MIDWEST JOURNAL OF

TRENCHLESS TECHNOLOGY 2016

OFFICIAL PUBLICATION OF THE MIDWEST SOCIETY FOR TRENCHLESS TECHNOLOGY

Minneapolis Pilot Tube

Learning Opportunity

Visionary Owner

Over 25 Years Serving the Midwest and the World!

Trust the international pipe inspection experts from right next door.

Headquartered in Indiana, R&R has been providing unique inspection services to the municipal, nuclear, petrochemical, and industrial sectors throughout the world since 1991. We have strived to be your single source subsurface inspection contractor utilizing the latest in technology coupled with a full staff of trained professionals. Taking on the tough and near impossible projects is our specialty. R&R Visual has pioneered many of the technologies that they use and many have become international standards for sewer inspection and other types of pipeline inspections. We have the ability to inspect pipelines from 1 inch to 30 feet plus in diameter, drilled shafts from 10 inch to 20 foot diameter, and nearly any other subsurface cavity, cavern, or hole.

SERVICES

- Video Inspection
- Sonar Inspection
- Lateral Launch Video Inspections
- Laser Pipe Profiling
- Downhole Inspections
- 360º Scanning Cameras
- Manhole/Confined Inspections
- Smoke Testing
- Deep Tunnel Inspections
- Off-Road Capability
- Eco-Sensitive Inspections
- Drilled Shaft Inspections
- Explosion Proof Equipment
- High Security Qualified
- Petro/Nuclear/Industrial
- High Pressure Cleaning
- Inclination Reporting

R&R VISUAL
Subsurface Search Team

www.seepipe.com Rochester, Indiana 800-776-5653

Environmentally sensitive projects are our specialty!
Tough, and near impossible jobs call for creativity and experience. Let us help you complete your project on time and in-budget!

CONTECH®
ENGINEERED SOLUTIONS

SPR™ PE
Yes, we can manufacture a new pipe inside the host with equipment that fits through a 22" manhole opening!

CONTECH®
ENGINEERED SOLUTIONS

RELINE DONE RIGHT™

With over 70 years of relining experience, **Contech Engineered Solutions** provides permanent, fully structural (the way a structural engineer uses the term) solutions based on time-proven design methods. Since we've been around the block a few times, we don't play games with the hydraulics or structural design. Knowing pipe assessment, structural design & hydraulic analysis is what we do. The result – the right solution for your project needs - done right, on time and under budget.

www.ContechES.com/reline | 800-338-1122

Proven in the Trenches – And in Trenchless Installations

As more municipalities return to VCP, NCPI is leading the way in the advancement of trenchless techniques for the wastewater industry.

Vitrified clay jacking pipe is the right choice for trenchless installations:

- Watertight, leak-free joints, even when subjected to significant head pressure associated with deep tunnel installations
- Unsurpassed 18,000 psi average compressive strength
- Nearly one million linear feet of jacking-pipe has been produced by U.S. manufacturers
- The only pipe suited for sanitary environments with material properties that do not degrade with age

Visit our YouTube channel to see video of recent trenchless installations.

VCP manufacturers are proud to provide the longest lasting, most durable and sustainable sewer pipe ever produced. Find out more about the benefits of VCP by visiting our website or calling our office.

VCP Engineering Manual

Visit our website to download the Vitrified Clay Pipe Engineering Manual. This edition of the engineering manual includes much more information on trenchless techniques using vitrified clay.

NCPI

National Clay Pipe Institute

www.ncpi.org • **262-742-2904**

CONTENTS

Features:

Also:

Departments:

PUBLISHER

A to B Publishing Inc.

662 Dudley Avenue
Winnipeg MB
R3M 1R8

EDITORIAL

Andrew Pattison
204.275.6946
marcomap@shaw.ca

ADVERTISING SALES

Bert Eastman
204.997.6371
bert@atobpublishing.com

PRODUCTION TEAM

COLLECTIVE spark COMMUNICATIONS

381 Churchill Drive
Winnipeg, MB
R3L 1W1

DIRECTOR

John Vandale
204.782.7004
jvandale@collective-spark.com

ART DIRECTOR

Ryan Germain
204.806.7123
ryan.germain@gmail.com

CLIENT SERVICES

Janet Stevenson
204.782.2436
jstevenson@collective-spark.com

Printed 10/16 in Canada

Cover photo courtesy Minger Construction

MESSAGE FROM THE PRESIDENT

ADVANCING THE SCIENCE AND PRACTICE OF TRENCHLESS TECHNOLOGY

Jeff Boschert, P.E., MSTT President

We are happy to be celebrating the fourth annual publication of the Midwest Journal of Trenchless Technology, because it is evidence of your continued involvement and support.

Our History. The idea for this organization began at the innovative ISTT worldwide videoconference. An Indianapolis group was assembled and organized by Dr. Tom Iseley with a select group of just over 20 industry attendees. The germination of this chapter was just one result of this meeting. Before the meeting was over, the MSTT was formed encompassing the states of **Michigan**, **Illinois**, **Kentucky**, **Ohio**, and **Indiana**. Once the news was out, other NASTT members asked to join us, and **Iowa**, **Minnesota**, **Missouri** and **Wisconsin** were soon welcomed to our ranks.

MSTT was granted approval to operate as a 9-state regional chapter of NASTT. In the winter of 1996-1997, under the leadership of Mr. Mark Bruce and Dr. Sanjiv Gokhale, the chapter conducted its first programs at university campuses in the cities of Indianapolis, Louisville, Saint Louis, Kansas City, Cincinnati, and Chicago.

Get Involved. Your support is critical. We're proud to have earned that support for the growth of the trenchless industry and our part in it. We encourage you to join the NASTT/ MSTT and get involved. For more information on the annual No-Dig Show, education & training programs and membership see pages 40 and 45.

Member Benefits: 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. http://www.istt.com/

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.

2017 No-Dig Show: The No-Dig Show represents an annual opportunity for education, professional development and industry engagement. I encourage you to attend the 2017 show, scheduled for April 9-13, 2017 at the Gaylord National in Washington, D.C.

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. To apply see https://www.nastt.org/no-dig-show/municipal-scholarships/

Application deadline is November 1, 2016.

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

Sincerely,

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

MSTT SITE

NASTT MIDWEST CHAPTER TM

GREETINGS FROM THE MSTT EXECUTIVE DIRECTOR

Leonard Ingram, Executive Director, MSTT

Welcome to the 4th annual publication of the Midwest Journal of Trenchless Technology 2016. This magazine highlights some of the many trenchless projects performed in and around the Midwest. It shows the successes and continued growth in demand for trenchless projects. It presents some of the new ideas and innovations coming from MSTT members. Please help me thank the Board of Directors of MSTT and their companies for their support throughout the year and for making this journal a reality. The MSTT Board of Directors is listed on page 10.

Since its foundation as a NASTT Chapter, the MSTT purpose has been to "promote education and development of Trenchless Technology for public benefit". To date MSTT has presented a total of 29 two-day seminars in 15 cities throughout the Chapter's nine state Midwest region. Through this active education outreach, MSTT has reached over 1,200 classroom attendees.

MSTT had a very successful "Trenchless Technology, SSES and Buried Asset Management" seminar July 27th – 28th 2016 at The Hyatt Place Detroit/Novi, Detroit, MI. Mr. Bryce Feighner, P.E., Michigan Department of Environmental Quality and Ms. Palencia Mobley, P.E., Detroit Water & Sewerage Department were the Guest Presenters. ASCE Southeastern Michigan Branch was co-sponsor of the seminar. There was excellent networking and learning at the seminar. Details are on page 35.

MSTT is planning a "Trenchless Technology, SSES and Buried Asset Management" seminar for St. Louis MO December 14 - 15 (tentative). We have been to St. Louis several times before and the response was always great. So, please plan to register early to support and attend the seminar. There will be a lot of networking and learning.

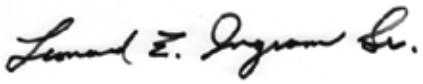
For professionals who are responsible for design, installation and maintenance of infrastructure, certainty is paramount and risk has to be minimized. Knowledge, information and continuing education are vitally important. As trenchless technology leaders it is our mission to educate these professionals with case studies, experiences and demonstrations showing the environmental and social benefits of using trenchless methods. This is why MSTT and NASTT conduct seminars conferences and trade shows. I want to thank all our exhibitors, food sponsors, presenters, guest presenters and ASCE co-sponsor members for their support. MSTT could not have had such an active successful program without them.

I also serve on the Board of Directors of the Buried Asset Management Institute – International (BAMI-I) as Treasurer. Led by founder Dr. Tom Iseley, P.E., Professor at Louisiana Tech University, BAMI-I conducts a four part Certification of Training in Asset Management (CTAM) course that certifies Water Asset Managers as Associate or Professional Water Asset Managers (AWAM and PWAM).

This certification process is very important to protect our water resources through proper knowledge and correct implementation of trenchless technology methods, equipment and techniques. Water Asset Managers who are CTAM certified will have a better understanding of new and existing water system problems and to correct them with the best and most affordable methods available. The CTAM course is available on line at http://bami-i.com. For details, see page 41.

Thank you for your support!

Sincerely,



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

MESSAGE FROM NASTT CHAIR

Dr. Kimberlie Staheli, PH.D, P.E., NASTT Chair

Greetings Midwest Chapter Members! NASTT is having another great year, and I'm excited for our future during my term as Chair of the Board of Directors and beyond. As I'm sure you know, NASTT's 2016 No-Dig Show in Dallas was a huge success as we experienced a sold-out exhibit hall and had excellent attendance.

NASTT would never be where we are today without the dedication and support of our volunteers and our 11 regional chapters. I would like to thank the following Midwest Chapter Members that served on our No-Dig Show Program Committee and volunteered their time and expertise to peer-review each and every abstract submittal to ensure the technical presentations were up to the standards we are known for: Alan Atalah, Rory Ball, Dan Koo, Bernie Krzys, Johnathan Kunay, Marc Lehman, John Milligan, Cathy Morley, Kevin Nagle, Jim Rankin, Jon Robison, Jason Schiro, Chris Schuler, Srini Vallabhaneni and Craig Vandaelle. I would also like to extent a special thank you to the Program Committee members that also served as Session Leaders: Alan Atalah, Jonathan Kunay, Marc Lehman, Jon Robison and Jason Schiro.

This year, we had the honor of recognizing Midwest Chapter Member, Rory Ball, as one of the recipients of the Ralston Award for Young Trenchless Achievement. Rory is a graduate of the University of Illinois and a Senior Project Manager based out of Cleveland, Ohio for Mott MacDonald. Congratulations, Rory!

In addition to the annual No-Dig Show, NASTT provides many trenchless training courses. We are focused on trenchless education and our highly-experienced instructors are dedicated to trenchless education, providing their expertise strictly on a volunteer basis. They donate personal time to travel around North America to provide high quality training on a host of trenchless technologies. I would like to thank MSTT members, Dr. Alan Atalah for serving as an instructor this year for our HDD and Pipe Bursting Good Practices courses; and Dr. Ray Sterling, for serving as an instructor for our Laterals Good Practices Course.

We were excited to visit the Midwest in August for the APWA PWX conference in Minneapolis. During the conference NASTT hosted a panel discussion August 28 on Trenchless Trends in the Midwest. Many thanks to MSTT Member Paul Pasko for moderating and coordinating the session along with the MSTT Members who served on the panel: Jason Holden, Jeff Oliver, Red Pederson and Craig Vandaelle.

During our strategic planning efforts, the Board of Directors identified goals of engaging larger groups of trenchless professionals to participate in the many volunteer opportunities provided by NASTT. These opportunities prove to be very satisfying and rewarding. NASTT has a wide variety of ways to participate that allow involvement at any level. If you are interested in more information, please visit our website at nastt.org/volunteer. There you can view our committees and learn more about these great ways to stay involved with the trenchless community. Please consider becoming a volunteer – we would love to have you get more involved.

NASTT has a very promising future and the Midwest Chapter is stronger than ever. Thank you again for your continued support and dedication to NASTT and the trenchless technology industry.

Kim Staheli

Dr. Kimberlie Staheli
NASTT Chair

MSTT BOARD OF DIRECTORS

Jeff Boschert – *President*

Jeff Boschert, P.E. is the President of the National Clay Pipe Institute (NCPI), a technical resource for sewer system managers and designers of gravity sanitary sewer lines. He holds a BSCE from Missouri University of Science and Technology. Jeff joined NCPI from Missouri DOT in 2004 to serve as the leader of NCPI's trenchless initiatives and has become a leading expert in the field of pilot tube guided boring. In 2012 he took on the added responsibility of conducting research and educational outreach and is now actively working with municipalities as they rediscover the benefits of vitrified clay pipe. In addition to his work with MSTT, he represents the industry on multiple ASCE and ASTM committees. In 2013 and 2014, Jeff presented papers at the NASTT No-Dig show and the ASCE Pipelines conferences. As President of NCPI, Jeff recently completed a comprehensive update of the Vitrified Clay Pipe Engineering Manual.

Chris Schuler – *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 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 rehabilitation solutions for municipalities in need. Ryan has spent his entire professional career working in the water and wastewater rehabilitation fields. Prior to the 5 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 2016 - 2017

UPCOMING TRENCHLESS EVENTS

October 5 – 6, 2016
NASTT Rocky Mountain Conference – Trenchless Elevated 2016
Utah Cultural Celebration Center
Salt Lake City, Utah
Information:
www.trenchlesselevated.com

October 12 – 13, 2016
SESTT Trenchless Technology, SSES & Buried Asset Management Seminar
Miami, Florida
(Date may change)
Information: Leonard Ingram,
sestt@engconco.com

October 17 – 18, 2016
12th Annual Western Regional No-Dig Conference and Exhibition
South Point Hotel
Las Vegas, Nevada
Information:
www.westt.org/events.html

November 1-4, 2016
Geotechnics For Trenchless Construction
Colorado School of Mines
Golden, Colorado
Information:
csmspace.com/events/trenchless

November 9 – 10, 2016
NASTT Northwest Regional Chapter Conference
Fantasyland Hotel,
West Edmonton Mall
Edmonton, Alberta
Information:
www.nastt-nw.com

November 17, 2016
NASTT-NE Northeast Trenchless Conference 2016
UMASS Lowell Inn &
Conference Center
Lowell, Massachusetts
Information:
www.nastt-ne.org/seminars.html

December 7 - 8, 2016
MSTT Trenchless Technology, SSES & Buried Asset Management Seminar
St. Louis, Missouri
(Date may change)
Information: Leonard Ingram,
mstt@engconco.com

January 11 – 12, 2017
Pacific Northwest Chapter 2017 Symposium
Cedarbrook Lodge
Seatac, Washington
Information:
www.nastt.org/calendar

April 9 - 13, 2017
NASTT 2017 No-Dig Show
Gaylord Texan Hotel &
Convention Center
Washington, D.C.
Information:
www.nodigshow.com

March 25 - 29, 2018
NASTT 2018 No-Dig Show
Palm Springs Convention Center
Palm Springs, California
Information:
www.nodigshow.com

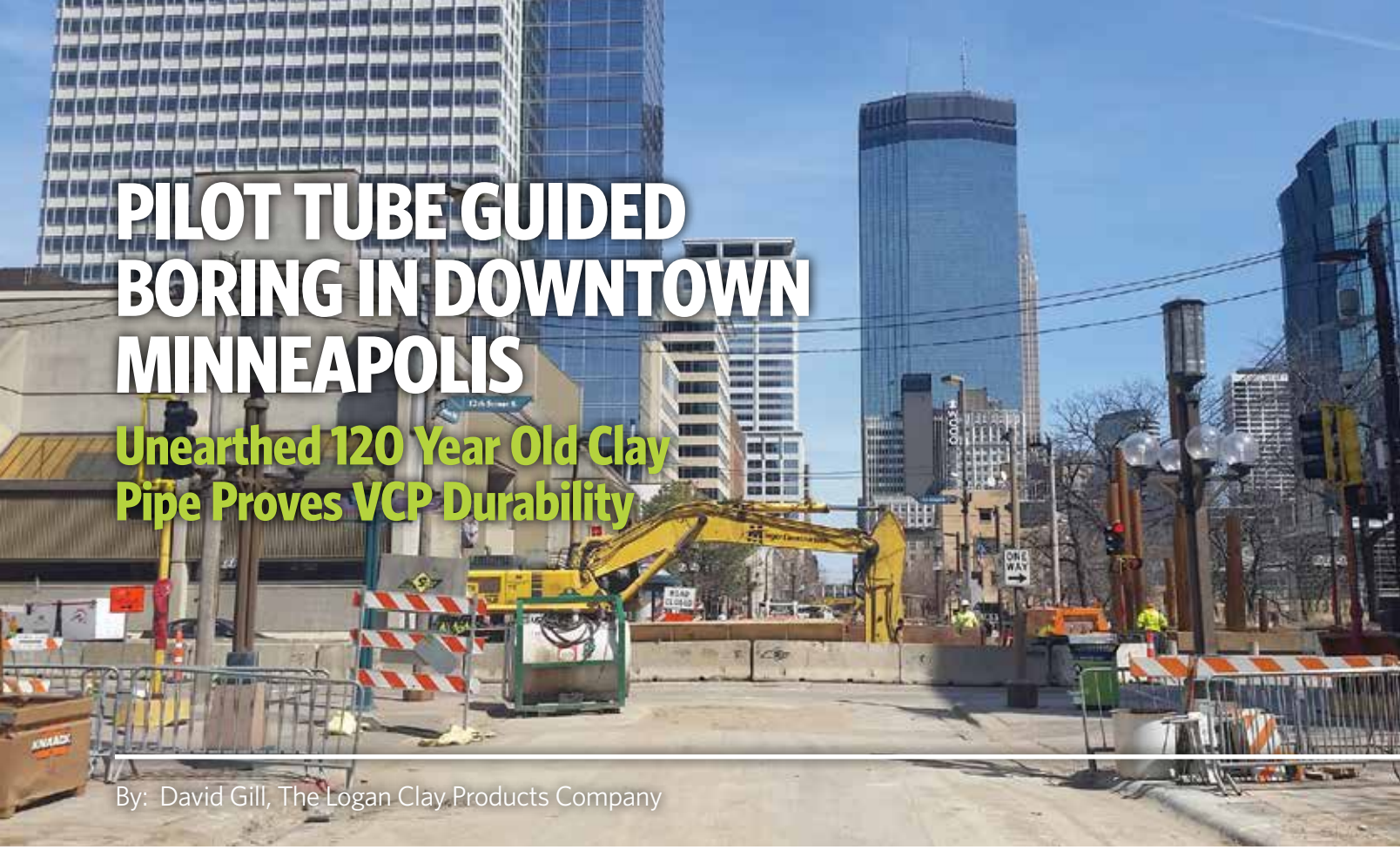
MSTT BOARD MEMBER RORY BALL 2016 NASTT TRENT J. RALSTON AWARD RECIPIENT

At the NASTT 2016 No-Dig Show in Dallas, March 20 - 24, MSTT Chapter Board of Directors member Rory Ball, Mott MacDonald, was one of the two recipients of the **2016 Trent Ralston Award for Young Trenchless Achievement**, along with Mary Neher of Bennett Trenchless Engineers. Since 2010, this annual award has recognized a young individual who has demonstrated excellence in the early stages of his or her career and who has made a valuable contribution to the trenchless technology industry. Volunteer service to NASTT, a NASTT Regional Chapter or NASTT Student Chapter is an important component of the award criteria.

Rory is a graduate of the University of Illinois and a Senior Project Manager with Mott MacDonald based in Cleveland OH. He has over twelve years of work experience in the tunneling industry on a wide variety of tunneling projects in four countries and over a dozen states. Rory is passionate about pressurized face tunneling and fostering advancements within the North American industry. He also serves on the NASTT 2017 No-Dig Show Program Committee, and is a member of ASCE and SME. Congratulations Rory on another career achievement!

(l-r): Frank Firsching, NASTT Vice Chair, Ralston Award winners Mary Neher & Rory Ball, Kim Staheli, NASTT Chair

Rory Ball accepts 2016 NASTT Trent J. Ralston Award



PILOT TUBE GUIDED BORING IN DOWNTOWN MINNEAPOLIS

Unearthed 120 Year Old Clay Pipe Proves VCP Durability

By: David Gill, The Logan Clay Products Company

A dynamic, growing urban core frequently drives the need to upsize pipelines in challenging conditions. In Minneapolis, the line being replaced was still serving the community after 120 years.

Project Goals

Having served the community well for 120 years, the existing 9-inch and 12-inch sanitary sewer lines in the 12th & Nicollet Avenue area of downtown Minneapolis were no longer large enough to meet the demands of continued growth. Since the project was located in part of a vibrant downtown, with a variety of existing utilities, open trench installation was seen as undesirable. Preserving traffic flows and protecting existing structures and landscaping were important benefits of a trenchless installation for a new sanitary sewer.

Method of Tunneling

Three different methods were used on this project:

- **Pilot tube method (PTM)** for approximately 1,800 feet (chosen to take advantage of the superior compressive strength of Vitrified Clay Pipe (VCP) for the longer runs). The 2 meter lengths proved a good choice due to tight pit constraints from multiple existing utilities.
- **Pipe ramming** for approximately 350 feet. A 30-inch permanent steel casing was used and then sliplined with VCP. This approach was used in areas originally designed as open cut installations. For an experienced contractor, pipe ramming presented a more efficient option due to existing utilities and the ability to save costs on shoring. This approach provided the added benefits of safety for the crew and maintenance of pedestrian walkways in the area.
- **Hand mining.** One run presented special challenges due to the number of cobbles and an existing live 24-inch brick sewer which would be penetrated. To ensure preservation of the existing brick sewer and to avoid the possibility of backups, hand mining this short section limited the need for bypass pumping while busting thru the existing sewer. The 30 foot section was underneath a skyway and a major telecommunications vault. Thus, the precision and control of hand mining in a field of cobbles proved the right choice.

Ground Conditions

Ground conditions on one side of the project were very challenging due to a concentration of large cobbles. Minger Construction had experience with similar challenges in the past and opted to make the switch and jack a 30-inch steel casing, later sliplined with 18-inch pipe.

Another run, designed Pilot Tube and 12-inch VCP jacking pipe, had such a large concentration of cobbles, getting the pilot tubes through proved impractical, if not impossible. The contractor opted to jack half of the run and hand mine the portion of the run, requiring extra effort. Due to the amount of cobbles, clean backfill was imported for the shafts.

The remainder of the installation consisted of granular materials that allowed

Minger Construction used a variety of shafts at depths of up to 20 feet

the project to proceed using a pilot tube installation as originally designed. This was the preferred method for more than 80% of this project.

Shafts

A total of 15 shafts were used. Shafts ranged from 8-foot x 16-foot slide shoring and 7-foot to 16-foot round caissons. Depths ranged from 14 feet to 20 feet.

PTM Equipment and Tooling

The Akkerman 4812 GBM and 4800 GBM jacking frames were used on this project. The 18-inch clay jacking pipe was installed within a permanent 30-inch OD steel casing. The final step was completed with an Akkerman Powered Cutter Head (PCH 28.5) which was skinned to 30 inches. The 15-inch clay jacking pipe utilized an Akkerman Powered Reaming Head (PRH 20).

Drive Stats

Drive lengths were generally determined by the physical constraints of this metropolitan area.

- 12-inch VCP: 7 runs for a total of 511 LF with runs ranging from 42 LF to 201 LF
- 15-inch VCP: 2 runs for a total of 836 LF with runs of 411 LF and 425 LF
  - *The jacking forces ranged from 150 to 160 Tons start to finish for these two drives*
- 18-inch VCP: 2 runs for a total of 426 LF with runs of 59 LF and 367 LF

"With the extensive existing infrastructure and all of the traffic around the work area, the use of trenchless methods for this project was the only option in my opinion,"

Luke Minger, President, Minger Construction

Contractor's Comment

"The use of trenchless methods for this project was the only option in my opinion," said Luke Minger, president of Minger Construction. "With the extensive existing infrastructure and all of the traffic around the work area, the project wouldn't have been completed ahead of schedule and under budget like it was. I wouldn't even consider open cutting the runs that were completed on this project, even with some of the challenges we did face."

PTM Process in Detail

PTM was the method used for installation of 1,800 feet of the 2,180 feet installed. Once the jacking shafts were constructed, the PTM jacking frame was set to the desired height, grade and line from control points established using conventional surveying techniques. The guidance system was a digital theodolite with integrated camera (independent of the jacking frame), a battery-powered LED illuminated target located in the steering head, and a computer monitor. The theodolite was also adjusted for height, grade and line.

Step one: Minger Construction installed the 4-inch pilot tubes on line and grade (1/2-inch or better accuracy was achieved over lengths of up to 425 feet). During installation, the ground was displaced by the slant-faced steering head and no spoil was removed. The pilot tube was then directed on line and grade by rotation during advancement. The hollow stem of the pilot tube provided an optical path for the camera to view the LED target housed inside the steering head displaying the head position and steering orientation.

Tight working conditions in active urban areas make trenchless installation using the Pilot Tube Method the best option.

"This project is a classic example of what an experienced team can bring."

Jeff Boschert, President,
National Clay Pipe Institute

This step established the center line of the new sewer installation; the remaining steps followed the path of the pilot tube. Once the pilot tubes reached the reception shaft, the theodolite, video camera, and monitor guidance system were no longer needed and were removed from the jacking pit.

Step two: the path of the pilot tube was followed with a 16-inch OD reaming head - the front of the reaming head fastened to the last pilot tube in the same manner in which the pilot tubes fasten to each other. Advancing the pilot tubes and reaming head were 16-inch OD thrust (auger) casings, which transported the spoil to the jacking shaft for removal. The contractor removed the spoil conventionally using a muck bucket. A vacuum could have been used as an alternative method of spoil removal.

120 YEARS OF SERVICE & GOOD AS NEW!

In the spring of 2016 the city of Minneapolis was upsizing an existing sanitary sewer pipeline to add capacity. The old line was a 12-inch diameter pipe manufactured by the Red Wing Sewer Pipe Company in Red Wing, MN, installed and in-service since 1896 (see the as-built plan and profile).

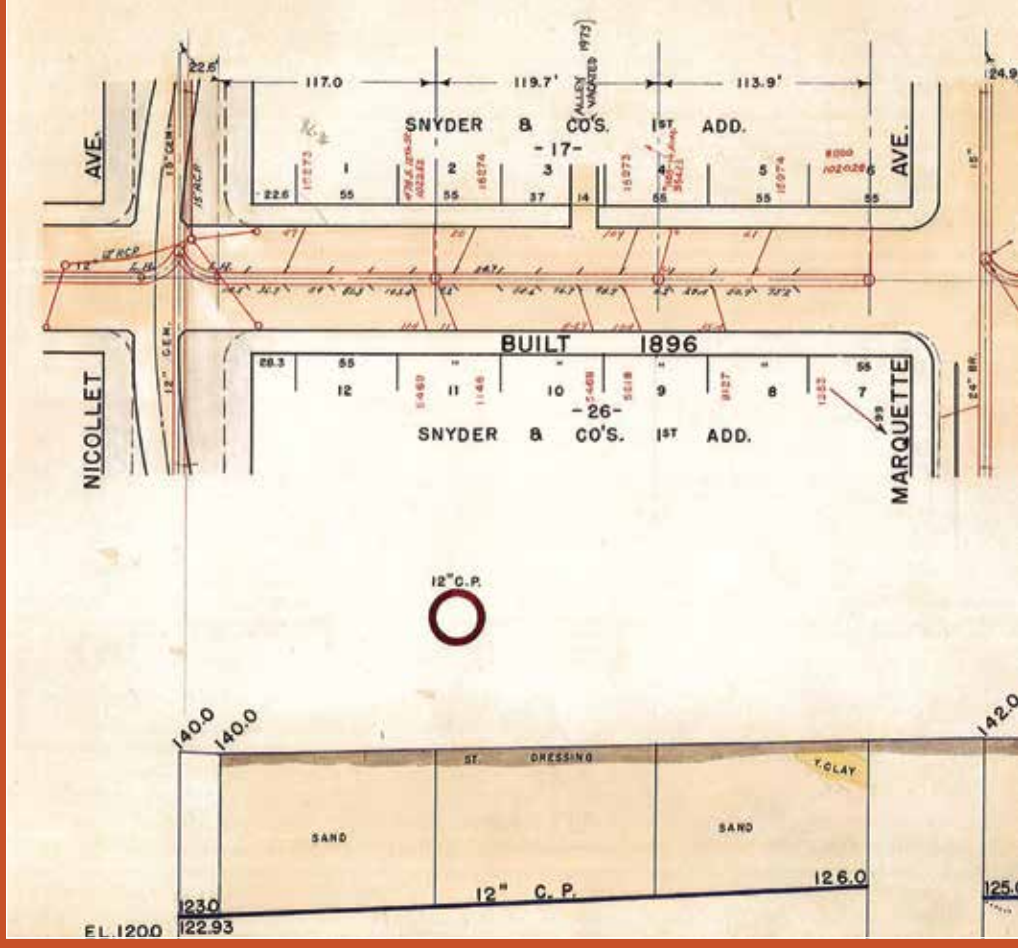
Naturally, the National Clay Pipe Institute was eager to evaluate the condition of the 120-year old pipe. The contractor, Minger Construction, retrieved several of the existing 12-inch by 3-foot long pipe sections from a jacking shaft located at the corner of 12th and Nicollet Avenues.

A few sections of pipe were shipped to The Logan Clay Products Company in Logan, Ohio for testing.

In 2016, a 120 year old pipe, manufactured and installed 20 years prior to the first ASTM governing standard, tested 42% above the minimum bearing strength requirement, first introduced in 1917 (see the pipe section being tested for bearing strength).

The 1896 clay pipe was in condition to serve another 120 years.

The Bottom Line: Vitrified Clay Pipe (as a fired ceramic) doesn't degrade with time – Vitrified Clay Pipe, properly installed, will serve a community for centuries!



Plan and profile drawings of the 1896 installation from the City of Minneapolis, Surface Water & Sewers Department.

Clay Pipe Standards & Practice Timeline 1896 - 2016		
1896	12-inch Sanitary pipeline installed. • No design specifications • No bearing strength standards • No installation standards	
1917	ASTM C13 for Standard Strength (SS) Clay Pipe introduced: • Minimum bearing strength for 12-inch pipe	1,200 lbs/LF
After 120 years of service	120 Year old pipe tested • Actual Bearing Strength	1,700 lbs/LF
2016	Current bearing strength standards (per ASTM C700) • 12-inch Extra Strength (ES) VCP	2,600 lbs/LF

The 120-year-old pipe being tested in the lab at The Logan Clay Products Company. The 3-foot pipe withstood over 5100 lbs. of pressure in the three-edge bearing test.

During the installation of the casings in the jacking shaft, the previously installed pilot tubes were advanced into the reception shaft and were disassembled. Step 2 was complete when the reamer and auger casings reached the reception shaft and all spoil was removed from the bore.

Final Step (12-inch ID VCP jacking pipe): Product pipe (16-inch OD) was installed directly behind the 16-inch thrust casings. The product pipes advanced the thrust casings into the reception shaft, where they were uncoupled and removed one-by-one. No spoil was removed in this step since the product pipe had the same outside diameter as the auger casings.

Final Step (15-inch ID VCP jacking pipe): The contractor installed a 20-inch OD Powered Reaming Head (PRH) behind the thrust casings which were advanced by the product pipe. The PRH increased the 16-inch bore to match the 20-inch OD of the product pipe. The remaining soil around the previously installed 16-inch OD thrust casings (step 2) was taken into the PRH and discharged via the reception shaft by reversing the auger flight direction. The final product pipe was then installed directly behind the PRH in the jacking shaft. As each section of auger casing was removed from the reception shaft, a section of product pipe was installed in the jacking shaft until the process was completed. Step 2 was complete when the PRH entered the reception shaft advanced by the final product pipe.

Final Step (18-inch ID VCP jacking pipe): The process was the same as for 15-inch except the 18-inch product pipe was sliplined inside a 30-inch steel casing installed with a powered cutter head (PCH) due to ground conditions.

Housed inside the cutter face are three jetting ports connected by a single hose for water distribution to keep the face clean and ease spoil transport. Lubrication ports to keep jacking pressures down were located in the rear of the machine connected by a single hose. Seven hoses (four hydraulic, one lubrication, one jetting, and one for a hydraulic pump check valve) ran from the jacking frame though the product pipe to the PCH unit. Staging the VCP product pipe at the surface with the hoses installed before the start of this step was crucial to production timelines.

The Result:

"This project is a classic example of what an experienced team can bring to any project," said Jeff Boschert, President of the National Clay Pipe Institute. "The trenchless expertise Minger brought to this project resulted a well-executed installation. The end result was a quickly executed installation which will serve downtown Minneapolis for the next couple hundred years (or until they outgrow the line again)."

ABOUT THE AUTHOR:

***David Gill** is Sales Engineer with The Logan Clay Products and has more than 25-years of experience in the sanitary sewer pipe industry. He has been involved with countless open cut, pilot tube and pipe bursting projects in the United States and Canada. David speaks annually at the Colorado Tunneling Short Course on Vitrified Clay Jacking Pipe and presents educational information to municipalities and consulting firms on the technology of the Pilot Tube Method and Pipe Bursting. He holds a Bachelor of Science degree in construction engineering from the University of Nebraska Omaha.*

MIDWEST MOLE SOLVES ONE LARGE SEWER PROBLEM IN STEUBENVILLE, OH

By: Brian Brown, Midwest Mole

Relining was done upstream and downstream from the work shaft

Along the banks of the Ohio River sits the city of Steubenville, Ohio—home to more than 20,000 citizens, dozens of historic sites and museums, and one large sewer problem. Midwest Mole, a leading trenchless technology company based in Greenfield, Indiana, was contracted by MWH Constructors to reline a deteriorating section of the city's existing sewer line in December 2015. City of Steubenville officials had provided CCTV footage of the sewer line which indicated it had a number of collapsing and deteriorating sections that had developed over the years and needed to be addressed. Putting together the plan for the project, Midwest Mole, MWH Constructors and city officials determined the overall project would include the following work:

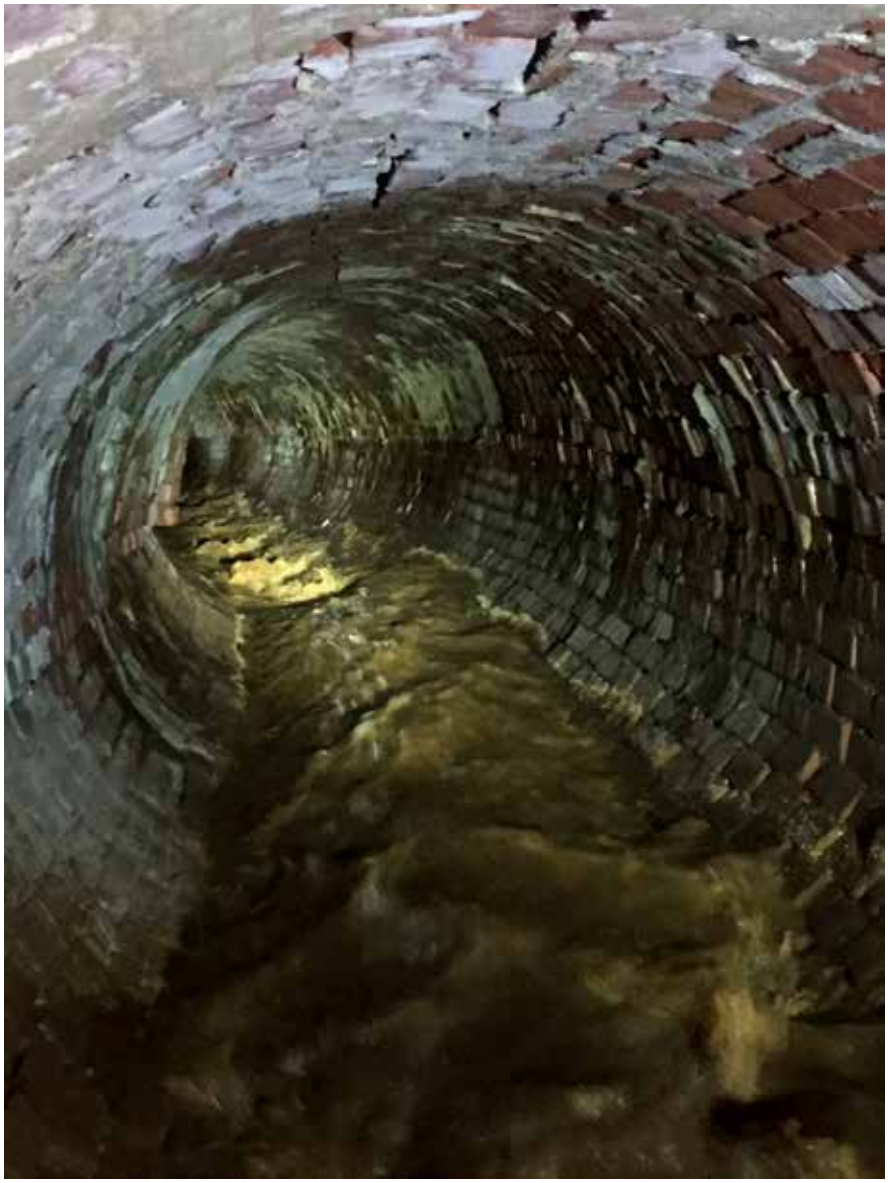
1. Bypassing a section of the existing sewer by pumping the sewage from upstream of the work area over to a different sewer line to facilitate the work.
2. Relining the 700-foot section of the sewer with 30-inch Hobas flush reline pipe.
3. Reinstating any functioning laterals.
4. Grouting the annular space between the original sewer and the liner pipe with cellular grout.
5. Reinstatement of two manholes on the site.

The plan called for Midwest Mole to install two shafts. One was for installation of the bypass pumping operation and the second was used as the main work shaft from which the lining would commence. After the shafts were installed and the bypass operation up and running, the upstream section would be lined first. Once the upstream section was complete, the jacking frame used to install the pipes would be set up again in the opposite direction, in the same hole, so that crews could reline downstream from the main work pit.

The mission of Midwest Mole is to provide clients with the most responsive, innovative and dependable trenchless technology services. Its employees take pride in working with clients from the planning stages through project execution to ensure complete satisfaction. Midwest Mole's commitment to providing high-quality service and value engineering played a large role in this particular project as the site was located near two important businesses — LaBelle News Agency and the local Hampton Inn.

Installing HDPE pipe proved to be a well thought out and wise solution

After discussing the initial plans, Midwest Mole evaluated the affected parties and, in order to limit the number of disruptions to city residents, decided it was best to propose a new plan. Since Midwest Mole is consistently looking for the best way to reduce costs and inconveniences, is committed to maintaining an open and honest line of communication with clients, and dedicated to helping affected parties understand the scope of the project at-hand, they were able to create a plan that was in the best interests of all companies, crews and citizens involved. Specifically, the newly proposed plan moved the working shaft to the beginning of the relined section of sewer, located in the parking lot of LaBelle News Agency. This move allowed LaBelle News Agency to access their garage bays located on the main level,



Original brick sewer showing curved section

instead of restricting access to the garage bays altogether. After discussion, all parties agreed this was the approach to be taken, and set out to get the job done.

Prior to starting construction, Midwest Mole needed to observe the sewer line to determine its current condition. In order to achieve this, the bypass shaft had to be constructed and put in place in the nearby Hampton Inn parking lot. Midwest Mole then began excavation to the existing sewer line, cutting the sewer from the spring line and removing a top section in order to place in the pumps for the bypass operation. Following the construction of the shaft, the bypass pumps were installed and all flow was diverted from the sewer line and directed to a different section of the sewer. Observation of the sewer line was completed with the use of CCTV inspection and, much to everyone's surprise, it showed the problem was more significant than initially believed. The sewer's collapsed area posed additional concerns due to its location. Because the section of the sewer was located beneath University Blvd., Midwest Mole crews were afraid that if there was a complete collapse of the sewer line and it couldn't be relined, the only other way to access the sewer would be by cutting open the entire section of the road. This not only posed critical safety concerns

"all parties were satisfied with the final results and overall execution of the project"

for crews and citizens, it also posed serious financial concerns to the city and its allotted budget.

Due to this newfound severity of the project, Midwest Mole and MWH Constructors met with local law enforcement and city officials to discuss the situation and create a contingency plan for the potentially catastrophic event of complete collapse of the sewer line. Press releases were written, plans were put into place, and Midwest Mole met with property owners in the potentially impacted area, local traffic providers, and the city, to inform citizens of the project's effects on everyday life in Steubenville. From road closings, to changes in traffic routes and patterns, it was important that each citizen was aware and prepared for any potential issues and possible inconveniences.

The construction finally began on the working shaft, which measured 35 feet deep and 33 feet in diameter, and consisted of steel ring beams, wood lagging and tunnel liner plates to provide optimal stability and protection. While the shaft was being installed another completely unforeseen and deeply concerning issue was discovered: the actual size, shape and structure of the existing sewer line. Originally thought to be straight, the sewer line instead displayed curved sections giving no indication whether the rigid pipe would be able to deflect through curved sections of the sewer line.

Midwest Mole took field photographs, and concluded the risk outweighed the reward in lining the sewer with the Hobas pipe. Given the excessive amount of flow the sewer facilitated, simply downsizing the pipe was out of the question. In response to the problem, the Midwest Mole crew utilized a solid wall High Density Polyethylene (HDPE) pipe, which allowed greater

deflection. It was an approved specified material for reline, and was installed without any issues—proving to be a well thought out and wise solution.

Once the HDPE was installed, the relined section of the sewer was filled with water and bulkheads were constructed at each of the four manholes, which the liner was installed in, allowing the annular space to be filled with cellular grout. After the grouting the water was released from within the liner and the two relined manholes and functioning lateral were reinstated. Once the construction of the sewer line was completed and as the shaft was being backfilled and compacted, the ring beams, lagging and liner plates were removed until the existing ground elevation was reached.

The final piece of the sewer line puzzle completed was asphalt restoration in the LaBelle News and Hampton Inn parking lots. Midwest Mole was dedicated to restoring the asphalt in the local businesses parking lots to a better condition than before the project began, and provided additional striping once the new pavement was laid.

Once the project was completed and all ends were tied up, the vendors, city of Steubenville officials, law enforcement officials, from and the Hampton Inn and LaBelle News Agency property owners, met with Midwest Mole and MWH Constructors expressing their satisfaction with a job well done. With all parties satisfied with the final results and overall execution of the project, Midwest Mole moved off-site in early June 2016, meeting the expectations and the timeline initially laid out for the project.

Completing a project of this size and scope requires several moving pieces, including a well-advised and well-researched plan, the ability to quickly adapt to change, and the willingness to work together with all entities involved to create a successful outcome. Because of the collective efforts of Midwest Mole, MWH Constructors, city of Steubenville officials, law enforcement officials, LaBelle News Agency, the Hampton Inn, Franciscan University, all subcontractors and vendors, inconveniences to the citizens of Steubenville were significantly minimized.

Although many complex challenges and unforeseen issues arose throughout the construction process, the members of Midwest Mole as well as members from MWH and the City of Steubenville consistently showed their ability to work together, remain flexible, and handle the increasing complexity of this specific project with expertise.

ABOUT THE AUTHOR:

***Brian Brown** is a Project Engineer for Midwest Mole. He is involved with estimating, project engineering and project management, and has had particular involvement with several tunneling projects since joining the company. Prior to Midwest Mole, Brian's career included 10 years of management and three years of executive leadership in the financial services industry.*

FALCON F5 COMPLETES A "WIRELINE" BORE IN HEAVY INTERFERENCE— WITHOUT A WIRE, MUNSTER, IN

By: Eric Muench, Digital Control, Inc.
Julian Perez, Digital Control, Inc.

Northern Pipeline (NPL) is a nationally recognized infrastructure construction company headquartered in Tucson, Arizona with almost 50 years of experience installing utilities, mostly employing Trenchless Technology methods in later years. In April 2016, NPL was working for Nipsco, a provider of gas and electrical services, installing a 24-inch gas main in Munster, IN. This was one of four planned HDD bores and called for the installation of a 1,000-foot bore at a maximum depth of 28 feet. At its deepest point, it would cross the intersection of Indianapolis Blvd and Ridge Rd.

At its deepest point, the bore path crossed the busy intersection of Indianapolis Blvd and Ridge Rd.

Planning the Bore

In the planning stages of the bore, NPL assumed this would be a difficult job. This was not due to the sand and clay ground conditions, which most drillers would call "good", but because of the required depth, and the likely presence of extreme interference. Kurt Eberly, Bore Superintendent for NPL, was planning to use a wireline guidance system - their typical solution for bores like this. This decision to use a wireline was further verified when, a few weeks prior to the bore, Kurt used one of their DigiTrak F5 systems to perform a range test. This highly recommended step allows a contractor to see what they will be up against from an interference standpoint, and to gauge locator performance.

NPL brought one of their classic F5 receivers and a dual frequency transmitter into the intersection, the deepest point of the bore, and moved the transmitter away from the receiver, to simulate separation with the transmitter in the ground. They tested both transmitter frequencies (12 and 19 kHz), and in both cases, roll and pitch data was lost at 12 feet. Due to interference, this fell far short of the 65 feet the system is rated for in a non-interference environment, and was short of the planned maximum bore depth of 28 feet. Large overhead powerlines, various buried utilities and traffic light sensors were the primary causes of the interference.

Large overhead powerlines, various buried utilities and traffic light sensors were the primary causes of heavy interference

Interference

Interference in the context of HDD locating is classified as either active or passive. Active interference is often defined as "anything that emits a signal or generates its own magnetic field" while passive interference can be described as "anything that blocks, absorbs, or distorts a magnetic field". On this particular installation, active interference was the primary obstacle.

Active interference emits a signal that competes with the transmitter's signal. This,

Using the Falcon F5 convinced the Bore Superintendent that the pilot bore could be completed with a walkover system

in turn, can reduce the receiver's ability to pick up the transmitter signal with accuracy. Effects of active interference include erratic signal strength and depth readings, impaired depth readings (depths may appear less than they actually are), loss of pitch and roll data, and inaccurate receiver calibration (which may lead to depth errors).

Dealing with Interference

Typically, there are three primary methods of dealing with interference. The first is to try to achieve separation between the receiver and the interfering source. For example, moving to the other side of the bore path where roll and pitch signal reception might be better. This had proven unsuccessful in the middle of the Indianapolis Blvd./Ridge Rd. intersection as data was lost at the relatively short distance of 12 feet.

A second method is to use a different frequency, as many locating systems support more than one. The success of an alternative frequency depends primarily on how close it is to that of the interfering signal. In NPL's pre-bore test, two of the F5 receiver's five frequencies yielded far less range than required.

A third method is to resort to a more powerful (stronger signal) transmitter. Here, the assumption is that a stronger signal stands a better chance at reaching the receiver over the sources of interference. The ability to boost transmitter power has inherent limits in the size and design of the transmitter and the power source (battery). In some cases, interference is so strong that no amount of power boost can overcome it.

Beyond these methods, there is another "extreme" option, wireline guidance, which transmits steering information up a wire. Therefore, it is generally unaffected by outside active interference. However, this option is expensive and time-consuming because wire connections have to be made for each drill rod, adding significant time and dozens of potential wire splice failures into the pilot bore process.

Falcon Technology

In early 2016, Digital Control, Inc. released a new technology, Falcon, aimed directly at combatting active interference. Falcon technology allows a user to measure active interference at a job site, identify one or more

"The savings were in the thousands and the system paid for itself by not having to hire a wireline"

optimum bands of multiple frequencies, and pair these bands with a transmitter. In short, Falcon adapts to the different interference characteristics at every jobsite in a way that systems using only a few discrete frequencies cannot.

Falcon technology divides the 40.5 kHz-wide operating range (4.5 to 45 kHz) into 9 bands, each band spanning 4.5 kHz. This wide range encompasses most of the discrete frequencies used in today's walkover systems. Each band is identified by its approximate center frequency: 7, 11, 16, 20, 25, 29, 34, 38, and 43. This simplifies the user interaction as well as communications related to frequencies.

The user selects which band to use based on readings from the receiver's frequency optimization menu (in general, this is the band with the lowest amount of active interference, with exceptions for the visible presence of passive interference such as rebar). Within the selected band, the system uses multiple specific frequencies customized for that site. Falcon F2® and Falcon F5® guidance systems also allow the operator to optimize and select a second band to use where interference requirements change. An operator might optimize and use one band for most of the bore and the second band in an area of high interference, without having to trip out.

Checking Interference with the Falcon F2 System

Once the Falcon technology became available, Kurt Eberly contacted Julian Perez, Midwest Manager for Digital Control, and Matt Lind, Sales for Vermeer Aurora, IL, to find out whether this new technology might do better than their current system. Completing the job with a walkover system would mean significant cost and time savings from using wireline guidance.

Matt brought out a Falcon F2 system and after turning on the frequency optimizer (FO), walked and scanned the entire 1000 feet of the intended bore path for interference. It became clear that the center of the intersection at the planned 28 foot depth was where interference was also the heaviest.

One of the Nipsco project requirements was to document the pilot bore, which Nipsco needed to see before NPL could proceed with the pullback. This required use of the Falcon F5, because it includes Log-While-Drilling (LWD, or data logging) as a standard feature. Although the above-ground range testing with the Falcon was encouraging, NPL had a steering tool service on standby in case of any issues.

Drilling the Pilot Bore

At the point of highest interference in the intersection, Matt Lind ran the Falcon F5 FO to identify the best frequencies for this particular area. The FO showed that the optimal frequencies to overcome the high interference in the intersection were neither 12 nor 19 khz (tried with the classic F5), but rather frequencies within the 40.5 – 45 kHz range (band 43). Testing the above-ground range with band 43 (separating the transmitter from the receiver, where the F5 lost signal at 12 feet) showed it could achieve a distance (depth) of 42 feet. This test convinced Kurt Eberly that this pilot bore could be completed using a walkover system.

Matt performed a second optimization at another point along the bore where high interference was present from power lines overhead and utilities underground. Range testing there showed more than enough signal with band 34 to meet the planned depth of 21 feet. With both optimal bands selected, he then paired the Falcon F5 receiver and transmitter, which, in a few seconds, transfers the optimized band data from the receiver to the transmitter via Infrared (IR) communications.

The pilot bore started at 8 a.m. on April 20 using a Vermeer D330x500 drill and the DigiTrak Falcon F5 locating system. The pilot bore took 13 drilling hours to finish. Roll/pitch loss was a major concern due to the exact pitch parameters allowed for each rod in the bore plan, but all the above-ground range testing proved to be accurate: at no point throughout the bore was roll or pitch lost. The pilot bore was logged by using the LWD feature of the Falcon F5, and within minutes of completion, an LWD Log file containing the bore profile and rod-by-rod details had been sent to Nipsco for approval before starting the pullback.

Due to the success of this high-profile bore completed with the Falcon F5 walkover system, NPL continued to use the Falcon system on three additional bores where a walkover system would not have been considered in the past. On one of the bores, NPL used a more powerful 19-inch Falcon transmitter that increased by 30% the already impressive 15-inch Falcon transmitter's depth capability of 100 feet.

The Future of HDD

Because a system specified to a certain depth in ideal conditions may not always meet that specification in the presence of active interference, the ability to choose the frequencies that work best with interference at a specific jobsite is a critical advantage over other systems. With its unique method of scanning interference and selecting multiple optimal frequencies for individual jobsites, a Falcon guidance system comes closer to getting every job done than any other system.

According to Kurt, NPL saved about five days of setup time by not having to survey and place the grid needed for the wireline system. During the pilot bore, further time savings were realized by not having to perform the wire splices required on each rod for wireline systems. "The savings were in the thousands and the system paid for itself by not having to hire a wireline," said Kurt after finishing the bore. Kurt is excited to see how Falcon shines on their toughest upcoming bores - and rightfully so!

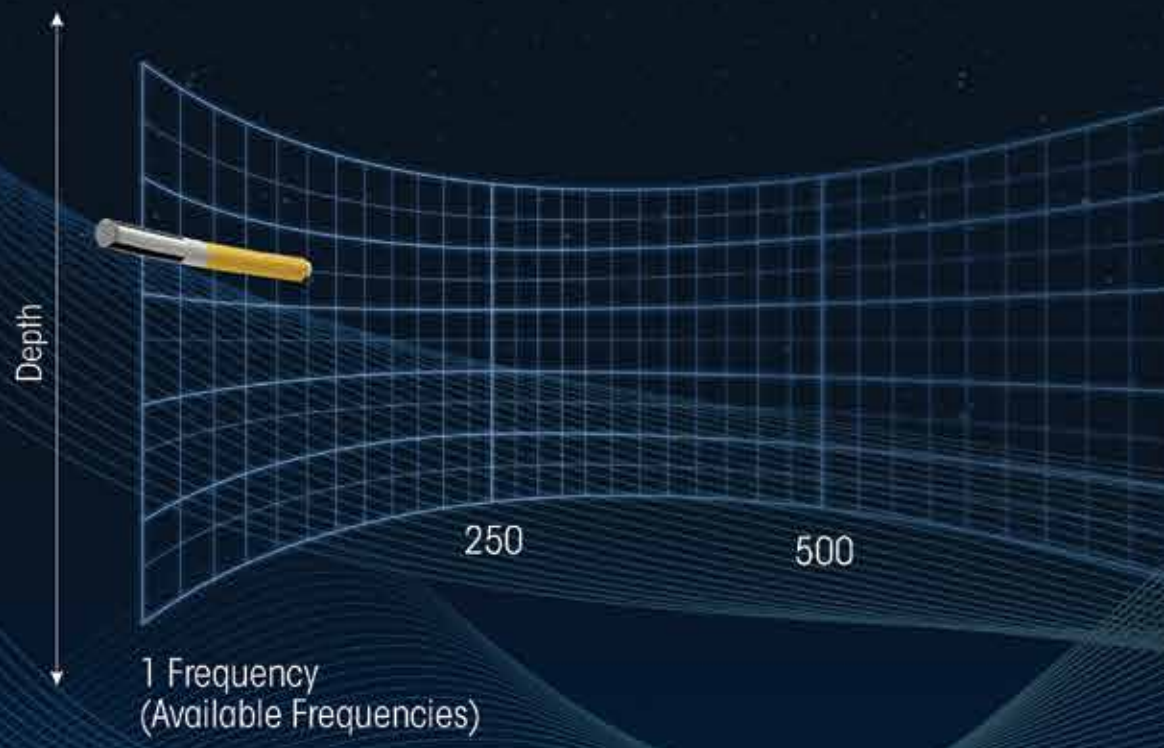
ABOUT THE AUTHORS:

Eric Muench *has captained his own writing company and written for dozens of different industries over his 24-year career. Now as Sr. Technical Writer and Content Architect at DCI, he relishes the diverse and exquisite blend of stainless steel, mud, software and circuit boards as a tech writer's paradise.*

Julian Perez *is the Midwest USA and Latin America manager for Digital Control Inc. He joined DCI in 1998 and has over 18 years of experience in the HDD industry. He resides in Indianapolis where he has been managing the Midwest region for the past 9 years.*

Old Faithful.

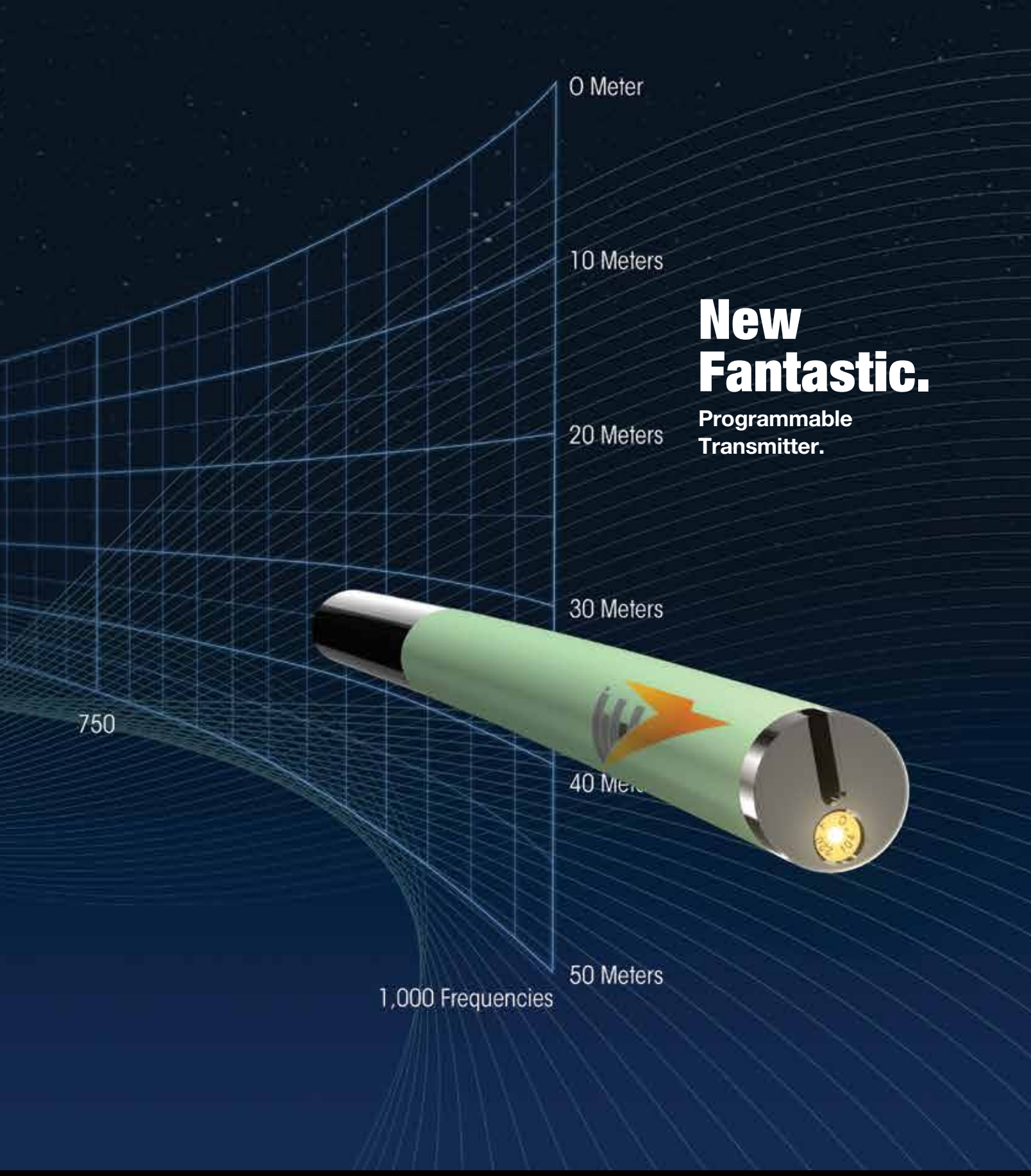
1 Transmitter.
1 Frequency.



One transmitter. One locator. For every job.

Trying to accurately navigate the drill head in active interference can be frustrating and result in lost time and productivity. Increase your crew's confidence with the industry's first programmable, wideband transmitter. Introducing the Falcon F2 and the Falcon F5 wideband transmitter. A single Falcon transmitter offers hundreds of frequencies that can be optimized to address the most demanding job site challenges. For more information visit us at www.digital-control.com.

Simplicity. Precision. Speed. Fantastic.



New Fantastic.

Programmable Transmitter.

DCI® Digital Control Incorporated

Industry leaders. Passionate visionaries. And genuinely nice guys.

SEALING THE CONNECTION FOR LARGE DIAMETER MAINS

LMK Technologies Man-Entry Lapel Liner Goes Under Streetcar Tracks in Kansas City, MO

By: Amana Arayan, LMK Technologies

Man-Entry Lapel Liner

Effective repairs to large diameter lined or unlined lateral connections, where a robotically positioned connection liner is not feasible, are made possible by the Man-Entry Lapel Liner system. Engineered for sealing gravity sewers and low pressure piping, this trenchless rehabilitation method creates a one-piece main to lateral lining in large diameter, 27-inch to 60-inch, and odd-shaped mainline pipes. The large diameter connection liner makes a water-tight connection to the cured-in-place pipe (CIPP) lining or to the original host pipe because of a molded gasket made of hydrophilic rubber, anchored in place with a stainless steel compression ring fastened to the main pipe.

The molded hydrophilic gasket seal mechanically locked into place seals the connection.

Utilizing a stainless steel compression ring fastened at the main-to-lateral connection, the Lapel Liner does not depend upon resin bonding to the CIPP lining or to the host pipe. This mechanically anchored connection liner won't fall away from the mainline liner like "brim style" liners that are installed using only resin. The compression flange removes all the concerns of bonding, and results in a sealed lateral lining and sealed main-to-lateral connection. Adhesion is not part of the design, so the Lapel Liner is compatible with all pipe materials.

Easy to install, the Man-Entry Lapel Liner system consists of a non-woven fabric tube of desired length with a factory-stitched sealed fabric brim, and thermo-set CIPP resin. The mainline brim and lateral tube are vacuum impregnated with the resin, molded, hydrophilic gaskets are installed, and then the liner is mechanically placed inside the pipes via man entry. The lapel and hydrophilic gasket are held in place with an appropriately sized stainless steel compression ring, which is anchored into place. The lateral liner tube is then pressed against the lateral pipe wall using a rubber inflation device, and cured at ambient temperature. Once cured, the lateral inflation device is removed. The end result is a one-piece structural lateral lining and mechanically fastened connection to the main that provides a verifiable non-leaking connection for every type of mainline pipe.

"The molded hydrophilic gasket seal mechanically locked into place seals the connection"

Lapel Liner inserted into service line

Anchor installation onto the brim through the steel ring

The End Result: A one-piece structural lateral lining and sealed connection to the main

Insignia™ Hydrophilic Connection Hat

When cured, the liner extends over a predetermined length of the service lateral and a portion of the main pipe at the connection and forms a continuous, single-piece, tight fitting, corrosion resistant main-to-lateral CIPP, with a 50 plus year design life and a 50 plus year service life. The new pipe exhibits a seamless smooth-bore interior that typically increases flow rates.

The Man-Entry Lapel Liner method for CIPP reconstruction of a main-to-lateral connection was used as part of the project to build the new streetcar line in downtown Kansas City, MO. KC Streetcar is a two-mile route running primarily along Main Street connecting Kansas City's River Market area to Crown Center and Union Station. As part of the construction project, mains and laterals under the tracks had to be lined, rehabbed and brought up to date so the city wouldn't have to dig under the tracks or interrupt streetcar service. The Downtown Streetcar Sewer Rehab CIPP project was also intended to help provide better structural integrity to the aging brick and clay tile pipes under the streetcar tracks.

The rehab project was located in heavily populated downtown Kansas City, so work was performed at night, when there was less traffic and surface activity. Lower nighttime flows meant there was no need for bypass pumping. Work was performed in small spaces, all man entry, by skilled, trained crews from LMK Licensed Installer, Kissick Construction. Based in Kansas City, MO, Kissick Construction is a self-performing heavy civil contractor with a strong local reputation for innovative thinking and a focus on quality.

"Adhesion is not part of the design so the Lapel Liner is compatible with all pipe materials."

Completed in June 2015, work by the contractor included the rehabilitation of 46 main to lateral connections (8-, 12- and 15-inch) using the large diameter lining method, Man-Entry Lapel Liner and Insignia™ Hydrophilic Hydrohat, a circular shaped gasket. By using the compression connection gasket to hold each one-piece structural lateral lining in place, a water-tight seal was guaranteed.

ABOUT LMK TECHNOLOGIES:

***LMK Technologies** has been a leader in trenchless Cured-In-Place-Pipe (CIPP) lining since 1993. LMK is recognized by many municipalities and engineering firms as the innovative leader for the trenchless renewal of sewer laterals, mainlines and manholes. LMK has over 100 patents and pending patent applications throughout the world.*

VISIONARY OWNER + GREAT DESIGN/ CONSTRUCTION + GREAT MATERIALS = GREAT PROJECTS!

Citizens Energy Group Takes a Big STEP Forwards in Indianapolis

By: Miller Pipeline

The City of Indianapolis currently has over 17,000 homes served by private septic systems. Septic systems have a limited life and eventually fail, seeping human waste into groundwater, backyards and neighborhood ditches and streams. Septic systems are linked to high E. coli bacteria counts in many small neighborhood streams and ditches during dry weather when children are most likely to play in them.

To combat this problem, the city has had a Septic Tank Elimination Program (STEP) in place for over 10 years. In 2011, Citizens Energy Group, founded in 1887, took over the wastewater system from the city and has made tremendous investment and improvements in the system.

Among these improvements are the changes in the STEP program implemented within the last year. Citizens has converted to utilizing primarily low pressure sewer systems to bring sewer service to areas previously served by private septic systems. This change has many advantages for areas to be serviced and to the general public as well.

For the homeowners being serviced, gone are the deep excavations for new sewer mains and laterals causing disruption and extensive restoration and inconvenience to the homeowners. Additionally, there will be far less impact on the public trying to navigate the city streets. These primarily gravity sewer projects proved to be very time consuming and expensive in addition to other risks brought on by excavations in excess of 15-20 feet.

A low pressure sewer system utilizes 2-inch, 3-inch, and 4-inch small diameter polyethylene mains and service lines of 1-1/4 inches. These pipes are typically installed using the horizontal directional drilling method at depths of 5 feet. The systems rely on grinder pumps installed at every home to move the sewage to the existing system where it is transported to the treatment plants for processing. As a result, there are no possibilities for infiltration and inflow that commonly plague even new sewer systems. The polyethylene system is heat fused and a "closed system."

It is no surprise that Citizens would pursue improved and different than conventional technology to provide their customers with the most cost effective service while offering a long-lasting end product. They are decades ahead of many natural gas utilities that are either just starting or in process of replacing their gas infrastructure. Citizens started replacing bare steel and cast iron gas lines heavily in the 1970s with polyethylene and more updated coated steel pipelines.

"A great, engaged owner, best in class design/ construction team, and superior products can lead to great things!"

Citizens contracted with Miller Pipeline LLC, headquartered in Indianapolis, in a design build procurement model to eliminate 1100 septic tanks in 5 different areas within the city. The work will be completed in 2017 and virtually all main lines will be installed by the end of 2016.

HDD allows pipes to be installed with few public impacts and inconveniences to homeowners

Installations are completed with minimal invasiveness and restoration done immediately. The general public has embraced the STEP program

Post installation. Grinder pump lid is low profile, approx. 2 inches above ground

Miller Pipeline partnered with local engineering firm Shrewsberry and Associates for the design aspect of these projects. Shrewsberry and Associates was founded in 2002 in Indianapolis by Bill Shrewsberry and has been instrumental in several major projects in Indianapolis including the new international airport and Lucas Oil Stadium, home of the Indianapolis Colts, and many others. Shrewsberry has grown over time and now has offices in Cincinnati, Louisville, Denver and Washington D.C. "I don't believe we could have made a better choice for a partner for this project" says Chris Schuler, General Manager of Miller Pipeline.

The current projects Miller Pipeline has embarked on include a small project on the east side of Indianapolis that removed 35 septic tanks which is totally completed. Next, Miller began working on 3 projects that bordered each other on the north side of the city and represented over 1,000 septic tanks. Meanwhile, crews worked on a project on the south side that eliminated 93 septic tanks. Each has its challenges.

"An important lesson for our whole country is that water and wastewater infrastructure does not come without a cost that must be shouldered by all"

Most significantly, the 3 projects with over 1,000 septic tanks was anticipated and proven to be the most challenging. Narrow streets, unfavorable soil conditions, and riverfront lots contributed to the difficulty of these projects.

Remarkably, what was anticipated as the biggest problem has actually not materialized. "Going into these projects, I thought the public would be very much against these projects and would hinder our performance" said Brian Smith, Area Manager for Miller Pipeline. "To the contrary, the people have embraced the program and been quite helpful" says Smith.

One would think that parts of a community that will start receiving a sewer bill after years of not having one would be "reluctant" at best. However, Citizens Energy Group has done such an excellent job through public outreach and education that most residents are quite happy for the improvements. "I really expected to be dealing with many un-

Street view of STEP project installation

"To produce successful results like this, communication is paramount."

happy residents, but out of the approximately 1,000 residents I have interacted with, there are few that wouldn't or haven't invited me to sit down and have a cup of coffee with" say Jacob Johnson Miller's project manager on the projects. Further, Johnson says: "I truly believe that if not for such a great owner in CEG and overall partnership between Miller and CEG, this project could have gone in another direction.

Johnson would probably know better than anyone. To produce successful results like this, communication is paramount. Johnson has personally visited each property on multiple occasions to interact with the home-owner during different stages of the project obtaining what information he could to help with construction. Coordination of pump placement, property line valve placement and

New grinder pump in place

location of existing septic tank to be abandoned and electrical service is very important to make this a smooth operation.

Citizens Energy Group has chosen to furnish E/ONE grinder pumps for all projects. "It is very important that the same types of pumps be used within a system such as these for the proper operation within the design of the entire system" says Bob Jordan, Vice President of Covalen, the distributor of the E/ONE pumps in Indiana and other states. "Covalen has been an instrumental part of our team participating in location coordination, pump start-up, public education, and inspection of installations" says Chris Schuler General Manager of Miller Pipeline. "I have worked with Bob and Covalen on several projects over the past 15 years and their pumps, services, and customer satisfaction provided are unparalleled" Schuler goes on to say.

As of the end of August, over 35,000 feet of main has been installed, nearly 200 homes are totally complete with grinder pumps working flawlessly and another nearly 300 homes with service pipe installed to pump location awaiting pump installation. All of this accomplished with minimal invasiveness and restoration completed immediately behind work. Most importantly the amount of complaints can be counted on one hand - once again proving that having a great, engaged owner, best in class design/construction team, and superior products can lead to great things!

Most importantly, the cooperation and understanding of the citizens of Indianapolis that our water and wastewater infrastructure does not come without a cost that must be shouldered by all is an important lesson for our whole country to learn. There is much work to be done!

ABOUT MILLER PIPELINE:

Miller Pipeline *offers a full range of rehabilitation methods for wastewater pipeline systems, covering practically all methods of trenchless technologies, from pipe bursting and internal joint seals to trenchless options such as expanded-in-place PVC liner and cured-in-place pipe. A leader in building and maintaining America's infrastructure for over sixty years, Miller Pipeline is one of the nation's premier natural gas distribution, transmission pipeline and utility contractors.*

BREWERY CREEK STORM SEWER REPAIR, DULUTH, MN

Fully Structural Trenchless Solution at 37 feet Depth

By: Hugh B. Mickel, P.E., Contech Engineered Solutions LLC

Brewery Creek spends the majority of its journey to Lake Superior underground, having been relegated to underground status along Duluth, Minnesota's western Lake Superior hillside since the 1930's. Officials with the City of Duluth, Minnesota had been monitoring the piped sections of Brewery Creek for a number of years. A 72-inch section of reinforced concrete pipe (RCP) was particularly worrisome as it passed under an important adult care facility. Not long after installation the crown and invert had cracked due to excessive loads. Perhaps the pipe was improperly designed, or perhaps the installation procedure was substandard, but in either case the pipe wasn't able to carry the loads being imparted upon it. While the Transportation Section of the Engineering Division of the Duluth Public Works and Utilities Department is responsible for large-scale roadway projects in Duluth, it also oversees the inspection, construction, and replacement of streets, alleys, bridges, sidewalks and the drainage infrastructure. The condition of the 72-inch RCP was concerning, and City engineers determined it was now at a point where either a significant repair or replacement was necessary.

A supplemental concrete invert had been added to the existing RCP due to the significant longitudinal cracking along the invert and crown. With up to thirty-seven feet of cover over the pipe, an open cut solution would have been wise but extremely expensive. The deep fill also limited the trenchless solutions to those that could truly withstand the entire load as if a new line was being directly buried. This was due to the nature of the existing pipeline's condition. Although the cracking had occurred

Structural steel banding was placed in the crown of the RCP in order to allow for safe work activity inside. The crown and invert had cracked due to excessive loads.

SPR™ PE is a steel reinforced HDPE pipe liner with a smooth internal surface

early in its life, there were indications of the structure continuing to move. The saturation of the exterior backfill zone and subsequent movement of the surcharged groundwater back into the storm sewer through the joints was also worrisome. In light of these findings, the City of Duluth requested the assistance of LHB Corporation to identify the optimal solution to address their concerns. LHB Corporation, a multi-disciplinary engineering, architecture and planning firm, is known for their design leadership and experience in public works, pipeline, industrial, government, education and commercial design.

The LHB Corporation's Duluth office was determined to identify the best, long-term solution that would limit the disturbance and inconvenience to the surrounding community, while meeting all engineering challenges at the site. After detailed investigations and design work were completed, the city bid a reline project which included CIPP and spiral wound, steel reinforced polyethylene pipe as alternative options. PCi Roads LLC of St Michael, Minnesota was the low bidder, and selected spiral wound SPR™ PE supplied by Contech Engineered Solutions to line the pipe. SPR™ PE is a steel reinforced HDPE pipe liner with a smooth internal surface used to restore the reliability and integrity of aging sewers, storm sewers and culverts in a joint-less fashion without excessive site disruption. A single strip of steel reinforced HDPE profile was progressively wound into the existing pipeline by the winding machine that was positioned inside the existing storm sewer barrel. As the pipe is wound the seams are continuously fusion welded in a manner such that the seams are stronger in tension than the adjacent HDPE itself. In this fashion, the SPR™ PE spiral-wound, steel reinforced HDPE joint-less liner was able to restore the reliability and integrity of the aging storm sewer system.

Construction began in the spring of 2016 with the replacement of the upper sections of one of the manholes. Then structural steel banding was placed in the crown of the RCP in order to allow for safe

A single strip of steel reinforced HDPE profile was progressively fed into the winding equipment inside the existing pipe

Thirty-seven feet underground, 394LF of new steel reinforced polyethylene pipe was manufactured in place.

work activity inside. The first retrofit material (the poured concrete invert) had to be removed in order to provide enough room for the new pipe. PCi Roads contracted with Contech to secure the design and pipe materials. In the meantime, they contracted directly with Contech's Australian partner, Sekisui Rib Loc Australia (SRLA), to rent the winding equipment and cage. Two technicians from Australia and France were on site during the winding operation which took about two weeks. Contech and SRLA have found this arrangement to provide the highest quality and most cost effective end product. This contractual arrangement is available to anyone interested in using SPR PE technology in the U.S., whether an agency, utility or reline contractor.

The SPR™ PE pipe profile was shipped to the site on 4-foot to 8-foot diameter spools from Contech's Metamora, Illinois pipe manufacturing plant. The profile was then fed directly into the winding equipment which was placed inside the existing storm sewer pipe. Thirty-seven feet underground a new pipe was manufactured in place. The end solution was a fully structural, steel reinforced 394 LF polyethylene pipe that restored the hydraulic efficiency, reliability, and integrity of a severely deteriorated section of the 72-inch RCP storm sewer holding Brewery Creek.

ABOUT THE AUTHORS:

***Hugh B. Mickel, P.E** is the Vice President of Reline Technologies for Contech Engineered Solutions. He has been with Contech for 30 years and has 21 years of direct experience relining drainage and sewer pipes, culverts and small bridges. Much of this reline experience was gained while living in Massachusetts and serving as Region Engineer covering New York, Pennsylvania, New Jersey and New England. Hugh holds a B.S. in Civil Engineering from Purdue University and has been a registered Professional Engineer since 1990.*

MSTT DETROIT TRENCHLESS TECHNOLOGY SEMINAR

A LEARNING OPPORTUNITY!

The MSTT Trenchless Technology SSES and Buried Asset Management Seminar Detroit MI July 27-28 featured Special Guest Presenter Bryce Feighner, P.E., Chief, Office of Drinking Water and Municipal Assistance, Michigan Department of Environmental Quality. His presentation, "**Making Bitter Waters Sweet**", delivered a thorough review of water quality issues and the innovative technologies available for long term sustainable solutions.

Mr. Feighner's informative talk, and the Q&A session following, was given close attention by nearly 50 seminar participants. It provided important insights and better understanding of the path ahead for improvement of the nation's drinking water quality.

The information-packed two day seminar agenda also included an outline of "**Detroit's Green Infrastructure Program**" by Palencia Mobley, P.E., Deputy Director & Chief Engineer, Detroit Water & Sewerage Department, and an "**Overview of Trenchless Technology and NASTT Education Efforts**" from Dr Tom Iseley, P.E., Louisiana Tech University. An excellent range of trenchless technology topics and knowledgeable industry presenters also included:

WELCOME ADDRESS and "Liquid Assets" Overview Video,
Leonard Ingram, MSTT Executive Director

Guided Boring Using Pilot Tubes - Methodology and Case Studies,
Jeff Boschert, PE, National Clay Pipe Institute

A Novel Approach To Water Pipe Cleaning, Preparation & Lining,
Randy Cooper, Envirologics Engineering Inc.

Determining RUI Of Large Diameter Pipe With MSI,
Ed Diggs, Pipeline Inspection Partners Corp. (PPIC)

Trenchless NSF 61 Watermain Rehabilitation,
Fred Tingberg Jr., Lanzo Trenchless Technologies

Fold and Form PVC Liners for Sewer Rehabilitation,
Kerry Koressel, IPEX USA LLC

Repairing Laterals & the Connections: No One Solution Fits the Bill,
Pete Tortorici, LMK Technologies

Structural "No Dig" Solution to Repair Culverts,
Dennis Buckshaw, AP/M Permaform

The Trenchless Technology Center,
Dr Tom Iseley, P.E., The Trenchless Technology Center, Ruston LA

Jet Cleaning Efficiency,
Tony DeCarlo, NozzTeq

Inspection & Evaluation of the Oakland Macomb Interceptor Drain,
Harry R. Price, NTH Consultants, Ltd.

A Better Installation for CIPP for Water Main Rehabilitation,
Randy Cooper, Envirologics Engineering Inc.

BAMI-I & Certification of Training in Asset Management (CTAM) Program,
Dr. Tom Iseley, P.E., Buried Asset Management Institute - International.

Footing Drain Disconnection Programs,
Greg Marker, P.E., OHM Advisors

Digital Side Scanning Camera Systems,
Don Houck, MTech Company

Implementing A Successful Sewer Bypass Project,
Mark Coger, Xylem Dewatering Solutions Inc.

Internal Joint Seals - Where, When and Why,
Daniel Watters, P.E.. Miller Pipeline

Dr. Tom Iseley, P.E., BAMI-I, outlines the development of the CTAM program

Participants listen attentively. Two full days of informative trenchless presentations

Informative and well received presentation from Bryce Feighner, Michigan Department of Environmental Quality

In all, the MSTT seminar in Detroit was a well-attended educational and informative two full days of trenchless presentations, product demonstrations, networking and ideas, along with breakfast, lunches and all day refreshments! It was an intensive and fun learning opportunity which earned seminar participants 12 PDH credits. There was even a cash draw at the end!

Special thanks go out to food sponsors **National Clay Pipe Institute, Envirologics Engineering, PPIC, LMK Technologies, OHM Advisors, BAMI-I, NTH Consultants, Miller Pipeline**. They kept everyone going and focused!

For information dates and locations of future MSTT Trenchless Technology, SSES and Buried Asset Management seminars planned for the Midwest, visit:

www.mstt.org

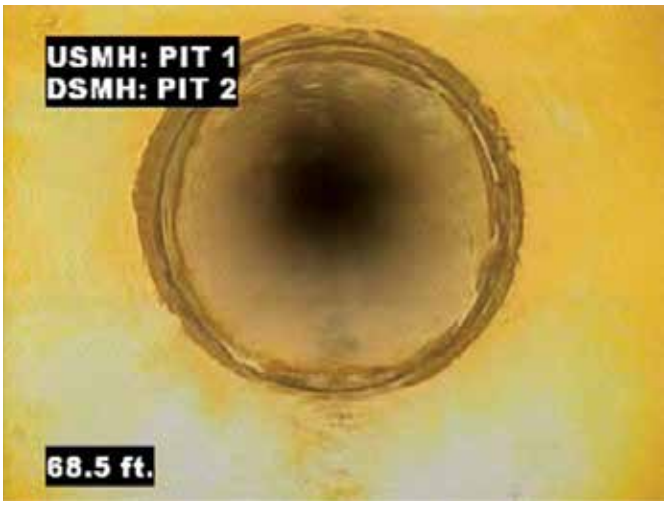
MAKING A BETTER CIPP LINER INSTALLATION FOR AGING PRESSURE PIPES USING TARGETED ADHESION

By: Randall Cooper, P.Eng., Envirologics Engineering Inc.

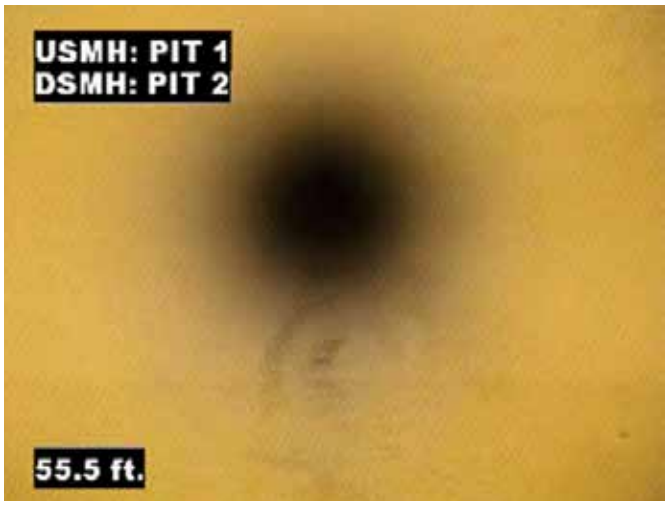
When we consider pressure pipe design for new buried pipes, standard practice in the design for any new installation includes restraint of movement. Restraint must be considered at direction changes, valves and appurtenances to address the pressure forces associated with fluid flow. For mechanically-jointed pipe like ductile iron, thrust restraint is a particularly important design consideration.

For plastic pipe (Plastic Pipe Institute, PPI) fused HDPE fittings are considered to be self-restraining at bends; however, for (material) transition fittings (e.g. plastic to metallic), restraint must be factored into any design due to Poisson-effect pipe shortening. When ductile pipe materials (thermoplastics and thermosets, e.g. CIPP) are pressurized, they expand slightly on diameter, and the length decreases in accordance with the Poisson ratio of the material. (This ratio is approximately 0.4 for HDPE and 0.3 for CIPP). To prevent Poisson pull-out disjoining in the transition area, external restraint must be achieved by installing in-line anchors, or by providing external joint restraints for unrestrained metallic pipe (bell and spigot joints).

For plastic pipe liners (CIPP and HDPE) inserted into metallic hosts, with the intention of providing a fully structural design, there can be no reliance on long-term



Left photo shows 12-inch CML-lined, corroded cast iron pipe under rail line. Right photo shows a pipe joint and prepared CML coating after removal of corrosion products with airborne stone.



Left photo shows 12-inch CML-lined cast iron pipe post-cleaning, preparation and pipe drying with airborne stone. Right photo shows the pipe (at the same location) after CIPP lining.

restraint from merely designing a "tight fit with the host pipe". Given that the AWWA definition of Class IV structural pipe design requires that "all loads are transferred to the host pipe", the host pipe has effectively "disappeared" in terms of design. Restraint of all plastic pipe liners (e.g. CIPP, HDPE) at all material transitions must be a "consideration" for any AWWA Class IV liner design.

Mechanical clamping or bonding of the liner to the host pipe (or what remains of it) is a prudent, first step in providing liner restraint. A second step is to insist on the quantification of this restraint through field-level testing, which is not currently required in AWWA Class IV liner design.

In addition to consideration of Poisson pull-out forces for pressure pipe liners, engineers must also consider tensile strain within the liner. An open-ended liner pipe subjected to internal pressure expands both circumferentially and longitudinally. When circumferential movement is resisted by whatever remains of the host pipe and the surrounding soil, a tensile strain ("stretch") is induced in the liner, which is independent of the length of the liner. Adhesion to the host pipe helps resist this tensile strain.

Beyond Poisson-effect pull-out and pressure induced axial strain, a liner may also experience axial shear loads dues to recurring pressure fluctuations and transient surge pressures. Pressure fluctuations will create axial shear waves that can exceed 2.5 – 3.0 times operating pressure in severe cases. Pressure fluctuations can also create tensile/compression forces on the liner at service connections, whereby the liner may be cyclically pushed and pulled at the service connection (radially) with recurring or transient surge pressure fluctuations.

If tension is about pulling and compression is about pushing, then axial shear is

about sliding – the tendency for a liner that is in contact with the pipe wall to literally slide along the host pipe. Surge pressures provide the source for these shear forces, and again, these pressure waves can be of sizable magnitude over and above operating line pressure.

Shearing is what happens when you jerk the rug out from underneath someone's feet. However, if the carpet is bonded to the floor, this provides assurance that adhesion will ensure the person walking on it does not take a tumble. If a quantitative adhesive seal can be achieved at the transition points for liners (from CIPP liner to metallic host pipe), the shearing effects of pressure waves can be mitigated for as long as the host pipe continues to exist. Proper adhesion will keep the CIPP liner installation leak-free at key points like CIPP end seals and CIPP service connections. Poor adhesion can result in liner movement and potential leakage along the interstitial space between the liner and host pipe at end seals and service connections. It is important to note that the logic surrounding the benefits of quantitative adhesion applies to all classes of pipe liners – AWWA Class I through IV.

In order to obtain a quantitative adhesive seal that can help liners resist Poisson pull-out, axial strain and the shearing effects forces of surge pressures, engineers can now have access to a technology that goes beyond simply cleaning the corrosion and sediment from aging pipes. This technology also prepares and dries the host pipe surfaces for long-term liner adhesion. Surface preparation is key for providing a surface profile with increased surface area for better resin adhesion. While the CIPP resin remains the bonding agent for the liner to the host pipe, a dry host pipe (substrate) with enhanced surface area (profile) for adhesion provides maximum resin contact and a high probability for enhanced leak-tight connection. These levels of surface preparation and dryness cannot be achieved using older cleaning methods like rack-feed boring and scraping.

A cleaned, prepared surface profile that meets the National Association of Corrosion Engineers level 3 standard (NACE 3) is now possible. The Tomahawk system uses various calibers of bacteria-free stone in a low-pressure airstream (vacuum truck) to remove old coatings and corrosion products from the inside of the aging host pipes. The stone is accelerated axially down the pipe, scraping the corrosion products from the host pipe surface, while the airflow then dries the pipe. Smaller caliber stone is subsequently metered into the airstream and deflected radially at targeted points like services, joints and end seals. This deflection process is monitored in real time to ensure effective targeting of the stone cleaning and surface preparation operation, which ensures there is no damage to the pipe or service connections. The process typically takes two hours to complete for 300 – 400 feet of pipe, and CIPP lining can start immediately thereafter.

The Tomahawk process was recently used for a CIPP installation under a high-speed rail line in New York City. Approximately 80 feet of 12-inch, mortar-lined cast iron pipe was leaking and had been shut down pending structural repairs. The cleaning objective was to remove corrosion product accumulation at pipe joints and along the pipe wall while providing

an enhanced bonding surface for CIPP, to enable rapid lining and quick return to service. The pipeline had been previously shut down due to leakage, and adhesion was desired to provide leak-free insurance against the future potential for water tracking between the host pipe and the CIPP liner.

The cleaning process for this installation took less than one hour, and the CIPP installation process proceeded immediately after final inspection. The customer was completely satisfied with the installation, and Tomahawk is now preparing for cleaning 200 feet of 12-inch diameter cast iron pipe under a major highway crossing in New York City this fall. A further installation is also planned under a major six-lane highway in New York City. While the outcomes for this CIPP installation were largely based upon CCTV inspections as opposed to quantified adhesion testing, such tests are planned for future installations. The speed of cleaning and drying process and the visual evidence (CCTV inspection) of a dry, surface profile provided confidence for the customer that the objective had been achieved. The cleaning and CIPP lining process was executed within 24 hours.

The use of airborne stone has a promising future in providing targeted, dry bonding surfaces that meet national standards (NACE 3) and can provide the adhesion needed to keep CIPP liners restrained, shear resistant, and leak-tight over the long-term.

ABOUT THE AUTHORS:

Randall Cooper P.Eng. *is a professional engineer with 23 years of experience in pipeline inspection, cleaning, condition assessment, and lining at large US industrial plants. He holds an honours MBA, and is a retired senior military officer with 14 years of service. He is a current member of ASCE, AWWA, ASTM, CATT and NASTT, serving on committees and preparing technical papers for the advancement of trenchless technology for the pipeline industry.*

BAMI-I INTRODUCES CTAM PROGRAM TO LATIN AMERICA

By: The Trenchless Technology Center (TTC)

On August 22, during the Instituto Colombiano de Tecnologías de Infraestructura Subterránea (ICTIS) Conference in Cartagena, Colombia, BAMI-I officially introduced its Certification of Training in Asset Management (CTAM) program in Latin America. Colombia is one of the pioneers of the trenchless technology industry in Latin America.

Dr. Tom Iseley, BAMI-I Chairman and TTC director, was Guest Speaker at the ICTIS Conference, invited by Mr. Arlex Toro Rodriguez, Executive Director ASOCIACION ICTIS/CISTT. Dr. Iseley delivered a presentation covering an introduction and overview of the CTAM program and trenchless technology design & construction considerations for new pipeline installations and renewal.

BAMI-I will translate the 4 CTAM courses into Spanish, continuing to serve its industry partners in Latin America, with the goal of having presence in more Spanish-speaking countries and sharing knowledge of asset management and trenchless technology.

Buried Asset Management Institute-International (BAMI-I)

The Buried Asset Management Institute - International (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. Although BAMI-I has been mainly focused on water and wastewater systems, the principles of asset management apply to all different types of buried assets including for instance gas distribution pipes, electric cables.

Good buried asset management practices will:

- Maximize life-cycle value of assets
- Sustain economic development
- Protect public health
- Improve the environment
- Enhance the quality of life

The purpose of BAMI-I is to provide a center of excellence for owners of underground water infrastructure to join with industry and researchers, using sound science, to evaluate and/or develop buried asset management protocols for application worldwide.

Certification in Training of Asset Management (CTAM)

The Certification of Training in Asset Management (CTAM) is an exclusive four part series in Asset Management coursework and certification. The CTAM program was developed by BAMI-I in conjunction with the TTC (Trenchless Technology Center) at Louisiana Tech and IUPUI (Indiana University-Purdue University at Indianapolis), in partnership with UIM: Water Utility Infrastructure Management, and is hosted by the Trenchless Technology Center at Louisiana Tech. CTAM is offered online and per request in classroom format. More than 650 individuals from 14 countries have enrolled in the CTAM program.

The CTAM program Certification Board is chaired by Richard Thomasson P.E. , Arcadis, BAMI-I Vice Chair, and MASTT Chair. Also serving on the Certification Board are Kurt Wright, SDG Engineering, CTAM-400 Chair; Jim Harris, Jacobs Engineering, CTAM-300 Chair; Ronald Thompson, Southeast Engineering & Consulting; and Tod Phinney, Souder, Miller & Associates.

Requirements and application information are available online (www.bami-i.com) for the three levels of certification available – Certificates of Completion, and the Associate Water Asset Manager (AWAM) and Professional Water Asset Manager (PWAM) designations. To date 55 AWAM and 15 PWAM certifications have been awarded.

Benefits of CTAM Courses to Professional Engineers

CTAM Courses benefit Professional Engineers with years of experience in management of underground asset infrastructure. Most State Licensing Boards require PDHs for PE license renewal. It is up to the individual to verify that the Board for the State she/he is seeking license renewal will allow the CTAM course certifications. Many PEs who have years of experience in water and wastewater systems have never developed and implemented formalized asset management plans. These courses are developed by industry professionals for industry professionals. Many of the course development professionals are PEs with many years of experience.

Benefits of CTAM Courses to Municipalities

Municipalities benefit from participating in CTAM training and certification process. One benefit of these courses and

certifications derived by smaller municipal systems may be related to the difficulty they have attracting/training/retaining highly skilled professionals to manage their underground asset infrastructure. The CTAM courses allow them to cost-effectively train inexperienced staff. It also provides a basis to recognize and reward individuals who attain the AWAM and/or PWAM certifications. This system of training and certifications also assists smaller municipalities with the hiring process and pay slotting for open positions.

The principles and practices of water asset management taught in the CTAM courses are appropriate for all sizes of utilities both public and private. BAMI-I makes a special effort to emphasize that this material was developed with a commitment to provide value to the 93% of utilities that serve fewer than 10,000 customers. For more information, and application requirements, please visit http://bami-i.com

TTC EXPANDS AWARENESS OF UNITRACC KNOWLEDGE NETWORK

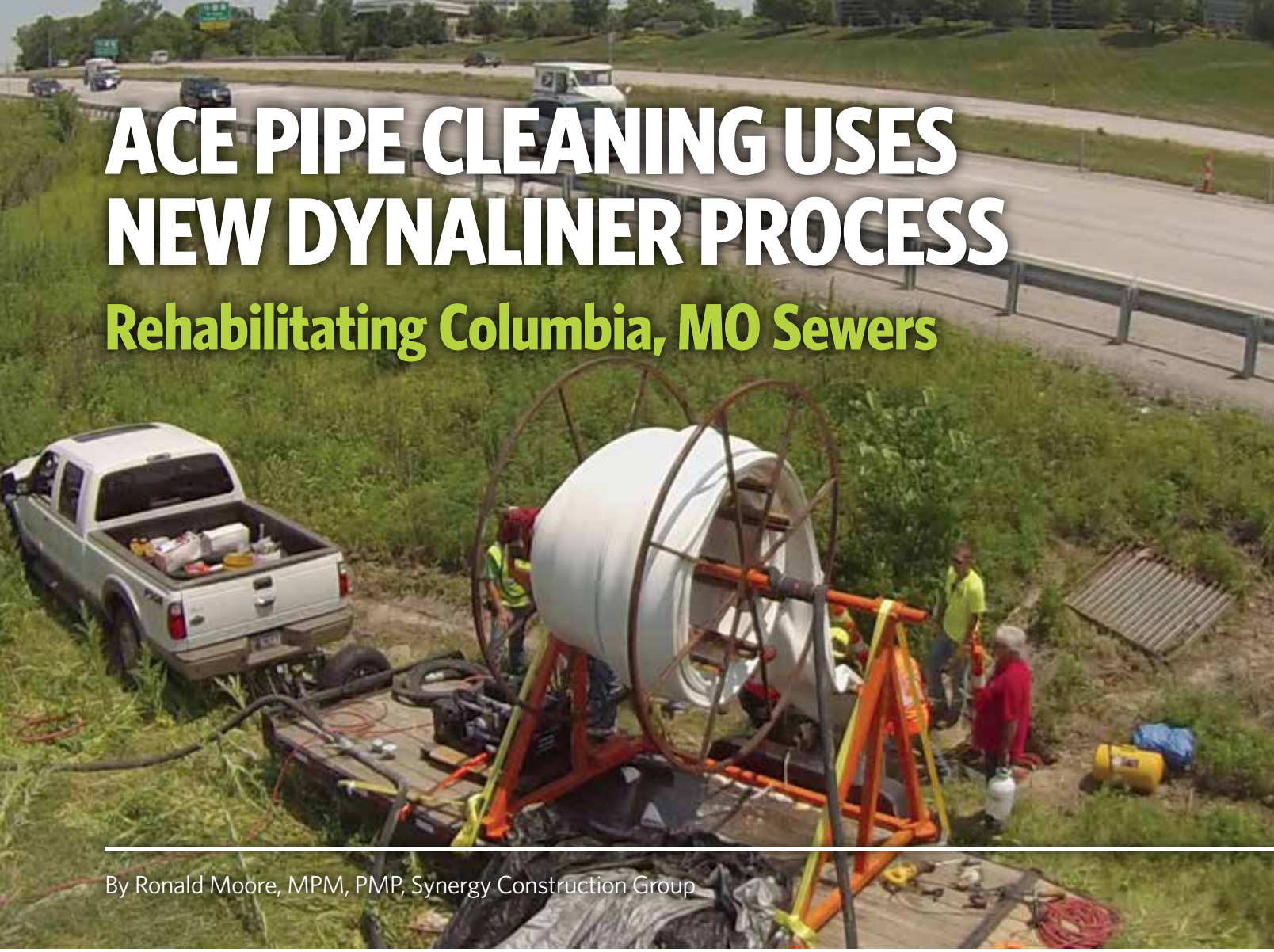
On August 30, 2016, the Trenchless Technology Center (TTC) at Louisiana Tech University and Stein & Partner, GmbH (S&P), based in Bochum, Germany, entered into an agreement to expand the awareness of the UNITRACC (Underground Infrastructure Training and Competence Centre) training and learning programs. This joint initiative will be led by Dr. Tom Iseley, Director of TTC; and by Dr. Robert Stein, CEO for S&P.

UNITRACC is the most extensive information, working and learning platform available for the planning, installation, operation, maintenance, rehabilitation and management of urban water supply and sewage disposal systems. It utilizes a huge library of media types such as photos, animations, videos, graphics, simulations, etc. to provide support for professionals throughout their careers.

This knowledge network has been developed over the past 20 years and is designed for professionals in all segments of the water sector. Dr. Iseley will serve as the international director for UNITRACC.com, and is well known for his global leadership related to underground infrastructure.

ACE PIPE CLEANING USES NEW DYNALINER PROCESS

Rehabilitating Columbia, MO Sewers



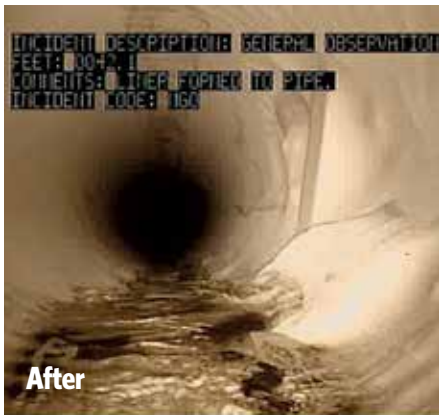
By Ronald Moore, MPM, PMP, Synergy Construction Group

The City of Columbia, MO Sewer Department had a few storm sewers that were impending failure with potentially catastrophic results. Columbia has an existing term and supply sewer rehabilitation contract with Ace Pipe Cleaning, Inc. According to Nate Runyan, an engineer for the city of Columbia, "One of the 30-inch corrugated metal pipes needed immediate repair due to the potential for collapse under a major arterial road alongside a major highway."

Ace Pipe Cleaning, Inc. contracted with DynaLiner, LLC. for the installation of a Thermoformed PVC Pipe Rehabilitation process—an alternative to the traditional Cured-In-Place-Pipe (CIPP) trenchless rehabilitation method—to repair the storm sewers. Ryan Poertner, General Manager for Ace Pipe Cleaning, stated "Columbia was interested in using the DynaLiner product as a new approach to repair their storm sewers."

DynaLiner uses a PVC compound to renovate existing sanitary, storm and culvert pipes from 3 inches to 36 inches in diameter. When properly installed DynaLiner will provide a continuous, structural, manhole-to-manhole PVC pipe, which is molded in tight conformity to the original host pipe. See the before and after pictures below.

"By contracting with DynaLiner—a new process on the market that rehabilitates sewer lines— we were able to meet the lead



time for manufacturing and installation, satisfy Columbia and reduce the risk of the road collapsing by completing the project within three weeks of our original discussion," said Ryan Poertner.

A total of four DynaLiner installations were completed including two 30-inch storm sewer installations in Corrugated Metal Pipe (CMP) with lengths of 85 feet and 184 feet and two 8-inch sanitary sewer installations in Vitrified Clay Pipe (VCP) with lengths of 270 feet and 302 feet.

Traditionally, these sorts of repairs are not only costly, but they are a hassle because digging up municipal pipe segments for repair can have a large impact to the general public. DynaLiner is a solution governmental agencies are looking for to reduce the financial hardship and stress the repairs cause to local traffic and the surrounding communities. The DynaLiner material is equivalent to installing SDR35 PVC sewer via open cut method without having to disturb the ground.

Gone are the days of digging up streets, removing and replacing driveways, trees and other utilities. What's more, the cost to utilities and stakeholders associated with rehabilitating sewers are justifiable, because typically repairs installed with PVC add at least 75 years of expected life to a sewer line.

Most agencies responsible for maintaining pipelines use American Standard for Testing and Materials to specify material properties, testing and installation methods. Utilizing ASTM in specifications ensures contractors and engineers are on the same page when it comes to bidding and quality of the installation. ASTM 1504-14 is the governing standard for the DynaLiner product. This makes DynaLiner an ideal choice for the rehabilitation of failing storm sewers.

DynaLiner offers a valuable solution to utilities because of its short lead time for the manufacture of the PVC liner, no sensitivity to weather elements and no styrene leaking into adjacent streams.

ABOUT THE AUTHOR:

Ronald Moore *is president of Synergy Construction Group, a company specializing in construction project management and rehabilitation of underground utilities. He has 30 years of experience in heavy and utility construction, serving for 20 years as principal evaluator of new materials and products for the fourth largest sewer district in the county. He also served his country as an enlisted soldier and combat engineering officer as a member of the Missouri National Guard. Moore is currently member of ASTM International committee F-17 (plastic pipe systems).*

For more information visit
nodigshow.com

NASTT's No-Dig Show &
ISTT's 35th International No-Dig

April 9-13, 2017

Gaylord National Convention Center | Washington, D.C.

INDUSTRY EXHIBITS

INNOVATIONS

TECHNICAL PAPERS

See what NASTT's No-Dig Show can do for you. Plan your experience.

"I make connections on the exhibit hall floor that turn into reliable leads. It's a great place to share your knowledge and learn a thing or two that you didn't know was even possible."

Vern Phillips, Sr.
Principal
Harris & Associates

Jerry D'Hulster, President of Perma-Liner, says the innovative concepts and products that exist within the trenchless technology industry are surreal. This show has the most knowledgeable people within the industry. Even if you can't attend the sessions, the exhibit hall is worth the cost to walk around the show floor for a few hours just to see the new developments.

"Each year I look forward to listening to specialists in our industry and adding the No-Dig Show proceedings to my personal library."

Rory Ball
Senior Tunnel Engineer
Mott MacDonald

INDEX TO ADVERTISERS:

Online Asset Management Training for Water Utility Professionals

Exclusive Four-Part Series in Asset Management Certification

1. CTAM-100 – Overview of Asset Management
2. CTAM-200 – Developing an Asset Management Program
3. CTAM-300 – Managing an Asset Management Program
4. CTAM-400 – Financing an Asset Management Program

Why offer courses in Asset Management?

The Buried Asset Management Institute-International (BAMI-I) created the Certification of Training in Asset Management (CTAM) program to increase awareness and train utility personnel on the best way to implement and use asset management to extend the life and efficiency of their water and wastewater systems. CTAM is an online educational series for obtaining certification of training in management of underground asset infrastructure.

Levels of Certification

I. Certificate of Completion – requires completion of each course

II. Associate Water Asset Manager (AWAM) – requires completion of CTAM 100-400 and an application submitted to BAMI-I Asset Management Certification Board

III. Professional Water Asset Manager (PWAM) – requires completion of CTAM 100-400, four years of relevant asset management experience and an application submitted to BAMI-I Asset Management Certification Board

Benefits of the CTAM Series

- Expand your knowledge and access to resources to enable you to initiate, continue or improve your own asset management program
- Earn internationally recognized certification in the field of asset management
- Earn 1 CEU / 10 PDHs* for each course

CTAM-100 At-a-Glance:

- Sharing Asset Management Knowledge Globally
- Asset Management Overview & Technologies
- Introduction to Appropriate Websites & Tools
- Risk Management
- Government Regulations
- Case Study Examples

CTAM-200 At-a-Glance:

- Underground Infrastructure Asset Management
- Advantages, Rewards, Obstacles & Planning
- Asset Inventory, Organization Strategies & Tools
- Water & Wastewater Condition Assessment
- Data Content, Analysis, Sharing & Distribution

CTAM-300 At-a-Glance:

- Organizational, Legal & Budgeting Considerations
- Developing Priorities & Key Performance Indicators
- Infrastructure Inspection, Mapping & Rehab Methods
- Capacity, Management, Operation & Maintenance
- Asset Worth Value & Life-Cycle Analysis
- Risk-Based Budgeting

CTAM-400 At-a-Glance:

- Financial Challenges & Developing Strategies
- Accounting Principles, Reporting & Budgeting
- Strategic Internal & External Financing Tools
- Public-Private Partnerships and Design-Build
- Level of Service and Capital Improvement Plans
- Life-Cycle Costing
- Case Study Examples

BAMI-I

Trenchless Technology Center

WATER FINANCE & MANAGEMENT

CTAM Certification of Training in Asset Management

The CTAM program was developed by BAMI-I (Buried Asset Management Institute International) in conjunction with the Trenchless Technology Center at Louisiana Tech and Indiana University-Purdue University at Indianapolis, in partnership with *Water Finance & Management*, and is hosted by the Trenchless Technology Center at Louisiana Tech.

For more information and to register, call 330.467.7588, e-mail, vminer@benjaminmedia.com or visit Conference.com/Benjamin/CTAM/CTAM_Home.html.

NATIONWIDE SERVICE

OVER 25 YEARS OF EXPERIENCE

Proud member of ISNetworld® and Veriforce

- Horizontal Directional Drilling (HDD)
- HDD Profiles
- Design Builds
- Jack and Bores
- Conventional Bores
- Road Bores
- Beach Approaches
- Pipeline Construction Welding and Fusing
- Pipe sizes from 2” up to 54”
- Drill lengths up to 5000’ plus
- Rock Drilling
- Union or non-union projects

For more information please contact us at:

Phone: 888-359-1115 | www.uscrossings.com | Email:mlind@uscrossings.com

U.S. Crossings Unlimited