadway

Manned entry - While means and methods were not dictated on the project, the reluctance of the Contractor to do manned entry for cleaning operations and push camera work was a challenge for prepping the pipe. To accommodate the sub-contractor's concerns, the City allowed them to conduct lateral televising with a lateral launcher camera system while occasionally going in the line to guide the launcher. The lateral televising was necessary to help determine what services were live and which were dead, especially since this infrastructure in some cases was 150 years old.

Coordination – Not only was this project in a downtown business district, but portions were also under Illinois Department of Transportation (IDOT) roads and therefore, permits had to be acquired and the Contractor had to be finished by a November 1st deadline. Material deliveries to the jobsite were coordinated for when the traffic volume was low, mainly during non-rush hours. In addition, there was coordination with large water users i.e. the Courthouse, the historic Rialto theatre, the farmer's market and other downtown events. This project also required coordination with a watermain replacement project, so efforts had to be made to not get in the way of each other's operations. One advantage the sewer contractor had, was the ability to utilize the watermain contractor's traffic control setup.

5. LESSONS LEARNED

Preparation of the pipe & Invert Repairs - In the cleaning phase of the operation, there were indeed lessons learned, as heavy cleaning became necessary due to 150+ years of little or no maintenance. This became an even more tricky part of the project, because the big high-pressure sewer nozzles, which typically ride along the bottom of a pipe, began ripping apart the sewer, pulling large amounts of limestone bricks and debris out at each downstream manhole. While caution was verbally given to the Contractor, this method was not corrected soon enough, and the arch sewer began falling apart. Low pressure jetting was eventually implemented and required to preserve as much of the host pipe as possible.

Figure 6. Invert damage caused during cleaning operations had to be repaired with bricks and flowable fill

Because of this lack of attention paid by the contractor as to how many bricks were being pulled from the sewer, extensive invert repair was necessary to provide a solid base for Geopolymer lining. On Jefferson Street, thousands of paving bricks were estimated to be used for filling voids. Hauling bricks into the sewer was labor intensive, so at Chicago Street, with larger voids present, the Contractor decided to use Quad Flow to fill the voids, Vortex's own version of a flowable fill. On the next segment, 40,000 lbs. of Quad Flow were used while on the project in total, nearly 144,000 lbs. were used. While the contract stated all invert repair was incidental, the extra effort and material costs became an issue, and a change order was presented to the City causing both parties to go back and forth for several months until a mutually agreed upon amount was negotiated.

Making Incidentals a Pay Item – Another lesson learned was to include as many pay items as necessary to ensure the Contractor can accurately bid and complete the work without skimping on materials and efforts necessary to complete the project properly. This includes adding pay items for the chemical grouting of active leaks in the sewer as well as for invert repairs. Because there were no pay items for these incidentals, it led to skipping over repairing leaks and a reluctance to go back to spots that were leaking. With proper pay items in place, the Contractor could be sure their efforts were covered and wouldn't lose money on unforeseen incidentals. Generally, contractors aren't happy when an incidental is part of the contract, so we learned it's best to include enough pay items for work to be covered lessening arguments over extra effort, change orders or unforeseen conditions.

Testing Results & Daily Reports - While testing results for compressive strengths and daily logs were required, these were areas that started slipping early and eventually got away from us. Daily logs were to provide such information as number of personnel onsite, amount of material used, batch numbers, time material was applied, ambient air temperature inside the infrastructure, water addition rate into the mix, etc. Testing results were required for 7-day & 28-day compressive strengths and five (5) cylinders were to be taken for every 40,000 lbs. of material applied, with some cylinders held for 56-day tests if necessary.

When early testing results showed 7-day strength failures, we were concerned, but assured by the Contractor they'd be passing by the 28-day test. It became even more worrisome when the 28-day tests results were not forthcoming. By the end of the project, several of the 28-day testing results had yet to be presented to the engineer and City. It was at this point that we started considering independent testing to get the strengths of the Geopolymer ourselves. While that never happened, it did educate us on what additional testing could be done. In the future, we'd put into the next contract that testing results are provided from an independent testing lab of our choice, with reporting going in triplicate to the Engineer, Owner & Contractor.

In addition to the compressive strength tests, the following tests would be added as a requirement on the next Geopolymer lining project:

1. X-Ray Fluorescence (XRF) testing for chemical analysis of the material (ASTM C 114)
2. Bond Strength testing (Pull -off Method) on manholes sprayed with geopolymer (ASTM C1583)
3. Rebound hammer test within the pipe to measure strength of material as an in-situ option. (ASTM C805)

6. CONCLUSIONS

There are several ways to rehabilitate sanitary sewers, however not every sewer rehabilitation project will have the unique characteristics, challenges and difficulties encountered as part of the Joliet limestone arch sewer project. This project dealt with a few challenges, which took a lot of coordination and had some important lessons learned, but overall the aging arch sewer and the downtown infrastructure is now in much better shape than when the project began. It's typical, that the first time you do something, you learn the most about it, and that was the case with our experience in geopolymer application and rehabilitating a 150-year-old limestone archway sewer. The project didn't always go smoothly, but in the end, we were able to eliminate 82 per cent of the service connections to this sewer, provide a structural coating adding 100 years of design life for sewer and manholes, successfully fill side chambers that were connected to the archway sewer, and locate several directly connected storm inlets that are now targeted for separation on future capital improvement projects.

Figure 7. The archway sewer after the geopolymer coating was applied. Bypass pumping lines also shown

7. REFERENCES

Pozzolanic Materials: Eco Friendly Substitute of Cement Ingredients. (2018, September 18). Retrieved from https://gharpedia.com/pozzolanic-materials-cement-ingredients/

Royer, Joe. "Considerations When Working with Geopolymer Mortar." Trenchless Technology Magazine, 10 Sept. 2018, https://trenchlesstechnology.com/considerations-when-working-with-geopolymer-mortar/

"Spiral Wound PVC (SPR)." SAK Construction, 6 Jan. 2016, www.sakcon.com/services/spiral-wound-pvc-spr

ABOUT THE AUTHORS:

Joseph Sullivan *is project manager with RJN Group, a national engineering firm specializing in underground infrastructure. Mr. Sullivan graduated from Northland College with a B.S. in Environmental Studies. His 28 years of municipal infrastructure experience covers inspection/rehabilitation of sewers including open cut, manhole rehabilitation, CIPP, and other trenchless methods.*

Allison Swisher *has 14 years of municipal engineering experience. She has a B.S. in Environmental Engineering from Northwestern University and a Masters in Public Administration from Governors State University. Allison is past president of the SW Branch of APWA and serves on the Illinois Public Service Institute executive committee.*

Owen Dean *graduated with B.S. in Civil Engineering from Platteville University of Wisconsin. Mr. Dean worked for 5-years with RJN Group as a Project Engineer for SSES and Rehabilitation Projects and recently moved to the City of Joliet engineering team as a Civil Engineer II for the sanitary sewer system.*

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PILOT TUBE METHOD MAINTAINS LINE AND GRADE FOR THE CITY OF FORT DODGE

Midwest Contractor Completes Demanding Deep Shaft Sanitary Sewer Upgrade Leading to a Record NO-DIG VCP Installation!

By: Laura Anderson, Akkerman Inc.

For years City of Fort Dodge, IA residents experienced the undesirable effects of an overloaded sanitary system during peak wastewater events.

Preparation to embark on a solution to address the situation began in February of 2011, following a comprehensive evaluation. City of Fort Dodge city council entered into a contract with McClure Engineering Company of Clive, IA. The study identified three areas most in need of immediate replacement. The first project was the 20th Avenue North Sanitary Sewer Gravity Bypass, located in a residential area, developed in the 1960s just east of the Fort Dodge Nature Trail.

Austyn Wolfe, project engineer with McClure, described the circumstances as "The project was designed to replace the City's Northgate Lift Station and provide overflow relief to other portions of the sanitary sewer in the surrounding region. The lift station was undersized and did not have backup power. It also discharged into a shallow gravity sewer which became overloaded during storm events causing basement backups and the need for bypass pumping."

Project location in a residential area, City of Fort Dodge, IA. To maintain accessibility, construction material and equipment had to be staged strategically so that it did not block driveways

From the beginning, the owner preferred a pilot tube guided boring installation to minimize impacts to residents and ensure line and grade accuracy of the sewer. Because of the installation depth, the selected method also presented project savings. Wolfe explains, "The new 12-inch gravity relief trunk was installed at depths from 15-30 feet. Open-cut construction would have required a trench that would have taken most of the right-of-way, and led to replacement of all the sidewalks, paving, curb and gutter, and possibly other existing utilities such as water main and storm sewers. Removing the road entirely would have left a significant number of residents without access to their homes as well as limiting access to emergency services."

The city council secured two sources of funding in 2012, and 2014 and sought bids for construction of the new sanitary sewer. In August of 2014, Minger Construction, Inc. of Jordan, MN was the low bidder, however, the bid exceeded available funds by $300K and was $500K over the design estimate.

To reduce expenditures, McClure went back to the drawing board to value engineer the original design package. He explained, "The initial design contained approximately 250 LF of roadway

Minger Construction, Inc. installed a new gravity relief trunk sewer at up to 30-foot depths to alleviate capacity during peak wastewater events

reconstruction at the intersection of 20th Avenue North and North 27th Street. It included water and storm utility replacement as well as 200 LF of open-cut sanitary sewer at 17-foot depths. Following the first bid, Minger Construction, Inc. suggested that costs could be significantly reduced if we were able to remove this work from the project."

Furthermore, Wolfe stated, "The original design did not have any bores that exceeded 400 linear feet. During redesign we consulted with guided boring professionals to verify the maximum bore length at which line and grade could be confidently maintained. Armed with this information, new bore pit locations were identified to limit the amount of traffic control and conflicts with existing utilities."

The project rebid in January of 2016. Minger Construction, Inc. was again low bidder with their base bid, and two additional alternative bids to connect five homes, which were on private septic systems to the new sewer. This brought the total approved contract amount to $1,570,367.00. The city council accepted the base bid and alternatives, and the project was awarded for construction to begin in the summer of 2016.

The 20th Avenue North Sanitary Gravity Bypass was installed between 16-30-feet, 10-20-feet deeper than the existing parallel sewer. Demolition of an existing lift station and utility lines, open cut installation of sanitary sewer, water main and storm sewer connections, and removal and replacement of manholes were all part of the project scope.

Owner selected pilot tube method to minimize construction impacts for residents. Method also presented project savings because of deep installation of the new sanitary sewer

Luke Minger, president of Minger Construction, Inc., stated, "From the beginning, the city wanted to minimize the construction impacts for residents by keeping traffic flowing, allowing access to driveways each night and centralizing construction so only small areas were affected at one time rather than full blocks. A pilot tube installation accomplishes all of these goals."

A total of 2,242 LF of new trenchless sanitary sewers were installed in six drives. Drives four through six were 480, 434 and 473 LF. These extended lengths were the result of the elimination of launch shafts in the design. Minger, confident in his crew's ability, stated, "Not every pilot tube contractor is up to this kind of undertaking, but because of our guided boring experience through all kinds of adversity, I knew that my crew was up to the challenge."

Minger crews mobilized in June of 2016. Work for the new gravity bypass sewer took place in the right of way along North 22nd Street and 20th Avenue North.

Minger elected to use their Akkerman GBM 4800 system which can install up to 48-inch outside diameter pipe. The jacking frame is fully customizable; it can be configured with 30-inch or 40-inch stroke cylinders and combinations of one, two, 10 and 14-foot skid extensions for a variety of shaft designs. The GBM 4800 Series jacking frame, skid extensions, thrust block, pipe, and tooling can fit in

> **"I knew that my crew was up to the challenge"**
>
> **- Luke Minger, President, Minger Construction, Inc.**

a minimum 11-foot shaft when installing one-meter length pipe or a 13-foot shaft using two-meter pipe. Contractors can also add an auger adapter assembly, likened to a master push ring, to direct install steel casing with the jacking frame while the auger adapter assembly facilitates the soil discharge in the launch shaft.

The design allowed Minger crews to construct four 12x20-foot trench box launch shafts, allowing for 2-meter pipe segments and extra space for tooling changes.

The pipe that was supplied for the new sanitary was 12-inch inside diameter NO-DIG Vitrified Clay Jacking Pipe (VCP) with a 15.875-inch outside diameter in two-meter segment lengths. Vitrified Clay Jacking Pipe was selected due to its inherent compressive strength, material durability, service life, and availability in both one and two-meter lengths. These segment lengths allow for smaller jacking shafts, which are more economical for deep applications.

The first three runs consisted of 144, 386 and 325 LF. When each drive was completed, Minger crews installed the connecting manholes, removed the shafts, and then moved them to the next location to be poised for the succeeding drive. Minger reported, "This leap-frog method was very efficient and kept things moving forward."

All six runs were constructed with the three-pass method.

With the three-pass method, the first step is to install pilot tubes using the guidance system. Akkerman pilot tubes are hollow, with a dual inner wall. The center ring provides a target sight path. The narrower outer ring allows for lubrication flow to the steering head ports which is released on the outside of pilot tube string to reduce jacking forces.

A steering head containing the LED target is affixed to the lead pilot tube and advanced as pilot tubes are added to the pilot tube string. As this happens, the steering head rotates and displaces the ground.

Concurrently, the operator views the target on the monitor, mounted to the jacking frame. The operator assesses the target's position and makes steering corrections as necessary to establish an accurate bore path for the pilot tubes. The operator also controls the hydraulic values on the gearbox for jacking, rotation, and advancement of tooling.

When the steering head reached the reception shaft, the crew began adding 16-inch temporary casing and augers which matched the outside diameter of the final product pipe, representing the second pass. The augers excavated the remaining soil in the annular space and moved it

to the launch shaft for removal. As each casing and auger segment was added and advanced, the pilot tubes were removed from the reception shaft.

The third and final step was to install the 12-inch VCP. As the pipe advanced forward, the casing and auger sections were removed from the reception shaft. When the product pipe reached the reception shaft, the drive was complete.

In addition to installation depth, the biggest challenges to minimize construction impacts were equipment and pipe staging. Minger states, "In order to maintain accessibility, material and equipment had to be staged strategically so that we were not blocking driveways or setting equipment or materials on people's lawns. This required good pre planning with suppliers to guarantee that materials arrived when they were needed."

The clay ground conditions were ideal for a pilot tube installation, with relatively low jacking forces. Often additional tooling like a reaming head or bearing swivel are added to the tooling string between the casing and auger and final product pipe, but they were not necessary on this project.

As a safeguard on the last three long runs, crews used BORE-GEL® bentonite lubricant which ported through the steering head during the pilot tube pass. The lubricant kept the jacking forces low and assisted to facilitate the longest drives.

The fourth and longest run of 480 feet is a record for NO-DIG VCP. With the Akkerman GBM guidance system, line and grade can be maintained within a quarter of an inch at distances of approximately 400 LF. Because of the project's ideal ground conditions, a clear target sight path, and operator skill, the distance was accurately achieved with repeated success on the 473 LF drive.

Minger crews finalized the remaining project construction and moved out on November 3, 2016.

Minger reports, "The residents were pleased with the owner's decision to go with trenchless technology and our attention to minimizing impacts allowed life to go on as normal as possible during the construction of the deep utility."

Wolfe concludes, "The City of Fort Dodge and the residents around 20th Avenue North were very pleased with the outcome of the project. Minger Construction, Inc. did an exceptional job with staging and management of the project construction which really did minimize the project's impact on citizens."

Since completion, the City has experienced several large rain events and has not needed to deploy bypass pumping equipment in this area.

ABOUT THE AUTHOR:

***Laura Anderson** is Director Marketing and Communications with Minnesota underground trenchless solutions manufacturer Akkerman in Brownsdale, MN.*

***NOTE:** This article originally appeared in the May 2019 issue of Trenchless Technology. It can be viewed at TrenchlessTechnology.com.*

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LIVONIA WEST COMMERCE CENTER RELINE, LIVONIA OHIO

By: Don Herbert, Contech Engineered Solutions

- **Owner:** Ashley Capital
- **Contractor:** National Reline Services LLC
- **Technical Description:** DuroMaxx SRPE Liner Pipe, 54-inch, 1,000 LF
- **Installation:** October, 2018

Using shorter pipe lengths eliminated the need for any access pits within the existing storm sewer line

The Industrial Corridor of Livonia, Michigan is attractive to developers and manufacturers alike for its strategic location and convenient access to M-14, I-96 & I-275 freeways.

The six-square mile corridor includes over 30 million square feet of industrial and warehouse space and is comprised of industry leaders in manufacturing, technology, automotive, aerospace, logistics and retail. Beginning in 2017, 3 million square feet of industrial space was added to the corridor. Local commercial real estate developer, Ashley Capital, redeveloped three major sites in Livonia; the Livonia Distribution Center, Livonia Corporate Center and the Livonia West Commerce Center.

The Livonia West Commerce Center was the former site of the old GM Livonia Spring and Bumper Plant, which had sat empty since the late 1990s and was leveled in 2001. The facility had a variety of environmental hazards associated with the site. Over the years, groundwater infiltrated into the storm sewer which was a point of potential environmental concern for the redevelopment of the site. The storm sewer system also had several elbows within the original design that would need to be addressed in any reline solution. Ashley Capital looked at various options to reline the existing 72-inch and 66-inch concrete storm sewer line.

The original solution included new access pits for placement of the new pipe. It was deemed "not feasible" based on the fact that groundwater dewatering would be required and would add significant expense to the relining of the existing storm sewer pipe.

An alternative solution was also considered and then discarded given the excessive cost, increased installation time necessary, and the uncertainty that it would add any structural enhancement to the host pipes. This solution incorporated cleaning the original pipeline and then relining using a chemical epoxy coating. The ability to use small sections of pipe and reline from one end seemed the most efficient way to implement the best solution.

Ashely Capital first considered utilizing Contech Engineered Solutions in a design-build approach when they realized that the manufacturer was able to offer a solution with DuroMaxx® SPRE liner pipe. By manufacturing 7-foot pipe segments that would allow access from an existing 9-foot diameter, concrete catch basin on the east end of the storm sewer line, they were able to eliminate the need for any access pits within the existing storm sewer line. This change added three times the original number of pipe joints to complete the project but was deemed to be the most cost-effective solution to a difficult relining project. This solution saved significant engineering time and total installation costs and allowed the project to move forward.

Contech provided a detailed plan for the installation, grouting and testing activities. Contech also outlined the required elbows which consisted of flanged pieces that were

"The support we received during installation and testing of the DuroMaxx SRPE liner pipe was excellent."

- Ed Mickel, National Reline Services, LLC

Seven foot lengths of DuroMaxx SRPE liner pipe were lowered into the existing storm system

Each piece was moved and blocked along the required 1000-foot length

lowered into the existing storm sewer system and bolted together underground thus allowing for 54-degree and 36-degree elbows to be placed without expensive excavation activities.

Installation of the liner system occurred entirely from the east end of the storm sewer run where the 7-foot lengths of DuroMaxx SRPE liner pipe were lowered into the existing storm system. Each piece was moved and blocked along the required 1000-foot length with each corresponding piece of pipe joined together using a pulley and blocking system to pull each pipe piece together. Once the entire length of pipe was set, the system was grouted in stages and tested to project specifications.

To facilitate testing the pipe, Contech and the project contractor, National Reline Services, LLC, created a unique testing protocol that would show water infiltration was minimized into the new pipe without conducting a difficult and dangerous air test of the new pipe system.

Ed Mickel from National Reline Services, LLC stated, "We are pleased with the efforts from Contech on this project as the design team required some innovative techniques to create elbows that could be placed in-situ. The support we received during installation and testing of the DuroMaxx SRPE liner pipe was excellent."

ABOUT THE AUTHOR:

***Don Herbert** is the Account Manager and Director for Rail Markets at Contech Engineered Solutions. He joined Contech in June of 1991 and has held many positions within Contech including sales engineer, regional sales engineer, area technical manager and most recently - area manager drainage. Don has a B.S. degree in Civil Engineering from Manhattan College and M.S. degree in Civil Engineering from Texas A&M University.*

CONTECH® ENGINEERED SOLUTIONS RELEASES A NEW RELINE DESIGN TOOL

Contech® Engineered Solutions' new Design Your Own Reline (DYOReline™) tool helps engineers and contractors determine the viability of relining a culvert or drainage system based on site specifics. The recently launched mobile-friendly online tool analyzes a site and recommends a solution in just a few simple steps. The recommendations include design specifications, standard details and reline considerations to help prepare for estimates and project meetings, providing immediate benefits that allow our customers to be even more efficient with their time. This tool is free and available at www.conteches.com/dyoreline. DYOReline™ users can log the geocoordinates of the project and upload photos while onsite. The tool also provides CAD and PDF files that can be used for creating plans and specs or estimating total installed costs. Users of the tool can include multiple systems per project, upload project specific documents, and save them for future use.

"Our customers want the benefits of reline but struggle to sort through the jumble of technologies and options available," said Bob Kerr, Vice President of Contech's Plastic Pipes. "Our new DYOReline tool gives them the ability to tap into Contech's 120-year history and start to sort through the haze in order to deliver the best solution at the best cost. I am proud of this tool and excited to see how it helps our customers."

The new DYOReline™ tool joins Contech's other online tools including the DYODS® and DYOB® design tools and is the first automated tool for Contech Pipe Solutions.

TRENCHLESS MINIMIZES DISRUPTION AT O'HARE AIRPORT:

L.J. Keefe Co. Combine Guided Boring & Pipe Ramming

By: TT Technologies Inc.

O'Hare International Airport, Chicago, Ill., is one of the world's busiest airports, which made the use of trenchless technology the ideal choice for limiting disruption during a recent casing installation project. As part of a modernization program, new, upgraded utilities are being installed at locations throughout the airport grounds. The initial phase of the project called for installing two (2) 36-inch steel casings a total distance of 1,000 feet to house a watermain; and two (2) 48-inch steel casings 640 feet for the placement of multiple electrical duct banks. The casings would travel under the various taxiways of the airport itself.

L.J. Keefe Company, Mount Prospect, Ill., one of the premier underground contractors in the country, was tasked with performing the work. L.J. Keefe Co. can trace its origin back to 1892, when Luke John Keefe, Sr., grandfather of its current president, founded a plumbing business in Chicago. Since that time, construction has been the family business for the last four generations concentrating its work in trenchless construction.

Initially, the project was specified as auger boring. However, the saturated, soft silt soils proved to be too difficult for that particular method. After failing to make progress with the auger bore after 40 feet for the 48-inch casing, the decision was made to submit a change order to proceed with a combination of pilot tube guided boring and pneumatic pipe ramming.

Trenchless Specialist Rick Melvin from trenchless equipment manufacturer TT Technologies, Aurora, Ill., explained, "The use of a pilot tube guided boring machine (GBM) in combination with pipe ramming to install casings longer distances and on grade. This can be a very effective pairing of trenchless technologies in certain situations and help overcome difficult soils. Ramming can be a strong choice in challenging conditions because it is capable of displacing the soil without creating voids or slumps."

Saturated silt soils proved difficult

Pipe Ramming and Guided Boring Pilot Tube

According to Melvin, pipe ramming is a very versatile installation method that can be paired with other trenchless technologies. He said, "Pneumatic pipe ramming provides a percussive power element that can really complement other trenchless technologies. For directional drilling for example, pneumatic pipe rammers have been used in a variety of assist methods for years. The percussive action of the rammer in the back of drill string can help during difficult pullbacks. Rammers can also be used to extract stuck drill pipes and drill stems. With guided boring, the GBM establishes a very specific on line and grade path. Basically, once that path is in place, the pipe rammer is used to drive in the casing following that line and grade."

Ramming tools on their own are capable of installing 4- through 80-inch diameter steel pipe and steel casings. Diameters up to 148 inches have been successfully installed using large scale ramming equipment. Ramming requires minimal working depths and has proven effective for horizontal, vertical, and angled applications. With the addition of the GBM pilot tube technology with its advanced guidance system, pipe ramming can be used to install casings on line and grade.

Melvin said, "The major components of this process include a line and grade control system and a hydraulic jacking frame. The line and grade control system uses a camera mounted theodolite and a pilot tube target with LED's, which display on a monitor. As the pilot tube is pushed into place, its line and grade are continuously monitored by a theodolite optical guidance system. The operator is able to watch the advance of the pilot tube on the guidance system monitoring screen and adjust the pilot tube heading as necessary to stay on target to the receiving pit."

The GBM utilizes a jacking frame to generate the force and rotational torque needed to push and steer the pilot tube segments and steering head through the ground. A casing adapter is connected to the first string of pilot tubes. The objective

is to install the casing following the line established by the pilot tube. As each length of casing is welded together and auger-bored/rammed in place, the pilot-tubes are being retrieved at the receiving pit.

O'Hare Modernization Program

This section of the O'Hare Modernization Program included the installation of two separate casings, in two separate locations. Approximately 640 feet of 48-inch casing was being installed to house an 18-way, 5-inch diameter electric service duct package under Taxiway T and Taxiway R. Approximately 1000 feet of 36-inch steel casing was being installed to house a 20-inch ductile iron pipe (DIP) water main under Taxiway SS and Taxiway T.

According to Melvin, the project needed some additional redesign. He said, "The original plans called for each of the casing runs to be divided into two separate installations from the outer edge of each run and to a central pit. But under the revised plan, a center pit would be established for each run and the installations would travel from the center pit out to receiving pits. This made everything more efficient and really more effective. Using a central location meant we could cut the number of launch pits in half. That's significant when you consider the amount of equipment moving and set up time that saves."

The 48-inch casing was first to be installed. A center launch pit and two receiving pits were established. Beam and lagging shoring was used on this installation with pit depths reaching 24 feet deep. The project was divided into one segment of 260 feet and another segment of 380 feet.

The 4-inch OD pilot tubes were installed on line and grade for the entire length of the run. Steering the pilot tube in the difficult soil conditions was challenging. Once the lead pilot tube reached the receiving pit, an intermediary 24-inch casing was welded to the rear pilot tube using a spoke adapter. The 24-inch casing was required to be installed the length of the run to make installation of the final 48-inch casing easier given the poor soil conditions. At this point the transition from guided boring to pneumatic pipe ramming took place.

The guided boring machine was removed and the pipe ramming system was placed in the center pit. Crews set the tracks for a 48-inch auger-boring machine that was used in combination with the ramming process to remove spoil from the casing during installation. A 24-inch diameter pipe ramming tool was used along with two (2) 1,600 cfm air compressors. The connection between the pipe ramming tool and the casing adapter was made through standard 24-inch diameter ramming gear. As the 48-inch casing was installed, crews would remove the rammer and clean the spoil out with the auger every 120 feet.

Once the 24-inch casing was installed, a similar adapter was used to transition to the 48-inch casing and then to the pneumatic pipe rammer. Ramming times for each 20-foot section of 24-inch casing, as well as the 48-inch casing, took approximately 45 minutes to 1 hour, with welding times for each new section averaging 2.5 to 3 hours. Once the installation was completed in one direction, the process started again in the opposite direction from the same pit until both lengths of 48-inch casing were installed and then joined in the center pit.

The process was repeated for the installation of the 36-inch casings in a different section of the project area. Trench boxes were used to shore up the center launch pit and receiving pits for the 36-inch casing installation. That project was divided into one segment of 537 feet and another of 469 feet. Similar installation times were achieved on the 36-inch casing. However, a 24-inch intermediary casing was not required on that portion of the project.

"Using a central location meant we could cut the number of launch pits in half."

- Rick Melvin, Trenchless Specialist, TT Technologies.

Extensive shoring was required

HDD ON DISPLAY

Midwest Mole Tackles Water Line Project at the National Mall

By: Mike Kezdi, Trenchless Technology

If you're one of the more than 25 million people who visit the National Mall & Memorial Parks in Washington, D.C., you can thank Midwest Mole and horizontal directional drilling (HDD) technology for your next sip of cool, refreshing water from a fountain or a faucet.

Midwest Mole, an Indianapolis-based trenchless contractor, was selected by the National Park Service (NPS) to complete the waterline upgrade in West Potomac Park. Started in January 2018, the $4.9 million project provides a much-needed improvement to the aging and under-sized water distribution system in the park. Midwest Mole handled the installation of more than 17,000 LF of 2- to 12-inch high density polyethylene pipe (HDPE) via HDD.

Location, Location, Location

The new waterline replaces existing infrastructure that is 95 to 100 years old and is sized to provide adequate flows and pressures for future fire protection systems for all facilities in accordance with National Fire Protection Association standards.

According to information provided by the NPS, the project replaced several miles of water piping, backflow preventers and fire hydrants on the west end of the National Mall, from the west end of the National Mall, from the Washington Monument grounds to the Lincoln Memorial, and through West Potomac Park between the Jefferson Memorial and the Lincoln Memorial. The project also improves water distribution in all NPS facilities in West Potomac Park south of Constitution Avenue and west of 14th Street.

Midwest Mole replaced piping that was 95- to 100-years-old with HDPE. Pipes ranged from 2- to 12-inch diameter

It's not every day an HDD operator can say they worked in front of the Lincoln Memorial

Midwest Mole project engineer Liviu Ciocan says that although the crew did not have any major difficulties completing the project, the estimated 12-month completion deadline was extended to May 2019 because of the government shutdown and change orders to address new tie-ins due to poor as-built designs.

"This is the second stage of the project. The first stage was a mix of HDD and open cut and was farther away from the monument and visitor traffic," says Ciocan. "Here, they determined that less disturbance meant for decreased impact on all of the visitors and their experiences.

It was the right decision because you could hardly see us working in the park, and to my knowledge, no one complained about our presence."

This is impressive and a testament to the less invasive nature of trenchless technologies considering crews - for the majority of the project - worked a 7 a.m. to 5 p.m. shift. Exceptions were made for critical tie-ins. One of those critical tie-ins required about a month of overnight work because the NPS did not want to close Jefferson Drive, as it is a busy access road for the area.

Trenchless Toolbox

To complete the project Midwest Mole relied on its Vermeer D36x50DR Series II Navigator Drill equipped with a DigiTrak F5 locating system for the bores. The drilling fluid system was comprised of two Vermeer MX240 Mixing Systems and pipe fusion was handled with a McElroy Mfg. TracStar 500 Series 3 fusing system. Ancillary equipment included a Caterpillar 420E IT backhoe loader and a Kubota SVL 90-2 skid steer.

"While drilling we have mostly encountered silty clay. There were a lot of obstructions though, from lumber and old abandoned drains to concrete footers and rebar," says Ciocan. "It seems the entire area used to be a swamp back in the day, and it was backfilled to the actual grade. In any case, a good combination of bore gel, platinum pack and soda ash proved adequate for these ground conditions."

He adds that because the as-builts were unreliable, Midwest Mole hired a private locating company to survey the project area. Even with that added layer of investigation, the crews still hit footers for what appear to be old building foundations dating to before World War II.

"Locating these obstacles became a trial and error process," he says. "The crews had to excavate the area every time a drill bit would hit an obstruction."

Even with these questionable as-builts, the Midwest Mole crew was able to complete the project without any major incidents and zero utility strikes.

For spoils and mud removal for the majority of the project, Midwest Mole used its own Tornado Global Hydrovacs vac truck. Ciocan adds that, to handle

Most of the underground obstructions crews encountered were due to as-builts that did not document footers for barracks

"Less disturbance meant for decreased impact on all of the visitors and their experiences. It was the right decision..."

- Liviu Ciocan, Project Engineer, Midwest Mole

Impressive project was a testament to the less invasive nature of trenchless technologies

Midwest Mole crew in front of the Washington Monument

the change order work at the end of the project, it hired Badger Daylighting for vac truck work since the Midwest Mole unit had returned to Indianapolis.

Congestion Concerns

Because of the heavy foot and vehicular traffic to this section of the Nation's Capital, Midwest Mole staged from a central location between Independence Avenue SW and Maine Avenue

SW near the Tidal Basin. It is here that Midwest Mole contained its drilling spoils in two, 10,000-gallon roll-off containers. When full, a third-party hauling service handled disposal. Had Midwest Mole employed its own vac truck for disposal it would have been a two- to three-hour round trip.

While soil conditions, undocumented utilities and mud disposal are all common areas of concern on HDD projects, probably the biggest non-typical challenge was handling the traffic - for events big and small - around the National Mall. During particularly high-traffic events, like the Cherry Blossom Festival and the 4th of July, it took a bit longer to mobilize to the sites and the Midwest Mole crew had to be prepared to answer the occasional question from passers-by.

"I think our guys handled this extraordinarily well and our foreman took the time to explain what was going on when people asked, 'What are you doing in my park?", Ciocan says. "Communication between us, AECOM [construction manager] and the National Park Service was a critical factor. Because of this open line of communication, the project worked."

ABOUT MIDWEST MOLE, INC.:

***Midwest Mole** is a responsive, innovative and dependable Trenchless Technology company, based in Indianapolis, IN. With over 30 years of experience in the trenchless business, Midwest Mole continues to provide municipal, utility, highway, railroad and private sector clients throughout the U.S. with the best quality service in the industry.*

***NOTE:** This article reprinted with permission from the Trenchless Technology Horizontal Directional Drilling Guide 2019 Supplement. It can be viewed at TrenchlessTechnology.com. Mike Kezdi is associate editor of Trenchless Technology.*

BAMI-I UPDATE

4-day CTAM workshop held in Atlanta GA September 2019

By: Buried Asset Management Institute - International (BAMI-I)

The Buried Asset Management Institute (BAMI) was established in the Department of Watershed Management (DWM) for the City of Atlanta in 2003 as a result of the leadership and inspiration of Mayor Shirley Franklin and DWM Commissioner Jack Ravan. In 2004, BAMI transitioned to BAMI-International (BAMI-I). BAMI-I is a non-profit corporation whose main purpose is to educate and assist those who have an interest in applying best buried asset management practices to extend the life and efficiency of their assets.

"The principles of asset management apply to all different types of buried assets including water and wastewater systems, gas distribution pipes, electric cables."

In 2006, BAMI-I was selected for U.S. EPA Cooperative Agreement (CP 83 282901-1), which was completed in 2008. As a result of it, BAMI-I launched the Certificate of Training in Asset Management courses (CTAM 100-400). This program consists of 4 online courses plus a 2-level certification program (Associate Water Asset Manager (AWAM) & Professional Water Asset Manager (PWAM). So far, individuals from 16 countries have enrolled in the CTAM program.

In August 2015, BAMI-I was requested by the Division of Water Infrastructure (DWI) of North Carolina Department of Environment and Natural Resources (NC - DENR) to conduct a 4-day course to teach CTAM 100-400 in Raleigh, NC. Also, BAMI-I was requested to conduct a 4-day CTAM course by Rural Community Assistance Partnership (RCAP) in Columbus, OH in May 2017, and by the Underground Construction Technology Association North Texas Chapter (UCTA-NT) in Lewisville TX November 2018.

Atlanta's DWM has become a national and international leader in learning and applying asset management principles. This leadership was again demonstrated when BAMI-I was honored by an invitation from Atlanta DWM Commissioner Kishia Powell to conduct a 4-day CTAM classroom course in September 2019. The workshop was the fourth four-day offering of the exclusive four part CTAM course, with one course level covered per day.

It was a great success and again made clear that the passion and commitment to Atlanta's water program continues to this day under the leadership and inspiration of Mayor Keisha Lance Bottoms and Commissioner Powell. All 34 attendees successfully completed all requirements to become BAMI-I AWAM certified.

For more information please visit www.bami-i.com and contact Dr. Tom Iseley, dtiseley@latech.edu.

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FORT WAYNE IMPLEMENTS 100-YEAR WATER MAIN REPLACEMENT PROGRAM

PE 4710 HDPE Pipe Selected to Solve Breaks and Leaks

By: Plastics Pipe Institute (PPI)

Faced with an aging water delivery system that has experienced an average of 398 main breaks per year during the last ten years, the Fort Wayne Water Utility has embarked upon a total pipe replacement program to improve reliability and customer satisfaction. Averaging nine miles being replaced a year, contractors hired by City Utilities primarily use horizontal directional drilling (HDD) to replace legacy mains with high-density polyethylene (HDPE) pipe. The initiative is supported by water rates, not taxes or other funding options.

"Fort Wayne, like many other Midwestern cities, grew rapidly into the 1960's," said Andrew Schipper, P.E., water engineering manager for Fort Wayne City Utilities. "Unfortunately the piping materials installed between 1940 and 1960 contained less metal and employed newer manufacturing techniques that have not stood the test of time or corrosion. These pipe materials are now responsible for the majority of main breaks in our system. About ten years ago, cast iron mains comprised nearly 70 percent of our distribution system. Today, when we include ductile iron and other metallic pipes, about 70 percent of our 1,400 miles of water main remain subject to corrosion. Therefore, Fort Wayne has a long-term need to replace water mains. We involved rate payers, obtained their support, and implemented a water main replacement program."

Fort Wayne is fortunate to have an extensive electronic record of nearly 11,000 main breaks dating back to 1974. "We have leveraged this information to prioritize which mains to replace first. We are able to look at mains with poor break history over the past 43 years as well as mains that are breaking now. Using this prioritization methodology to drive the main replacement program resulted in only 314 main breaks in 2016," Schipper observed.

The pipe used in the main replacement program is now entirely HDPE PE 4710, DR 11 with HDPE fittings. Before the decision to use HDPE pipe exclusively, Schipper and his department ran pilot

HDD used to install six-inch diameter water main from 500 foot reels. City crews have become skilled with electrofusion

> **"PE 4710 HDPE pipe is tough, durable and flexible, meeting AWWA C906 and ASTM F714 standards."**
>
> **- Camille Rubeiz, P.E., F. ASCE, Plastics Pipe Institute, Inc. (PPI)**

projects with other types of pipe including Fusible PVC® and Certa-Lok® PVC pressure pipe.

According to the Plastics Pipe Institute, Inc. (PPI), the major North American trade association representing all segments of the plastics pipe industry, PE 4710 is the highest performance classification of HDPE piping material for water applications. "PE 4710 HDPE pipe is tough, durable and flexible, meeting AWWA C906 and ASTM F714 standards," stated Camille George Rubeiz, P. E., F. ASCE, senior director of engineering for the Municipal and Industrial Division of PPI.

"PE 4710 compounds offer an excellent level of performance. This means PE 4710 HDPE pipe can be used with increased flow capacities plus increased resistance to surge pressure, fatigue and slow crack growth. The ANSI/AWWA C906-15 standard includes PE 4710 for sizes up to 65 inches and recognizes the increased durability and reliability of HDPE pressure pipe used in water systems."

"Just about all the replacement projects we have done are installed with directional drilling techniques," explained Landon Geiger, project manager for a number of main replacement projects for Fort Wayne. "We've continued to evaluate different HDPE installation methods such as pipe bursting. Due to the right-of-way layout in Fort Wayne we can generally find an alignment for a new main. Therefore, main replacement has been more economical than bursting an existing pipe. I would like to try it but haven't yet had a situation where a new main alignment is cost prohibitive."

"The contractors here are knowledgeable about drilling in Fort Wayne and they tend to know what's underground. Fort Wayne has some pretty stiff clay that is usually good for drilling. Once contractors get their mud mixes just right, we've actually had to slow down the drilling operation so the crews making service reconnections can catch up. This is a good problem to have," said Geiger.

On a number of multi-mile HDPE pipe replacement projects, six-inch diameter water main has been installed from reels on which 500 feet of pipe is coiled. Installation is done by local contractors who can also do the fusing of the pipe sections along with the in-house crew. There are typically five to six people on a crew with work continuing throughout the year, except in severely cold weather.

Fort Wayne has transitioned from using ductile iron fittings to using HDPE fittings on main replacement projects. "Historically we've used ductile iron fittings with HDPE pipe for hydrant assemblies and for other connections," explained Geiger. "We started comparing the cost to use HDPE from the hydrant all the way back to our cut-in at the existing cast iron main. We were pleasantly surprised to see that the price for HDPE was much more competitive than the ductile. On one replacement project, we allowed the contractor to bid both materials. The result was that using the HDPE fittings on this particular $2 million project saved $33,000. HDPE fittings are a win-win for us. They give us a longer lasting design without joints subject to corrosion as well as being cost effective for rate payers."

During the past three years, the Fort Wayne water utility has invested just under $16 million in eleven projects that have replaced a total of nearly 30 miles of main. The investment represents all costs assigned to the projects including design, construction, construction management, and inspection, along with maintenance labor provided by City Utilities employees and parts from in-house inventory. As part of the main replacement projects 3,124 private services were replaced. There are a total of 101,000 services in the Fort Wayne system.

"Working closely with contractors on main replacement projects has helped City Utilities' maintenance department become skilled with fusion and our crews are now able to electrofuse saddles and couplings, and perform hot taps on HDPE," Geiger observed. "We have a number of hot tapping machines and our maintenance staff is quite skilled at making hot taps. The contractors will excavate the hole and our maintenance staff will insert the tapping saddle, mount the valve, attach the machine, drill it, and be in and out in just a few hours."

According to Schipper, "HDPE provides many benefits for us including being a leak-free system without joints. Plus HDPE has the longest design life of any pipe material available. It's corrosion free, the material is durable and tough, and because the system is installed with HDD it is completely restrained."

ABOUT PPI:

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The Plastics Pipe Institute, Inc. *(PPI) is the major North American trade association representing all segments of the plastic pipe industry and is dedicated to promoting plastic as the materials of choice for pipe and conduit applications. PPI is the premier technical, engineering and industry knowledge resource publishing data for use in the development and design of plastic pipe and conduit systems. Additionally, PPI collaborates with industry organizations that set standards for manufacturing practices and installation methods. For additional information, go to the Plastics Pipe Institute's website at: www.plasticpipe.org.*

ARTIFICIAL INTELLIGENCE MOVES SEWER INSPECTION INTO THE FUTURE

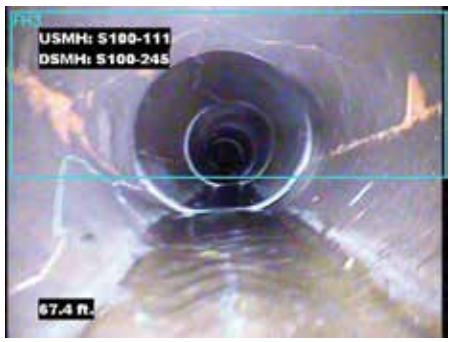
By: Ryan Poertner, Ace Pipe Cleaning, Inc.

These are the early days, but AI will be inspecting the sewers and storm drains sooner than many would think.

Closed-circuit television (CCTV) sewer inspections continue to be an important method of assessing small-diameter pipe conditions worldwide. While the sensor and crawler technology has evolved considerably, one aspect of the process - manual CCTV footage review and analysis – has remained practically unchanged in the last 30 years. This process is labor-intensive, expensive, and no one wants to spend hours on end looking at the inside of a sewer pipe – yet there currently is no other way. But a change may be on the horizon.

Molfar.AI, an artificial intelligence (AI) company focused on automation of CCTV sewer inspections, is working to deliver an AI solution to do just that. Currently in beta testing by Ace Pipe Cleaning, Inc. (a Carylon Corporation company located in Kansas City, Missouri) Molfar's cloud solution combines machine vision with cutting edge artificial intelligence technology to automatically detect the standard pipe faults and defects, extract the relevant snapshots and deliver the results, with the relevant clock references and distances, in a database-ready report which is easy to import into the existing reporting environment. Molfar's AI decision support solution is built to increase human productivity rather than take humans out of the equation. Once the AI analysis is complete, the resulting report and annotated snapshots are presented for the reviewer for validation. This spares the reviewers the need to watch CCTV videos at length and instead allows them to focus on the things which humans particularly excel in – drawing conclusions and making decisions.

The benefits of automated solutions are readily apparent. Cost-efficient and fully automated, it is available 24/7 and can provide up to 10-times the speed advantage in comparison with the human operator. Along with the consistency offered by an AI-powered system, it is a particularly powerful feature. No two human operators will code the same video in the same way – but AI will consistently



Fracture Hinged

Joint

Tap

produce the same results. The best part of AI is that it is continually trained and updated by the operators input and conclusions making it smarter and more accurate with each update.

Such an AI solution can be deployed to automate the quality assurance process and review the backlog of CCTV footage gathering dust in many US municipalities due to cost and labor shortages or provide a near real-time intelligent decision support tool to contractors' data teams working to complete pipe condition assessments. While the current solution is tested in the cloud, it does not have to stop there. The models used in Molfar's system have been selected to be portable to a standalone computer workstation at the operator's truck or to a single-board computer/embeddable hardware, to enable future integrations with the existing crawler hardware.

For now operators must drive the trucks and operate the crawlers, perform footage analysis, and generate report production (a cognitive repetitive task); however this is perfectly suited for AI automation. Machines see differently from how people see and work on aligning the human output and machine output to make the AI solution seamlessly embedded into the industry workflow continues. These are the early days, but AI will be inspecting the sewers and storm drains sooner than many would think.

This spares the need to watch CCTV videos at length and instead allows focus on human strengths – drawing conclusions and making decisions.

ABOUT ACE PIPE CLEANING, INC.:

Ace Pipe Cleaning, Inc. (www.acepipe.com) is the premier provider of turnkey services in the Midwest to maintain critically important environmental infrastructure and help municipalities, utilities, and industrial companies comply with environmental regulations.

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Bryan P. Dobson
Operations Manager
m: (816) 807-7947
o: (816) 241-2891
bdobson@acepipe.com

SEWER DIVISION

Pipe Assessment

Pipe Cleaning

Trenchless Rehabilitation

Ryan Poertner
General Manager/St. Louis Division
(314) 368-1574
rpoertner@acepipe.com

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6601 Universal Avenue
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