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MESSAGE FROM NASTT-NE CHAIR

Eric G. Schuler, P.E., NASTT-NE Chair

Welcome to the 12th edition of Northeast Journal of Trenchless Technology Practices! I hope that you find the content in this publication to be forward-thinking and practical. We continue to have great participation from our sponsors in our biannual Journal efforts; and for that I truly thank each and every one of them for their continued support.

We have new Executive Committee and Board Members for the 2022-2023 term. This Regional Chapter is always evolving, growing, and learning from our past experiences relating to both Journal content and annual conference results. We are a volunteer-run organization and it takes a strong commitment from a select group within this industry to keep the "wheels-on-the-wagon" as we strive to provide sound educational and networking experiences for our 7-state region. As you read this magazine, I encourage you to get involved with our close-knit group. We have several committees ranging from Journal Content, to Conference Content, to Conference Venue Planning; all of which can use additional volunteers.

Learning from the ***Past***, allows us to evolve for the ***Present***, which helps us grow for the ***Future***.

PAST (2021). The Northeast Chapter ended last year on a high-note with our first in-person conference since the COVID-19 pandemic hit our shores. The 2021 conference was held at the Historic Thayer Hotel at West Point NY; with approximately 100 attendees present for networking with peers/vendors and present for a full multi-track technical session agenda. UMASS-Lowell Student Chapter was integral in helping with on-site registration efforts and general conference support. Exterior demonstrations of various trenchless technologies has become a staple of our conferences; and many attendees braved the chilly NY November winds to join two contractors outside for their presentations.

Our two Journal publications in 2021 provided a great insight into industry trends and highlights within the region. We also continued to support the Trenchless for Gas Infrastructure magazines; a premier publication that is distributed beyond the borders of the Northeast Chapter.

PRESENT (2022). This is going to be an exciting year for the Regional Chapter as we are shifting our annual conference to Portland Maine for this November. We originally were planning on holding an annual conference in Portland back in 2020, but was forced into a cancellation due to the ongoing pandemic. Luckily, we were able to hold a spot on the Venue schedule for 2022 and are excited to bring our show to the northernmost state in our region. Our Conference Venue Planning Committee consisting of Bill Jeffery, Pat Ambrosio, and Tom Loyer are already full-steam ahead with getting us ready for this event. We will be releasing a detailed flyer later this spring highlighting conference details and "save the date" information.

We are looking for additional content for the Fall edition of our Journal! So if you have a good "lessons learned" topic or a project that you would like to highlight, please reach out to me or our Publisher at any time.

FUTURE (2023 & 2024). Our conference Venue committee of Jonathan Kunay and Claudia Law are evaluating venue options for 2023 and 2024. A short-list has already been developed and we anticipate securing a 2023 venue later this Spring or early Summer. An announcement on that location will be forthcoming.

> ***"LEARNING FROM THE PAST, ALLOWS US TO EVOLVE FOR THE PRESENT, WHICH HELPS US GROW FOR THE FUTURE."***

As we move through 2022 and into 2023, the Northeast Chapter will be focused on driving interest in the region for No-Dig 2024 in Providence RI. We have a sense of pride in No-Dig being held in the Northeast Region; close to home for many of our members. This will be the first No-Dig in the Northeast Region since the Northeast Chapter was formed.

Thank you for taking the time to read this publication, and I look forward to seeing you in Portland this November!

Eric Schuler

Eric G. Schuler, P.E.
Chair, NASTT-NE

MESSAGE FROM NASTT CHAIR

Alan Goodman, NASTT Chair

Our Chapter Members and Volunteers are Crucial to our Society

Hello Northeast Chapter Members. The trenchless industry grows stronger every year. Even in the pandemic our membership and regional chapters moved forward to educate the public. It's amazing when you look back at what we were able to do during these challenging times. Now we are excited to start looking forward to the future! We've led the industry in safely meeting face to face. As an organization and an industry, we successfully met in Orlando last spring, in Vancouver, BC for No-Dig North this past fall and now in Minneapolis for the NASTT 2022 No-Dig Show. Not to mention the extremely successful Northeast Trenchless Conference held in West Point!

The NASTT 2022 No-Dig Show being held in Minneapolis, Minnesota, April 10-13 is anticipating 2,000 attendees and nearly 200 exhibitors. There are many new features we plan to roll out including enhanced educational forums, more networking opportunities and expanded exhibit hall time. Our industry is constantly growing in innovative ways and the No-Dig Show is a representative of our industry. We are excited to bring new value and educational experiences to you.

"WE ARE A RESILIENT INDUSTRY!"

Mark your calendars for October 17-19 for the third annual No-Dig North in Toronto. The NASTT Canadian Regional Chapters come together with the entire trenchless industry for two days of training courses, technical sessions and networking opportunities. If you do business in Canada, this is the must-attend trenchless event.

NASTT's mission and vision are "to continuously improve infrastructure management through trenchless technology" and "to be the premier resource for knowledge, education, and training in trenchless technology." With education as our goal and striving to provide valuable, accessible learning tools to our community, one of the things of which we are most proud at NASTT is that even during uncertainty we have been able to grow. Recently, we welcomed our latest Regional Chapter to the NASTT family and completed our representation of the entirety of North America. NASTT was so excited to announce that we now have our first chapter in Mexico!

For more information on our organization, committees, and member benefits, visit our website at www.nastt.org and please feel free to contact us at info@nastt.org.

We look forward to seeing you at a regional or national conference or training event soon!

Alan Goodman

Alan Goodman,
NASTT Chair

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NASTT-NE BOARD 2022-2023

ERIC SCHULER – CHAIR

Eric Schuler is the Director of Engineering for a public water authority serving 16 municipalities in Central New York. As a Department Head he oversees all of Engineering, Distribution, and Maintenance Operations for MVWA. Mr. Schuler has over 10 years of experience as in both the private and public sectors. He earned his Bachelor of Science in Civil Engineering degree from Clarkson University in Potsdam, NY and has primarily been involved in wastewater, drinking water, civil-site, and stormwater sectors. Eric is a licensed Professional Engineer in New York whose design, project management, and construction-related experiences have helped successfully execute many "trenchless"-focused projects.

Early in his engineering career he gained exposure to various trenchless technologies through utility evaluations and development of utility project design alternatives. He immediately started to envision great opportunities for communities plagued by utility deficiencies and construction constraints to utilize CIPP, HDD, among other trenchless technologies; and for them to be able to benefit from both social and economic perspectives. Eric has also stressed the importance for municipalities to incorporate asset management into utility system evaluations and system rehabilitation designs in order to aid development of capital projects and to determine the most suitable trenchless applications for implementation.

In addition to NASTT-NE, Eric is also a Board Member for the Central New York Branch of the American Public Works Association (APWA), a Director of the Central New York Water Works Conference (CNYWCC), and is active with the New York State American Water Works Association (NYAWWA). Eric continues to push for growth of trenchless technologies in upstate-New York and has trained utility owners on the use of hydraulic modeling methods for proper development of utility rehabilitation project design. He is an advocate for educating (designers & installers) of trenchless applications through proper training and increased accessibility of industry standards/guidelines to ensure successful project design and execution. The successful use and increased awareness of modern-day trenchless technologies that incorporate innovative equipment and materials are what Eric believes will continue to shape and drive the direction of the utility industry for the coming decades.

JONATHAN KUNAY – VICE CHAIR

Jonathan Kunay, P.E., PMP is an Associate Engineer and the global Conveyance Market Discipline Leader for CDM Smith in Boston, MA. He has 19 years of experience working as a design engineer and project manager on a variety of trenchless projects including infrastructure assessment with traditional and state-of-the-art investigative techniques, rehabilitation using CIPP, HDD and pipe bursting, facilities planning and master planning, leak detection of water distribution systems, enterprise asset management and risk/criticality studies.

While trenchless technologies have been his primary focus over the past 16 years, he also has worked on civil site design for commercial developments and municipalities, navigated Consent Order driven long-term programs, designed new pumping stations and developed alternatives for sewer separation projects. Jonathan is based in New England; however, his diverse project experience has brought him many places to experience unique perspectives in the trenchless marketplace. He has worked on trenchless projects all over the United States including California, Texas, Illinois, Tennessee, Louisiana, South Carolina, Nebraska, Virginia, Florida and Georgia. He has also implemented trenchless projects and programs internationally in the Middle East, China, South America, the Pacific Islands and Europe.

Jonathan was the project manager and design engineer responsible for helping to bring service lateral lining into the New England market in 2008 as part of a comprehensive sewer system rehabilitation program. This comprehensive model has now been adopted across the country as a proven methodology by which infiltration and inflow can be removed in large quantities from the sewer collection system. This comprehensive approach has been presented at conferences to showcase the validity of utilizing a holistic trenchless methodology when large percentages of I/I by volume must be eliminated.

Jonathan has a Bachelor of Civil Engineering and a Minor in Environmental Engineering from the University of Cincinnati, is certified in NASSCO's Pipeline Assessment and Certification Program (PACP), Manhole Assessment and Certification Program (MACP), and Lateral Assessment and Certification Program (LACP), and is involved in multiple committees in the National Association of Sewer Service Companies (NASSCO).

EXECUTIVE COMMITTEE

CHARLES TRIPP – TREASURER

Charles Tripp, P.E. is a Technical Manager focusing on Pipeline Rehabilitation Design and Condition Assessment for the New England Water Business Line at AECOM in Chelmsford, MA. He has 16 years of experience working as a design engineer and project manager on a variety of trenchless projects including pipeline rehabilitation, condition assessment, risk modeling, and general asset management. His varied design experience also includes collection systems design and peer review, wastewater treatment, water resources, and site-civil design to improve municipal infrastructure.

Charles was first introduced to trenchless technologies through his involvement in multiple sanitary sewer rehabilitation projects starting early in his career. He also briefly served as a Field Engineer for a world leading CIPP construction company. This experience provided a wealth of exposure and instilled a desire to pursue and advocate for the use of trenchless technologies in projects as a way of mitigating the impacts of excavation in urbanized areas, but also as a means of cost-effective design.

Charles studied Civil Engineering at the University of Massachusetts Amherst earning his B.S. and went on to receive his M.S. in Environmental Engineering from the Worcester Polytechnic Institute. He is a licensed professional engineer in Massachusetts, New Hampshire, Rhode Island, and New York, and is also PACP/MACP certified by NASSCO.

As Treasurer for the Northeast Chapter of NASTT, Charles continues to capitalize on his devotion to trenchless technologies and in advocating for its use in the local construction market. He continues to apply his experience to the effective management and administration of fiscal matters of the organization.

JOHN ALTINYUREK – SECRETARY

John Altinyurek is presently a Senior Staff Engineer with the New York,NY office of McMillen Jacobs Associates. He previously worked for WSP for 6 years. During his career in the underground industry, John has been involved in major tunneling and trenchless projects in the New York City area for clients such as the NYC Dept. of Design & Construction, New York City MTA Transit, Port Authority of New York New Jersey, Amtrak and continuing his work on New York State Department of Environmental Conservation/Nassau County Design-build Bay Park Conveyance Project in Long Island, NY.

For the past 7 years, he has focused on underground construction management and design for tunnels and conveyance including transit projects, water and wastewater pipeline design and construction projects. He has worked on various pipeline projects utilizing microtunneling, pipe jacking, horizontal directional drilling, and other tunnel rehabilitation methods.

John views NASTT-NE Regional chapter as a very important organization in promoting the rapidly growing trenchless design and construction methods in the United States. As a young professional, John hopes to bridge the gap for his peers to get engaged with the NASTT-NE Chapter and be involved in the trenchless industry early on in their careers.

NASTT-NE BOARD 2022-2023 EXECUTIVE COMMITTEE

BABS MARQUIS – PAST CHAIR

Babs Marquis is presently the Trenchless Practice lead for the East Coast and Construction Manager with the Burlington, Mass., office of McMillen Jacobs Associates. He previously worked for Jacobs Engineering Group for 10 years and Stone & Webster for 11 years. During his extensive career in the trenchless industry, Babs has been involved in major tunneling and trenchless projects in the Northeast for clients such as the Massachusetts Water Resources Authority, Boston Water & Sewer Commission, the Metropolitan District Commission (Hartford, CT), Narragansett Bay Commission (Providence, RI), NYC Dept. of Design & Construction, NYC Dept. of Environmental Protection and continuing his work on a recently awarded New York State Department of Environmental Conservation/Nassau County Design-build Bay Park Conveyance Project in Long Island, NY.

For the past 25 years, he has focused on underground construction management for tunnels and conveyance including water and wastewater pipeline design and construction projects, with emphasis on trenchless construction methods. He has worked on various pipeline projects utilizing microtunneling, pipe jacking, horizontal auger bore, pipe bursting and other pipeline renewal methods.

Babs views the NASTT-NE Regional Chapter as an important vehicle to promoting greater awareness and understanding of trenchless applications at the local level. He sees the level of interest and confidence in trenchless technology growing among owner groups based on the successful completion of many high profile projects across the Northeast. Drawn to the varied unique and innovative aspects of trenchless technology, Babs believes access to ongoing education is key to even greater owner acceptance and NASTT-NE Chapter is a key component towards achieving this acceptance by making information available at the grassroots level as well as attracting student chapters from the region and a robust local participation in the Chapter activities throughout the region.

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Q&A

with

Dennis Doherty
P.E., F.ASCE

FOUNDING CHAIR OF NASTT-NE CHAPTER INDUCTED INTO NASTT HALL OF FAME

Dennis Doherty, P.E., F.ASCE, is a versatile senior principal engineer with Kleinfelder having proven experience and national recognition as a leader in trenchless technology. Dennis has more than 40 years of industry experience—the last 30 of which have been focused on design, construction, and management of underground infrastructure. Described as applying a "think outside the box" approach to his projects, he has successfully delivered significant projects involving environmentally sensitive sites, congested urban areas, river/body-of-water crossings, and sites with challenging terrains.

A NASTT member since 1992, Dennis has been a champion of bringing trenchless technology to the next generation. His efforts raising money for NASTT's Education Fund and sponsoring NASTT student chapters provided resources for student scholarships and attendance at the NASTT No-Dig Show and regional conferences. He is helping UMass Lowell develop a first-of-its-kind, graduate-level certificate in trenchless technology, which will count toward a Master's degree in civil engineering. Dennis also helped found the NASTT-NE Regional Chapter in 2016, and is the Founding Chair of this organization.

Dennis believes in continuous lifelong learning and self-improvement in a holistic approach to life. His approach to solving engineering problems is based on risk-based engineering principles. In his spare time, Dennis enjoys his dogs Rylee and Daisy, his wife Debra, his immediate and extended family, and his grandchildren. His hobbies include cooking, gardening, long rides with Debra, New England sports, drum corps, and hanging out with the dogs.

In a wide-ranging interview, Dennis describes his early exposure to trenchless technology, details milestone projects in his illustrious career, and shares his ideas on fostering the next generation of trenchless technologists:

What first inspired you to become interested in construction & engineering field, particularly underground construction?

I liked playing in the mud when I was a kid; I would use toy trucks, dozers, etc. to construct sites. Later, I took up designing things on paper. I knew I wanted to be an engineer, and in 1974, I entered Lowell Technological Institute (now UMass Lowell) where I received an excellent education that prepared me well for the real world. While at Lowell I became Managing Editor of the student newspaper, The Connector. This experience taught me a lot about communicating properly with people to get a message out. I also competed at a world class level in Drum Corps International (DCI). I was with the 27th Lancers Drum & Bugle Corps. We were always in the mix for the world championship. This experience taught me how to work with large groups of people for a common goal, how to persevere, work hard towards a goal, and leadership skills.

I started out working for a small construction company, but shortly after, I moved into structural engineering. I worked on nuclear power plants designing piping and pipe support systems. This work required living near the power plant you were assigned to. My wife, Debra, we first met when we were 11 /12 years old, dated throughout high school, went our separate ways in college and somehow found each other again. We have now been married 38 years, with 4 children and 2 grandchildren. When our kids got of school age, we decided to settle down back in New England so the kids would not have to jump from school to school and they could be near relatives. I took a job with a small civil engineering firm, but within a year, I moved to Bryant Associates in Boston.

"I LIKED PLAYING IN THE MUD WHEN I WAS A KID... LATER, I TOOK UP DESIGNING THINGS ON PAPER."

A Connector staff meeting

"I WOULD LIKE TO SEE NASTT AND THE INDUSTRY IN GENERAL DEVELOP DEGREED ENGINEERS IN TRENCHLESS TECHNOLOGY."

Competing in DCI

Outline your experience of first being introduced to trenchless technology methods and applications.

It was at Bryant Associates where I was first exposed to trenchless. In 1988/1989, I worked on the South Boston interceptor rehab project using a Gunite lining to rehabilitate the sewer. In 1990/1991, I was assigned to solve the problem in the Back Bay section of Boston where the existing old sewer system was drawing down groundwater to the numerous buildings on wood piles. When the tips of the piles are exposed to air above the groundwater table, they rot and buildings settle. The area was highly urbanized and historic. A detailed study was conducted that reviewed and compared numerous trenchless methods that were applicable to solving the problems. The project eventually included microtunneling, pipe bursting, CIPP lining, and Gunite lining. The project eventually won both Trenchless Project of the Year awards for New Installation and Rehabilitation – it's quite an accomplishment to win both awards in the same year! I have since been involved with five other New Installation Trenchless Projects of the Year and several runner ups and honorable mention projects.

After Bryant Associates, I worked for Metcalf & Eddy (now part of AECOM) where I collaborated with John Hair on my first HDD project. I was also involved with 36,000 feet of large diameter slip lining of the Big Creek Interceptor in Cleveland. There is a case study of the project in Dr. Mo Najafi's Trenchless Technology book "Pipeline and Utility Design, Construction, and Renewal" (WEF Press 2004), Section 14.10. I moved on to Jacobs Engineering where I was exposed to trenchless work, all over the world. Even got to test fire rockets at NASA's Stennis Space Center to study the massive fire deluge system and how best to rehabilitate the piping system.

But the project I am most proud of is the East Boston Branch Sewer for the Massachusetts Water Resources Authority (MWRA). Having grown up in the town of Winthrop right next door to East Boston, I knew the area well. An old combined sewer system in East Boston was a large contributor of sewage overflows into Boston's Inner Harbor. I became involved with this project while at Bryant. In fact, East Boston is modeled after St. James. Being involved from concept to end of construction, the project

was another Trenchless Technology Project of the Year. But the most important part was seeing marine life like seals and whales returning to Winthrop Harbor that was my playground growing up.

I also spent 10 years at Haley & Aldrich before moving over to Kleinfelder at the beginning of the Covid pandemic. At Haley & Aldrich, we worked on many high voltage power transmission projects using trenchless methods, including last year's Trenchless Project of the year, The Rappahannock River crossing acting as owners' rep during the preliminary design.

How did you first get involved with NASTT? What are some of the goals and initiatives you would like to see NASTT pursue?

I attended my first No Dig show in Washington, DC in 1992 and was amazed at the combinations of technologies that can be used to maintain and install needed underground horizontal infrastructure. These new tools allowed me to be creative in identifying and solving our underground horizontal infrastructure challenges. Outside of the past two years (due to the COVID pandemic), I have only missed two No Dig events since 1992. I became involved with the standardization of methods and contributed to many manuals of practice. The two documents I am most proud of are the ASCE

Past presidents dinner with the Northeast Regional Chapter and the former Northeast Trenchless Association

Overboarding pipe from fixed platforms for twin 17,000-foot HDD crossing of York River Power transmission project

Standard Design and Construction Guidelines for Microtunneling, where I was a principal author responsible for sections on planning and being Chair of the Blue-Ribbon Review Committee for the NASTT HDD Good Practices Manual, 4th edition.

With respect to goals and initiatives, I would like to see NASTT and the industry in general develop degreed engineers in trenchless technology. There is currently no degree in trenchless engineering, yet the wealth of knowledge required to successfully plan, design, and construct a trenchless project is highly specialized. This book of knowledge is no different than the book of knowledge for project managers, electrical engineers, geotechnical engineers, and so forth. It is specialized and should be recognized as such. The book of knowledge required to be a successful trenchless engineer is now well established; the issue is finding faculty to teach the various topics. I put together an eight-course curriculum for UMass Lowell to allow students to receive a Certificate in Trenchless Engineering where the credits also apply toward a master's degree in engineering. Four classes are required, with two classes focused on either new installation or rehabilitation, and two common courses – one on all methods and one on risk

HDD in historical downtown Atlanta

management for trenchless projects. We plan on starting small by offering a single hybrid online/in person class. I also would like to develop the Center for Excellence in Trenchless Technology and Underground Engineering (CETTUE) at UMass Lowell. I need a hobby for when I retire.

MWRA and East Boston Branch Sewer team accepting TT Project of the Year

What are your thoughts on the current state of the trenchless industry? What areas do you see evolving in STEM education and post-secondary academics?

We should start getting students interested and involved in high school, and even offer classes at vocational schools in the skills needed to be on an active trenchless construction site. The small rig manufacturers have done a good job developing training for operating small rigs. But I think the industry needs to step up and engage the high school and vocational school students. For those more interested in the engineering aspects of trenchless, I strongly believe that a degreed trenchless engineer will bring significantly more value to the industry than just trying to plug and play engineers that are not fully interested in a career in trenchless.

Is the trenchless industry generally doing a good job of attracting young professionals? What do you think can be done to better engage students and young professionals in the trenchless industry?

The Northeast Regional Chapter for NASTT goal is to have at least one higher education institute in each of the seven states in our region. We had plans to start a chapter at Quinnipiac University when COVID hit, causing many on-campus activities to cease. However, now that life has adjusted to COVID and students are re-engaging with campus activities, we need to renew our efforts and goals. I think it is critical that the industry engage and attract young engineers into this industry because the growth will not stop. Our recent regional conference at the US Military Academy at West Point has resulted in a strong interest by the West Point Department of Civil Engineering; they have requested a detailed presentation on all things trenchless. The conference this fall will be in Portland, Maine – a short drive for students at the University of Maine, University of New Hampshire, and UMass Lowell. The intent is to invite interested students and faculty from each institute.

Biggest challenges facing the trenchless industry today? Has acceptance and understanding of trenchless technology improved?

The biggest challenge facing the trenchless industry is limited resources to design and construct a successful trenchless project. Too many people are drawing lines on a piece of paper and calling it designed, when in fact they do not understand the intricacies

"I AM A BIG PROPONENT OF USING RISK-BASED ENGINEERING PRACTICES FOR TRENCHLESS PROJECTS."

With students from UMass Lowell Student Chapter checking out microtunnel project in Springfield, MA

of a trenchless design and often try to pass off the risk to the contractor. Conversely, many contractors could increase their knowledge and not take shortcuts in best practices. I am a big proponent of using risk-based engineering practices for trenchless projects. Understanding cause and effect of the various trenchless methods is a big step in managing risk associated with trenchless projects. The use of risk management methods for trenchless is growing, particularly in the private energy market and with public regulatory agencies. For example, the Pennsylvania Department of Environmental Protection (PADEP) is adapting some of my writings on the risk management topic to their developing standards for HDD projects. Additionally, a major energy company has developed a four-tier system for identifying and managing risk of trenchless projects based on alignment complexities. These initiatives will only require engineers and contractors to step up their game if they want to win work consistently.

Maintaining 2-way traffic in tight urban setting for microtunneling on East Boston Branch Sewer

Northeast Regional Chapter Board of Directors meeting

What do you personally enjoy most about working in the trenchless technology field?

With over 30 years in the industry, there are too many to list; if I tried, this article would be a 1,000-page book. However, the many relationships I've built over the years are certainly a career highlight worth mentioning. Bill Gray and Tom Iseley got me hooked on the industry, and I can call about half of the people in the Hall of Fame a friend, as I have worked and collaborated with them. When I got news of my induction, one of the first people I called was my friend Frank Cannon. I also spoke with my co inductee Mike Willmets. Paul Nicholas, my other co inductee, taught me about microtunneling way back in the days of St. James Ave. I have worked with many engineers, many on the NASTT Board of Directors. Perhaps the most influential person though, was my good friend Ron Halderman (RIP). We collaborated on projects together for 20 years, including last year's Trenchless Project of the Year. I am forever grateful for the knowledge he openly shared with me.

How do you foresee trenchless applications developing in the next decade?

I foresee the use of passive sonar in identifying the geology being microtunneled or drilled (HDD) with the use of virtual/augmented reality to "see" the ground you are going through. This is already being developed at the academic level. Although it may be possible to use AI for design and construction, such as Georgia Tech's Ant Colony Optimization theories, it still needs development.

Any further reflections as you become an honored member of the NASTT Hall of Fame?

I am not sure why I deserve this honor, considering I was only doing what I love to do. Strangely, when I checked with some of my friends in the Hall of Fame, they felt the same way, so I guess I am in good company. When you realize there are only 31 people in a billion-dollar industry with this honor, it requires some retrospect and reflection. These are all pioneers in this industry, but I do not consider myself a pioneer. I am in awe of this honor and realize the industry bestowing this honor on me will memorialize me; that is humbling. Not bad for a guy doing what he loves to play in the mud and develop processes to achieve a specific project goal!

PROVING AND IMPROVING PIPELINE TECHNOLOGY FOR TWENTY YEARS

Progressive Pipeline Management CEO Dave Wickersham Reflects on the Development of Trenchless Technology for Gas Pipelines

Since 2002, NASTT-NE Chapter member Progressive Pipeline Management (PPM) has been renewing natural gas pipelines from 12 to 42 inches along highways, bridges, railroad lines and urban environments. The Starline ® Cured-in-place-lining trenchless technology is a proven, cost-effective method that extends the life of an existing pipeline by over 100 years. As they celebrate twenty years, Dave Wickersham, founder and CEO, reflected on the decisions that shaped the first twenty years and what he sees ahead in the gas pipeline renewal landscape.

A CALCULATED GAMBLE ON AGING GAS MAINS

Over twenty years ago, I was asked to help on a gas pipeline project in Philadelphia where the Contractor, Exelon Infrastructure, needed help with removing oil and potential PCBs from the line. They need to remove the oil before they could "line" the 20-inch natural gas main.This was the very first time I witnessed the Starline® Cured-In-Place-Lining (CIPL) technology. A year later, Exelon was looking for an exit in the Starline license and I was immediately interested. Investing in it was a gamble, although calculated.Would the industry adopt the lining technology and capitalize on its ability to repair aging cast-iron gas mains?

We secured an exclusive license for North America for Starline® from the inventor and patent holder, Karl Weiss of Berlin, Germany and began PPM in August of 2002. The first 10 years focused on understanding the technology, testing and fine-tuning how to utilize the equipment and approach projects. Our customers - PSE&G, National Grid, Con Edison and PECO Energy in Philadelphia, were willing to come with us. Our core team spent hundreds of hours understanding the capabilities, the limitations, the opportunities and use cases for utilities. The learning curve and drive to both prove the technology and improve it kicked in early and remains a cornerstone of our work. The gamble paid off, slowly. Years of testing eventually proved to have very positive results.

> **"REHABILITATING A CAST-IRON GAS PIPELINE MINIMIZES OR ELIMINATES GREENHOUSE GAS EMISSIONS WHILE FIXING LEAKS."**

R&D & INDUSTRY TESTING

Our team collaborated with industry experts at leading utilities focused on specialized gas pipeline issues. The natural gas industry has invested over $15 million in testing of the Starline liner and its capabilities at Cornell University, Battelle Labs with research partners including the Gas Technology Institute, NYSEARCH and PHMSA.Multi-year research projects were co-funded by US DOT & PHMSA.Research & Development Program: Technology Transfer, Demonstrations and Post-Mortem Testing of Cast Iron and Steel Pipe Lined with Cured in- Place Pipe Liners.

With additional extensive R&D and independent testing on rehabilitated pipe with the Starline technology, CIPL has a confirmed service life of 100-plus years. At first, CIPL projects focused on smaller cast iron pipelines such as 12-inch diameter and less. We then moved up to 16-inch and 20-inch jobs. Starline® liner was developed specifically for lining high-pressure gas pipes. It is capable of installation applications at a maximum allowable operating pressure (MAOP) of 99 PSI, 180 PSI and 350 PSI.This culminated with meeting two ASTM Standards for lining gas mains and services.Namely F2207-02 and F2207-06.

"THE BEAUTY OF CIPL IS THAT IT NOT ONLY ADDRESSES THE LEAKS THAT OUR CUSTOMERS HAVE IDENTIFIED, BUT ELIMINATES THE ONES THAT HAVE NOT BEEN IDENTIFIED."

LARGE DIAMETERS & BREAKING WORLD RECORDS

The final Cornell studies with the DOT in 2014 and 2015 supported the 100+ year service life of an active liner. That endorsement opened PPM to lining projects that were much larger in diameter.After lining a 30-inch gas main, we secured the first world record lining project of a 36-inch cast iron gas main in 2017 with Public Service Electric & Gas (PSE&G) in South Orange, New Jersey. See the final project documents here. Research & Development Program: Technology Transfer, Demonstrations and Post-Mortem Testing of Cast Iron and Steel Pipe Lined with Cured in- Place Pipe Liners (https://primis.phmsa.dot.gov/matrix/PrjHome.rdm?prj=502)

Two years later, again with PSE&G in East Orange, N.J. we crushed our own world record for the largest size natural gas pipe to be rehabilitated with Starline liner. The 42-inch diameter cast iron gas main is in a highly congested area with multiple freeways, underpasses and a hospital. The gas line travels 80 feet directly down an embankment and then crosses under a major highway and back up the other side to street level.

Overhead view of the 42-inch drum, pit and transfer hose

There was no viable alternative for renewing these gas mains. In urban, historic and high-traffic areas where PPM is called in to solve a problem, the cost and disruption would be astronomical to dig up the old pipe and lay new pipe. To replace this section of pipe conventionally using open cut construction, would have cost millions of dollars and caused significant headaches and disruption.

SUPER-SIZED CHALLENGES

The move to larger-diameter pipes required an entirely different mindset and new advancements. Once the excavation holes are dug, there are four stages of a lining project. The inspection of the pipeline is done by CCTV. Then the lines have to be cleaned and prepared to be smooth and free of dust and grit. The GMZ's Guzzler vacuum trucks have a throughput of 5,000 CFM (cubic feet per minute.) To scale up, we invested in three trailer-mounted dust-collection machines from Rapid Prep with a throughput of 25,000 CFM. The dust collectors offer 5X the capacity for the same footprint.

Lining and curing phases use a conversion drum developed with Karl Weiss GMBH in Germany, which owns the patent for Starline in Europe. Wetting out the liner involves mixing two-part chemicals. The mixed resin goes into the open end of the liner and spreads out through its full length by rollers while being pulled onto the pipe inversion drum. To handle the large diameter liners and be mobile enough to manage getting around city streets and intersections like the ones in New York City, we designed a mega sized drum.

SHIFT FROM QUICK FIX TO LONG TERM STRATEGY

Super-sized drum for large diameter lining

Lining has become a more accepted, day-to-day solution than just a one-off bridge crossing or something that's an emerging tech. It used to be a stop-gap, quick-response, band-aid fix for a specific situation like a bridge, a historic block or train crossing. We'd get the call from one of our gas clients, 'Hey, I've got 1,000 feet on this corner, give me a price, give me a proposal, come do it when you can.'

On the engineering side and planning, gas companies are looking at lining as part of their long-term strategy to manage leaking infrastructure. The cost savings with this technology compared to traditional replacement where you tear up a street and "rip and replace" is significant. Most of the big leaks and gas needs are in inner cities in the Northeast and metropolitan areas such as Chicago. They have limited resources which are getting

more and more squeezed by inflation, price increases and budget cuts. Raw material availability is unpredictable. Price increases, inflation, choked shipping lines and supply chains are conditions outside of our control.

To mitigate that, we're shifting to a longer contractual arrangement with our clients to plan ahead for lining projects over the course of three years. Investing in the raw material and the lining material now allow them to have the goods in the country ready to roll. Otherwise, they are victims of erratic pricing and an unpredictable supply chain. We are seeing more long term planning and execution. For National Grid, one of our long-term partners, we are doing rehabilitation projects "Turn-Key", with PPM engineering, a contractor partner for the excavation and pipework, and PPM lining as an all-in package.This has streamlined the process and costs for the Utility, and we see this as an opportunity to use this model with our other Clients.

Lining project in Chicago for 20-inch cast iron pipe dated 1861

EPA PIPES ACT REDUCING METHANE EMISSIONS

Important positive shifts are happening as the industry is serious about eliminating hazardous leaks and reducing greenhouse gas emissions. The PHMSA Pipeline and Hazardous Materials Safety PIPES Act of 2020 came means tighter regulations on leaking pipes. Pipeline operators need to address leaks and releases of gas as well as address replacement or remediation of lines known to leak. Lining is a better and more cost effective way to fix leaks and includes a hundred year capitalization that goes onto the books as assets. Rehabilitating a cast-iron gas pipeline minimizes or eliminates greenhouse gas emissions while fixing leaks. The beauty of CIPL is that it not only addresses the leaks that our customers have identified, but eliminates the ones that have not been identified.

TESTING HYDROGEN BLEND TO NATURAL GAS PIPELINES

Testing and R&D is underway to look at the effects of transporting natural gas and hydrogen blends in the same pipeline. AGA and DOT have work groups sponsored by PHMSA that include testing lining as a solution for hydrogen blend and transportation. The BTU value between natural gas and hydrogen is very similar. It could reduce and make the transportation of natural gas safer, more efficient and greener. Part of the testing will be what happens to a gas pipeline that has already been lined with Starline. We feel good about the capability of the liner to withstand hydrogen gas. The liner composition could be changed if needed. We are involved with testing this year to address if a lined pipe has more resistance to leaking hydrogen than a normal pipe, and the level of hydrogen/gas blend the liner can withstand.

CONTINUOUS FINE TUNING – THE SMART BOX!

The first twenty years brought many changes, but our focus stays the same. We challenge ourselves every day to find ways to line faster, safer and more cost effectively.One aspect is to reduce project costs for our crews as well as the Utility crews. During the lining project gas is off line. To help us move towards that goal, we've developed a Wi-Fi system that allows us to remotely monitor pressure regulation during the curing of the liner. When we line a gas pipe, we monitor the curing, look at the pressure curing gauges and chart recorder in the hole. The old way was going back out for 2 hours of work with full crews to look at something that we typically know is fine. We do this for each day the liner cures, which may be 1 to 3 days or more depending on ambient temperature.

The "Smart Box" monitors the pressure of the line in real-time. Once we're in the curing process, we can remotely monitor the pressure in that line remotely. We can monitor pressure loss, temperature loss and can see the correlation between increases in temperature and decrease in temperature. It saves the client money, saves us money and time, and delivers better data. There are alarms and safeguards in place where we get a 9-1-1 code and an alert in the event of any anomalies. We are working closely with Honeywell and Verizon on the continued development of this powerful cost saving and data preservation tool.

MANAGING GROWTH AND RETAINING TALENT

Our company has lined over a million feet of pipeline– around 200 miles – of gas pipelines in 18 different states. Our Clients continue to see the benefits of the technology that PPM offers and our work also grows within each Client.These are pressure pipelines and predominantly natural gas both cast iron and steel.The growth will continue, we just signed a 10-year exclusive license renewal with Karl Weiss and re-invested more than $3m in capital equipment including two new CIPL pressure drums and replacing 70 percent of our fleet.

We have a strong and trusted team who have been with me all the way. These are folks who had kids after they started working at PPM (myself included!); then they were buying houses or moving to better homes to provide for their growing families.Now, their kids are going to college and they have maintained that PPM drive to continue to grow and achieve. Our employee retention remains very high, even throughout the pandemic.We are very proud of this achievement. It's a unique culture that we have fostered over the last 20 years and built a brand that our team and our clients are very proud of.

Finally, I would be remiss to not mention and remember Johnny Nelson, Ernest Woods, Phil Hoffer and Jean Rivard. Each played a critical role in our growth and development over the years and all left us much too soon.They remain a strong part of our PPM Family today and are with us in spirit on every project. God Speed boys.#PPMSTRONG.

PPM has a strong and trusted team that maintains the PPM drive to grow and achieve. #PPMSTRONG!

PROGRESSIVE PIPELINE MGT
SINCE 2002
Genuine PPM Quality
www.progressivepipe.com

Progressive Pipeline Management, Wenonah, New Jersey
Owner: David Wickersham
Founded: 2002
Employees: 150+
Service Area: National – But Home based in the Mid-Atlantic & North East.
Website: www.progressivepipe.com

TRENCHLESS GOES HYBRID:

Old Tricks Are Finding New Applications

By: Brian Dorwart, P.E., P.G.

The International Society for Trenchless Technology defines trenchless technology as "Underground construction methods of utility installation, rehabilitation, inspection, location and leak detection, with minimum excavation from the surface." Today, contractor innovations and technology improvements are responding to the demand for cheaper and faster trenchless construction at near-lightning speeds. Innovation is expanding the range of subsurface conditions where existing equipment can achieve owner-prescribed design criteria. Business sectors with linear underground infrastructure are realizing benefits related to reduced cost, schedule, permitting conditions, and avoidance of right-of-way surface and construction acquisition as a result of these advances and innovations in a maturing trenchless technology market. To understand the values of these advancements, some historical background offers perspective and context regarding their value.

EARLY TECHNIQUES

Early civilizations recognized the need for underground conveyances in the form of tunnels to provide common water and sewer infrastructure, while avoiding disruption and optimizing use of the ground surface. The industrial age accelerated urbanization for labor, resulting in the demand for cheaper and faster solutions for underground construction. The industrial age brought more efficient power and thermal sources such as coal followed by oil that replaced wood and charcoal. Having more reliable sources of heat allowed significant improvements in metallurgy and tooling to make machines and tools to produce higher volumes of quality goods than was possible with the Guild system. Demand for increased water supply combined with the increased availability of durable metals, like iron and steel led to the development of mechanized water well drilling equipment in 1808.

Mechanization indicated for the first time the importance of efficiency of the three construction tasks: excavation, removal of spoils, and support of excavation. Increased efficiency provided opportunity for more profit. For example, auger well excavation was soon followed by steel casing pipe ground support in the 1820s and 1830s all operated and installed by one drill rig.

The industrial age increased the need for reliable transportation to get goods to market. In response, railroad, canal, and roadways developed often using the same corridors. Heavy use of these transportation systems caused owners to demand no interruption of services should one cross another. Additionally, liquid product transportation still required the use of containers limiting the possible volume for markets, especially for the new and in high demand energy source, oil. Demand for larger volumes of oil without the use of the third-party railroad monopolies in bed with John D. Rockefeller resulted in construction of the world's first major oil transmission pipeline. Located between Coryville and Williamsport Pennsylvania, the pipeline consisted of about 112 statute miles of 6-inch steel pipe and was built by Byron Benson and the Tidewater Pipe Company. Opening May 28, 1879, this pipeline inflicted a small but significant defeat to the Rockefeller Standard Oil empire.

The pipeline concept provided a significant increase in the delivery of oil to market at a reduced cost per barrel. This

Pneumatic hammer 14-inch

6-inch pipeline was permitted by court action finding for the public good to allow pipelines to cross the railroad property with the condition that the pipeline must cross in culverts and not disturb railroad operations. This event provided the demand for trenchless culvert crossings under railroads to be used for pipelines.

The tunnel shield ground support system was invented in 1825 by Sir Marc Isambard for crossing beneath the Thames River in England. In 1851 hydraulic jacks were invented by Richard Dudgeon that provided small but high-powered force. Innovative mining/tunneling contractors recognized an opportunity to use newly developed hydraulic jacks combined with a concrete culvert ground support with shield followed by hand excavation to clear the spoils. This is the first documented application of pipe jacking and occurred in 1895 under the Northern Pacific Railroad.

Around 1936, contractors modified the pipe jacking method by turning water well

Auger bore through 42-inch casing

auger and casing equipment sideways to start auger boring for coal mining. Power was provided by hydraulic jacks and truck engines/transmissions. This technique advanced the pipe jacking two-step manual excavation and spoil removal to a single mechanized auger boring and spoil removal.

Transporting large volumes of liquids or gas using pipelines was soon recognized by municipalities and entrepreneurs to satisfy the increasing demand for water and sewer services. In the 1940s resourceful contractors saw an opportunity to adapt the auger boring techniques into efficient and relatively low-cost small tunnel construction for pipelines, satisfying industrial and municipal demand in urban areas without disturbing surface facilities like rail and roadways.

Small diameter trenchless lateral and short road crossing flourished after World War II responding to demand from transportation and communications providers to deliver underground construction with less interruption to existing infrastructure. In addition, increasing energy demand required pipelines to move volumes of oil and gas that far exceeded railroad transportation capacity. To meet these demands, contractors developed unguided piercing technology to install small-diameter cables across congested roads. First used in the early 1900s with pneumatic hammers, this method evolved through the development of stronger piercing tool materials during the 1950s and 1960s, in Poland and Russia, which provided a faster and more economical trenchless alternative. Further advancements in the 1970s ultimately led to present-day pipe-ramming methods, applicable to both small- and large-diameter pipes.

In 1964, a semi-steerable horizontal directional drill was invented to install power cables without surface disruption under streets for the Sacramento Municipal Utility District. The longest drive was a 1,530-foot installation below a curved street. The first successful HDD river crossing in 1971 involved the installation of a 4-inch gas pipe under the Pajaro River in the Central Coast region of California.

Sewer and water pipeline projects eventually required larger pipe installations in unstable ground that could not be accomplished using auger boring or HDD methods. During the early 1970s, Japan responded to the need for trenchless excavation in unstable ground by developing microtunneling that borrowed slurry technology from the drilling industry to stabilize the excavation face.

Pilot tube guidance system for the tunnel - Thinking out of the box.

Cleaning the 42-inch casing

RECENT INNOVATIONS

Just over the last decade, the trenchless construction industry has pioneered the use of curved microtunnels, bursting methods to replace every type of pipe material, HDD projects with lengths exceeding 12,000 feet, and a large assortment of flexible and rigid rehabilitation lining systems that can rehabilitate pipes with diameters of over 100 inches. In fact, innovation has advanced at such a rapid pace that no one person or professional group can be reasonably expected to remain current with the state of the art, but teams of trenchless professionals can provide successful projects nonetheless.

Today's successful trenchless construction involves innovation through teamwork with strong cooperation and communication among the owner, the engineer, the contractor, and the equipment manufacturer. Recent overall advances by the specialized team members include:

- Owner – Performance-based contracting, assignment of risks, and proper funding
- Engineer – Risk-based engineering studies, risk identification and management options, and the definition of ground conditions along the bore path
- Contractor – Current knowledge of tooling, implementation of available tooling for solving stability and excavation issues, and field implementation of means and methods with contingency options

Innovation grows from the recognition of an opportunity to make money and to reduce exposure to losing money on similar projects. Trenchless knowledge and capabilities have led to recent and rapidly developed innovations as problems are identified and solutions developed in a team environment. Opportunity thus exists for all as education and experience from individual members permeate these teams.

Innovation can occur when a project team encounters costs that exceed the perceived gains. Perceived high costs are often associated with a lack of team knowledge regarding variable ground conditions at a project location. The range of properties posed by hard rock and loose silty sand can impact daily production rates by a factor of up to 100, even when conditions are known. Trenchless operating cost per day is a relatively predictable and constant, but based on a review of hundreds of HDD projects by the American Gas Association, an advance rate of 10 feet per day can be expected in hard rock, while soft, stable ground may result in rates of 1,000 feet per day. The resultant cost range significantly increases when conditions are unexpected and both tooling and production require delays and modification.

Trenchless failures provide opportunities for innovation, often arising from inadequate delineation of common ground layers and proper tooling for common ground behavior. "Common ground" is defined as having similar reactions to the excavation process. For example, silty sand and sandy silt react in a similar manner during excavation. In addition, groundwater, clay content, permeability, density, and compression or dilation during shear can all affect material behavior during excavation. Therefore, a portion of the trenchless design should include similar interaction stability analyses of each common ground condition anticipated along a bore path.

Owners and engineers have achieved lower pricing and improved schedules by using performance-based specifications that include fair change condition clauses for distributing risk among the project participants. Owners understand that contractors provide more competitive prices for projects with understandable risks that can be controlled. For example, an owner-specified pipe grade of 0.022 percent, where 1.50 percent would suffice, can have significant impacts on contractor equipment selection and production rate. Specifying the use of equipment requires knowledge of the ground reaction to that equipment.

Contractors' and manufacturers' innovations in tooling and in means and methods have expanded the range of

"WITHOUT THIS TYPE OF COLLABORATION AND COOPERATION PROJECT LIKE THIS COULD NOT BE SUCCESSFULLY COMPLETED."

-Tom Loyer, Trenchless Technologies Market Director, ECI - Engineers Construction Inc.

Spoils removal

Akkerman weld-on reaming head

subsurface conditions that specific tools can economically mine. For example, guided pipe ramming has captured auger boring work; steering tools on auger boring casing allows earlier and less aggressive steering, and thus requires accuracy to capture pilot tube tunneling work; and pilot tube tunneling with auger boring equipment in soil or rock provides accurate and precise casing placement, thus capturing grade line microtunneling work.

INNOVATION IN ACTION

Engineers Construction, Inc. (ECI) of Williston, VT provides an excellent example in the use of teamwork to accelerate recent innovations, and application of new tooling addressing common issues are cited in the following example of an urban sewer under wetlands and highway.

According to Tom Loyer, Trenchless Technologies Market Director at ECI - Engineers Construction Inc., "Without this type of collaboration and cooperation project like this could not be successfully completed."

An urban gradeline sewer required the installation of a 12-inch PVC pipe crossing approximately 378 feet under wetlands and a major four-lane highway. Limited workspace prevented pre-assembly of the pipe. The installation depth was 25 feet with a 0.5 percent vertical alignment. The subsurface conditions consisted of loose saturated silty sand to silty clay with uncorrected SPT N-values in the range of 3 to 4 blows per foot. The deposit was placed by marine glacial fluvial processes, and thus common ground was unpredictable and contained pockets of clean material. The original design called for steel casing installed by auger boring or slurry tunneling between two watertight work shafts, including external dewatering systems, but no dewatering was permitted under the highway.

The project bids were higher than the municipality could afford, and rebidding would have violated the court-ordered construction schedule. A solution was devised to engage the apparent low bidder in a design-build contract and to rely on contractor innovation to lower costs while maintaining the necessary program schedule. Team cooperation is critical to the success of this type of construction contract.

The contractor's risk assessment identified several areas of concern. First, the required gradeline accuracy suggested using a microtunnel to meet the slope tolerance, but the project's funding was insufficient for an auger bore, or for the more expensive microtunnel. Additionally, there was a high risk that the weight of the microtunnel equipment would sink in the very soft soil. The solution was to first install a 5-inch laser guided steel pilot-tube pipe to achieve the required

Water flows steadily into pit

Theodolite guidance system

precision and accuracy. Then a single pass string, consisting of 100 feet of 24-inch steel casing, followed by a 42-inch steel casing, was attached to the pilot tube. Each step-up in diameter consisted of an open structural adapter welded into the string. Thrust would be provided by a 14-inch pneumatic hammer with an option to increase to a 24-inch pneumatic hammer. Augers would only be used when necessary, to lighten the casing by removing spoils. Telescoping casing provided for lighter tooling to manage construction settlement. Pneumatic hammers provided the potential to accelerate the construction and offer reduced cost.

The contingency should the hammer run out of power was to cut out the adapter between the 24-inch and 42-inch casing, then drive a heavy wall, 24-inch casing the remainder of the distance to better transmit energy to the cutting head. The 12-inch PVC pipe could then be assembled by cartridge methods into the casing using spacers to achieve grade. The resulting annulus would be filled with grout to secure the alignment and to fill voids to prevent settlement of the highway above.

During construction, the initial pilot tube lost grade when it encountered very loose saturated fine sand and silt. However, the small-diameter assembly allowed for removal and successful reinstallation on line and grade and within the same corridor path. As the subsequent casing drive progressed, an unexpected pocket of clean, saturated fine sand was encountered, which stopped the advance. Hammer vibration on the stalled casing caused the saturated fine sand to flow into the 48-inch casing through the adapter, causing a sinkhole between the drive shaft and the highway. The contractor converted the sinkhole to a dewatered shaft, removed the adapter, installed heavy wall 24-inch casing as called for in the contingency plan, and successfully completed the installation.

PROGRESS CONTINUES

Trenchless construction has and always will demand a combination of art and skill. But subsurface conditions and their reaction to excavation are not always easy to predict. Significant innovations have evolved to tackle these challenges, but there remains much to be learned by all stakeholders. Residual risk always remains, but there is room for improvement with innovative contracting in a team environment, with all parties listening

Ready to launch

Saturated fine sand flowing into the receiving shaft.

and contributing. A contractor's experience and ability to adapt tooling and processes to address unexpected conditions can be effective when given the opportunity to participate as a project team member. Letting contractors select the means and methods based on project-specific and meaningful subsurface information, along with proper funding and a project-team focus, will benefit owners, contractors, and manufacturers, and stimulate new, cost-effective innovations.

ABOUT THE AUTHOR:

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SPRINGFIELD WATER AND SEWER COMMISSION:

Connecticut River Crossing Project

By: Gus O'Leary, Kleinfelder

INTRODUCTION

The Springfield Water and Sewer Commission (the "Commission") operates roughly 460 miles of collection system piping in Springfield, Massachusetts and treats combined and sanitary sewer flows from Springfield and six other nearby communities – Agawam, West Springfield, Longmeadow, East Longmeadow, Wilbraham and Ludlow – at the Springfield Regional Wastewater Treatment Facility (SRWTF) in Agawam, Massachusetts. Roughly 30 percent of the Springfield collection system is comprised of combined sewers and the Commission maintains 23 combined sewer overflows.

The Commission is in the process of completing one of the first "horizontal" (non-building) alternative delivery projects in the Commonwealth of Massachusetts. The York Street Pump Station (YSPS) and Connecticut River Crossing Project ("the Project") is being implemented by the Commission as part of a United States Environmental Protection Agency (US EPA)-approved Long Term Control Plan and Integrated Wastewater Plan ("LTCP\IWP") for management of the Commission's combined sewer system. The Project, Phase 2 of the LTCP\IWP, is the largest phase from both a monetary perspective and in terms of reduction of combined sewer overflow ("CSO") volume and frequency conveying an additional 30 million gallon per day (MGD) to the SRWTF. Phase 2 also creates operational flexibility and redundancy of critical infrastructure in order to allow for rehabilitation and replacement of existing infrastructure in future phases of the LTCP\IWP. It includes construction of the new 62 MGD YSPS on the east side of the Connecticut River in Springfield, installation of two new 42-inch combined sewer force mains and a new 72-inch combined sewer siphon crossing of the Connecticut River, and connection to a new influent structure at the SRWTF on the west side of the Connecticut River in Agawam. Kleinfelder is the Engineer of record for the SRWTF upgrade, the River Crossing pipelines, and the work on the east bank of the Connecticut River and teamed with Stantec to fulfill the role of Designer on the project. Daniel O'Connell's Sons (DOC) was selected as Construction Manager At-Risk in 2018.

Figure 1 - Aerial photograph of the project area indicating major elements of the LTCP\IWP Phase 2 project

EXISTING CONDITIONS AND HISTORY

An existing US Army Corps of Engineers (USACE) Flood Damage Reduction System (FDRS), existing Amtrak Commuter Railroad, the Connecticut Riverwalk and Bikeway, and the Connecticut River lie between the new YSPS and the SRWTF, see Figure 2. Integral to conveying those additional flows to the SRWTF is the crossing of these features while protecting them and maintaining the FDRS and the Railroad in operation. The Commission and Kleinfelder identified very early in the planning of the Phase 2 project that a trenchless crossing would be required in order to cross, at a minimum, the FDRS and Railroad.

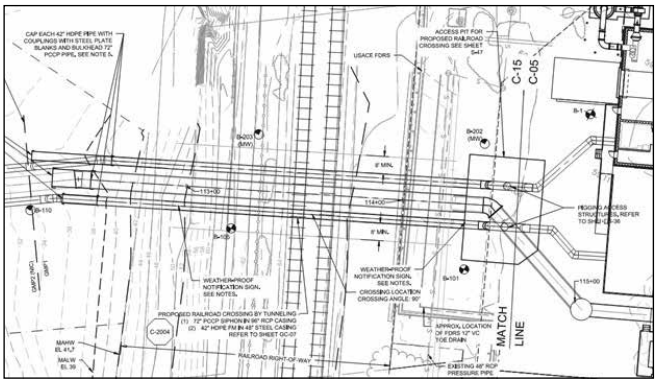


Figure 2 - Excerpt from project plans showing trenchless crossing below FDRS and Amtrak Railroad

The USACE FDRS consists of a flood wall, groundwater cut off sheeting, and a toe drain in the area of the crossing. Top of wall is approximately elevation 65.08, existing grade behind the wall

varies in the range of elevation 60, and bottom of steel sheeting is approximately elevation 44.83. The proposed pipelines are 72-inch and 42-inch, requiring casings of 96 and 48 inches respectively. Holding a minimum of one casing diameter clear from the bottom of steel sheeting leads to an invert of approximately elevation 29.00, approximately 30 feet below grade behind the wall and roughly 36 feet below the top of rail. The length of the crossings under the FDRS and Railroad would be between 150 and 200 feet depending on how the transition to the River Crossing portion of the work was to be done.

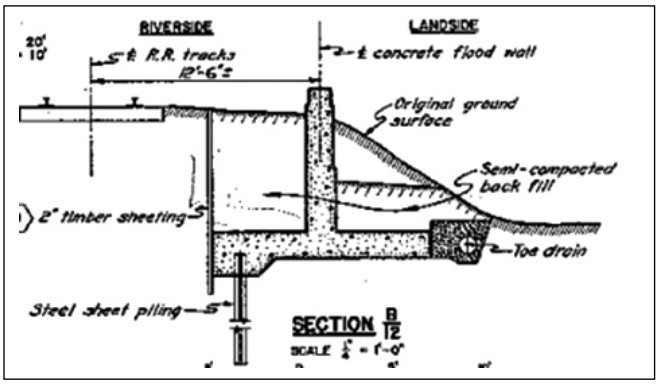


Figure 3 - Record drawing of USACE FDRS in Section

The area of the crossing is difficult geologically, see Figure 4. Based on existing information and our investigations we were able to determine that a thick strata of very hard glacial till closely underlaid the desired alignment, but that the face of any crossing tunnel would be in a mixture of alluvial sands and silts, and clays. Sand and silt layers were anticipated to be connected hydraulically to the Connecticut River. Note also in Figure 4 the slope into the river at the western end of the crossing alignment. This slope, coupled with the Railroad, made access from land to this area exceedingly difficult.

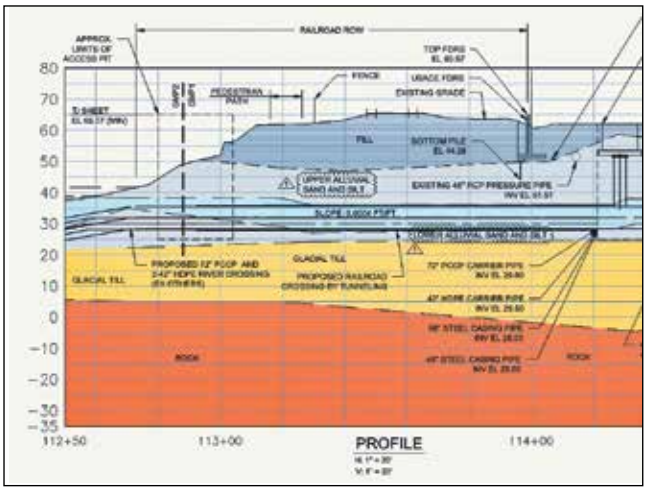


Figure 4 - Profile of crossing showing stratigraphy

The Commission maintains pipeline crossings immediately north and south of this area. To the north, the existing 42-inch cast iron force main dates to the construction of the FDRS in the 1930s and that crossing was incorporated as part of the construction of the wall. To the south, the 66-inch PCCP Main Intercepting Sewer Siphon crosses the FDRS and Railroad. This crossing was conducted in 1973 by jack and bore, and actually cut through the cutoff sheet rather than passing below it, terminating above the slope on the west side of the Railroad. Kleinfelder and the Commission interviewed the contractor who performed that jack and bore as part of the procurement process for this work. The higher elevation of this installation, relative to our own proposed crossing, mitigated groundwater issues in the alluvial sands and silts significantly.

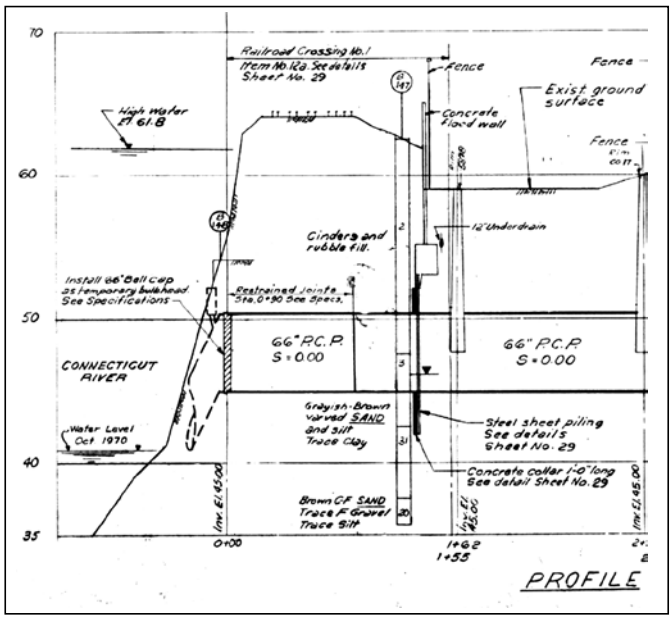


Figure 5 - Profile of the Commission's 66-Inch Main Intercepting Sewer Crossing of the FDRS and Railroad

APPROACH

Kleinfelder and the Commission identified two technologies that would be appropriate given the length and diameters of the crossings and the infrastructure involved. Jack and bore and microtunneling approaches were considered. Control of groundwater and constructing a receiving pit were the primary challenges identified for a jack and bore approach. Similarly, while use of a closed face microtunnel machine serves to mitigate groundwater issues, retrieval of the MTBMs and costs of mobilization for two different diameter tunnel boring machines for such short lengths of tunnel were anticipated to make this approach infeasible from a cost perspective. The design team also thought that a microtunnel approach would serve to mitigate ground settlement risk somewhat by allowing for greater control of the face and minimizing potential over excavation.

Kleinfelder elected to prepare the procurement documents assuming a jack and bore approach given the historic precedent and anticipated cost disparity, but leave sufficient flexibility in the project specifications to allow a contractor to propose an alternative approach in recognition of the challenges presented

by groundwater conditions. In order to address groundwater challenges in the documents we incorporated permeation grouting throughout the alignment into the design. We also included provisions for establishing an at grade railroad crossing and access roadway to the receiving shaft site, as well as restoration of the bank after the completion of the crossing. We negotiated that crossing restoration of the railroad right of way with Amtrak as part of our license for construction of the new pipelines. Based on constructability feedback from DOC as the Construction Manager, Kleinfelder also ultimately designed a complex support of excavation system for the receiving shaft in the slope of the east bank that could be constructed from the Connecticut River.

During procurement of non-trade subcontracts under the Construction Manager we received three bids assuming a jack and bore approach, generally in the range of approximately $3.8 million. We also received one proposal utilizing microtunneling as an alternative to jack and bore, for approximately $5.4 million, confirming Kleinfelder and the Commission's expectation that while a microtunneling approach mitigated issues around groundwater and some of the risk associated with the work, the cost of mobilizing specialized equipment made the work cost ineffective. Note that ground improvement was not included in this bid package.

During scope review meetings with each proposer, we received feedback on the jack and bore approach:

- The receiving pit on the eastern riverbank is expensive and extremely difficult to construct due to access constraints and its location in the slope.
- Proposers considered proposing a "blind jack" in which they abandoned the jacking shield and eliminated the receiving pit – this too was difficult and expensive.
- Proposers saw significant risk in the ground improvements due to the possibility of over-improvement (ie. Making the soil too difficult to excavate), potential for frac-out due to the proximity to the river, and a high likelihood of missing a sand seam.

Feedback from the contractor proposing a microtunnel approach was also enlightening:

- Ground improvement scope could be eliminated if a microtunnel approach was used, this represented a significant cost savings for the project, outside the scope of this bid package, and addressed the risks of over improvement and missing a sand seam identified in the feedback from Jack and Bore proposers.
- The receiving pit on the eastern riverbank is the most difficult element of the work.

The potential for elimination of ground improvements puts microtunneling on a much more even cost footing with a jack and bore approach. The cost of those improvements was separately estimated at almost $1.5 million, bringing the effective microtunnel proposal cost down to $3.9 million.

The Construction Manager and the Designer set about solving the receiving pit next – that work had been separately estimated at approximately $670,000 and the team recognized the potential

to gain the risk reduction benefits of a microtunnel approach for little to no added cost over the jack and bore proposals if an alternative approach could be identified there. Through further coordination with the proposer, we were able to sufficiently validate the possibility of "daylighting" the bores within the river and retrieving the MTBMs as part of the river crossing work, without the use of a receiving pit on the eastern riverbank. This resulted in the award of the FDRS and Railroad crossing contract to SECA Underground on the basis of their alternate microtunneling proposal. Prior to beginning the work, Kleinfelder revised the documents to eliminate the receiving pit and extend the microtunnel drives into the River, for execution as a change order to the contract, saving the cost of that excavation with added costs for coordination and retrieval of the microtunneling machines within the river.

Figure 6 – 96-inch MTBM awaiting the start of tunneling

Two of the primary challenges we faced in eliminating the receiving pit and "daylighting" the three proposed drives in the river were the termination of those casings and pipelines in the river and coordinating the connection in the river with operations in the jacking pit. "Daylighting" in the river required extending the bores to a point at which the MTBMs could be retrieved, which in turn had to be coordinated with restoration requirements in the River and minimum required cover on the pipelines. This led to the incorporation of short sacrificial sections of casing extending beyond the carrier pipelines which would be removed by the River Crossing contractor before connecting to the carrier pipelines and extending them across the river. Elimination of the receiving pit also required bulkheading the pipelines within the jacking pit so that connections could be made in the wet, while still isolating the jacking pit, and the landward side of the FDRS, from the River.

By making use of the flexibility of the Alternative Delivery process, with the coordination and cooperation of the Construction Manager, we were able to successfully deliver a contract for microtunneling this crossing for a comparable cost to a jack and bore approach.

Construction of the FDRS and Railroad crossing began in August 2021 and despite delays and issues of various types,

Figure 7 - Retrieval of the 96-inch MTBM from the Connecticut River

proceeded without major disruptive impacts to the FDRS or Railroad. The 96-inch drive and first 48-inch drive were completed in December 2021 and January 2022 and those MTBMs retrieved from the river by the river crossing contractor. After retrieval of the 48-inch MTBM, the machine was returned to the upland project site and the second 48-inch drive was completed in February 2022. That MTBM will be retrieved after restarting the river crossing work in summer of this year.

ABOUT THE AUTHOR:

Gus O'Leary *is a Principal Engineer and Project Manager with 15 years of experience in the design and construction of municipal utilities. His experience includes design of traditional water, stormwater, and sewer replacement projects as well as application of trenchless rehabilitation techniques and technologies including such as pipe jacking, microtunneling, and horizontal directional drilling to provide solutions to engineering problems in dense, urban areas. Gus is the technical lead and Engineer of Record for the Springfield Water and Sewer Commission's Connecticut River Crossing Project.*

TRENCHLESS TECHNOLOGY COMPARISONS FOR THE IPSWICH RIVER CROSSING WATER MAIN REHABILITATION

By: Emily Church, PE, & Daniel Roop, PE, Tighe & Bond

INTRODUCTION

The Town of Ipswich is a coastal community in Massachusetts approximately 30 miles north of Boston with approximately 13,800 residents. The Ipswich Utilities Department maintains the water system that consists of over 93 mils of pipe ranging from 6 to 12 inches, 4,700 services, three pump stations, three water tanks, 680 hydrants, and 1,100 gate valves.

The Mill Road Ipswich River water main crossing is located at the Ipswich, MA and Hamilton, MA town line. The 10-inch diameter cast iron main was installed in 1969, running along Mill Road then dropping nearly 20 feet off road for an approximately 230-foot run beneath the Ipswich River parallel to the historic Warner Bridge. In 2017, a segment of approximately 12 feet of pipe beneath the River experienced longitudinal fractures. Gate valves on either side of the River were closed to isolate the pipe and emergency work was performed to replace the compromised section with new 10-inch ductile iron pipe using an open cut method.

Unfortunately, the pressure testing of the repaired pipe failed. Despite Contractor and Town efforts at the time, the cause of the pressure test failure beneath the river could not be identified and corrected at the time and the water main remained offline for approximately 2-years afterwards. The main's shutdown did not affect water transmission to other areas of Ipswich as flow could be redirected through the system. However, the Town desired to restore service to the main running beneath the River to improve system reliability and redundancy.

2017 Fractured pipe

2017 emergency repair

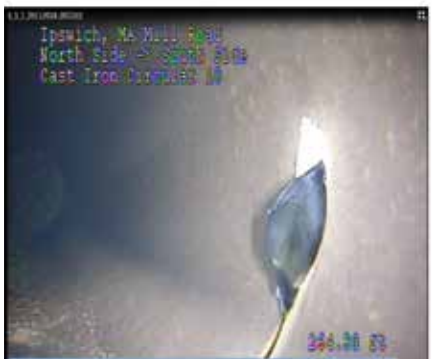
From project onset, Tighe & Bond and the Town agreed that implementation of a rehabilitation technology that would preclude the need for extensive permitting and in-river geotechnical investigations was important, if practical, to minimize schedule and reduce permitting service fees. For comparison, a recently completed sewer siphon replacement project in Town crossing beneath the Ipswich River required a 2-phase open cut approach that took nearly 2 years to permit and thousands of dollars in permitting support fees. The team knew significant time and cost savings could be realized if a trenchless approach were feasible.

CONDITION ASSESSMENT

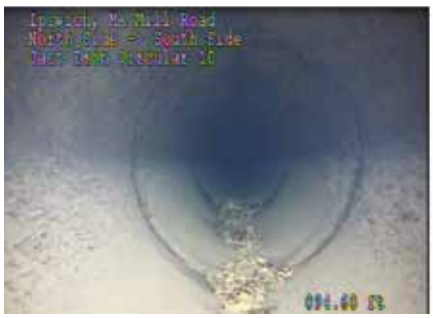
To determine viable rehabilitation methods, a Closed-Circuit Television (CCTV) investigation was performed in November 2018 of the water main to assess its condition. The Town cut out an approximate 2-foot length of pipe for CCTV access. Following the CCTV investigation, Ipswich Water Department staff repaired the pipe and installed a new 10-inch gate valve, spool piece, and couplings. A gate valve was not originally installed at this location, however the Town added one to make future shut-offs, pressure tests, and future rehabilitation work on the water main easier.

Two 45-degree bends were encountered beneath the north and bank of the River as well as two 22.5-degree bends on the south bank near the road. A small intrusion into the pipe was observed. It was speculated to possibly be an abandoned water service the Town had no record of or a blow off that has been dislodged and caused the pipe to crack. This also appeared to be a potential source of infiltration into the water main and may have contributed to why the water main did not pass the pressure test two years prior. The intrusion was located at street level near the gate valve and could be replaced with a

OPEN CUT TRENCH REPAIR COULD HAVE POTENTIALLY TAKEN MONTHS TO COMPETE WHILE THE CIPP LINING OPTION TOOK ONLY THREE WEEKS.



Intrusion in Pipe, CCTV



Sediment Deposits, CCTV

new segment of ductile iron pipe during.

Overall, the pipe was found to be in good condition. There was minimal tuberculation and only a few areas had sediment deposits. Based on this condition assessment it was determined that only a light cleaning and flushing would be needed if a structural lining were the selected rehabilitation method. The pipe also appeared to be a good candidate for pipe bursting since cast iron pipe is relatively brittle and would only require basic pipe bursting methods. The rehabilitation repair methods reviewed for this project are described below.

CURED-IN-PLACE-PIPE (CIPP) LINING

Cured-In-Place Pipe (CIPP) lining was identified as a desirable method for rehabilitation due to the fully independent

CIPP Liner Cured in Existing Pipe

structural nature of the cured liner. The "pipe within a pipe" system consists of curing a prefabricated liner made of polyester layers injected with resin to a host pipe using hot water or steam. The cured liners leave no annular space between the host pipe which was an important distinction in reviewing alternative methods. Since the pipe is beneath the Ipswich River, the repair method needed to ensure a watertight seal. The scope of the Mill Road water main repair was determined to be a standard application for CIPP installers. Typical installations range from 6-inch to 48-inch diameter pipes for a variety of materials including cast iron, asbestos cement, and ductile iron. The 10-inch, 230 linear foot Mill Road water main was an excellent candidate for the CIPP process especially since the pipe was already in good condition and minimal cleaning was required.

SPRAYED-IN-PLACE PIPE (SIPP) LINING

Sprayed-In-Place-Pipe (SIPP) linings have many of the same benefits as CIPP linings and were also considered for the water main repair. SIPP linings apply a structural spray of polyurea epoxy that have long working times. They also create a watertight seal between the epoxy and the host pipe. SIPP linings eliminate the need for a prefabricated liner which reduces the amount of equipment needed on site compared to CIPP linings that require transportation of the liner as well as boiler and compressor equipment that heat and circulate water or steam. Typical installations range from 3-inch to 60-inch diameter pipes for a variety of materials including cast iron, asbestos cement, and ductile iron. One drawback of an SIPP lining is that the finished product is only semi-structural and depends on the integrity of the host pipe. If a host pipe were to become compromised in the future, the SIPP liner would have a higher likelihood of failing.

PIPE BURSTING

The third repair method reviewed for the Mill Road water main was pipe bursting since the existing water main was cast iron and considered a fracturable

pipe material type that typically results in successful burstings without any specialized equipment. The new water main to be installed would be a high density polyethylene (HDPE) pipe since it is flexible and enables versatility when installing. Since HDPE pipe is butt-fused, no fittings would be required underneath the river ensuring a continuous pipe with no joints for potential infiltration. Pipe bursting also offered the option to upsize the existing pipe. An area of concern with this method of repair was the chance that splitting the existing pipe could cause damage to the new pipe if the existing pipe fractured in an unanticipated manner. Depending on the severity of the problem, open cut trench may be required to remedy a failed pipe bursting.

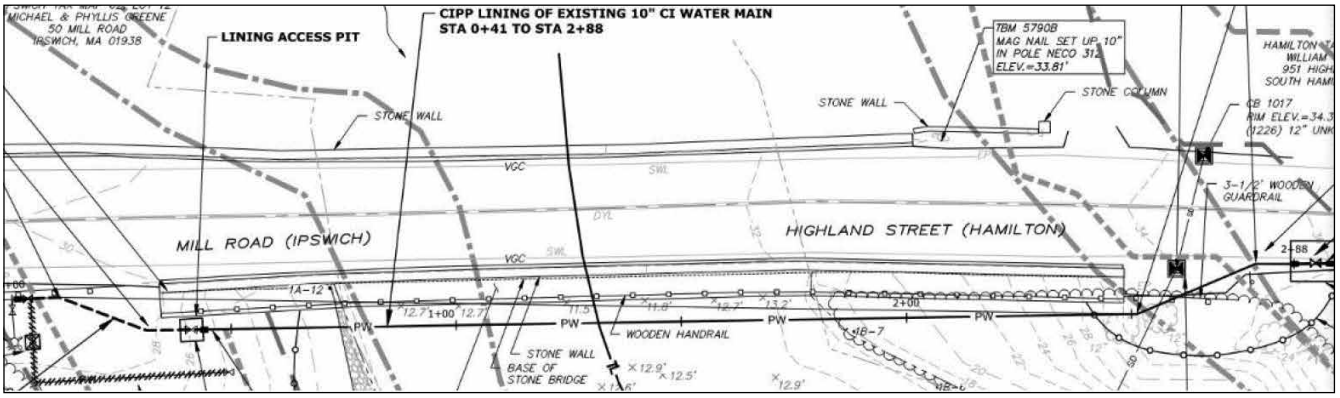
SELECTED ALTERNATIVE CONSTRUCTION OVERVIEW AND LESSONS LEARNED

All methods examined were appropriate rehabilitation options given the scope of the project. However, it was determined that in this scenario, SIPP and pipe bursting had a greater risk of failure over CIPP. If the host pipe were to be compromised after a SIPP lining install, the risk of the liner failing would increase since the liner relies on the host pipe. Pipe bursting introduced the risk that open cut trench would be necessary given the chance of an unanticipated issue with the bursting of the existing pipe. It was determined that CIPP posed the least risks given that the purpose of choosing a trenchless rehabilitation repair was to avoid open cut trench and the permitting costs associated with it.

Plans and specifications were developed with input from several CIPP manufacturers and installers. It was determined that two access pits were needed on either side of the river since the total repair area was only 230 linear feet and could be completed in one liner shot. The 22.5-degree bends on the south bank of the river would be able to be lined through while the 45-degree bends on the north side of the river would be replaced with new ductile iron pipe and bends. The intrusion in the pipe would also be removed and replaced with new ductile iron which would eliminate concerns of future infiltration at this point. To tie in to the existing main on both side of the river, new ductile iron pipe along with new gate valves would be installed. A new hydrant would also be installed on the north side of the Ipswich River to serve as a filling and flushing point for the new main for pressure and bacteriological testing purposes.

During the CIPP liner installation process, the installer realized that they were having issues fully dewatering the pipe. The

Squeegeeing the existing water main



2019 Water Main Rehabilitation Plan

initial CCTV showed that the pipe was completely full of water. However, since the water was clear and the CCTV camera was able to record existing conditions despite being underwater, the survey continued. Infiltration sources were therefore not able to be identified during the design which led to the installer needing to pull multiple squeegees through the pipe after their standard dewatering process to get a dry enough surface for the CIPP liner to adhere to. Any similar project should consider requiring the dewatering of the pipe prior to CCTV inspection to fully identify infiltration sources.

The installation process was very standard once the pipe was dried and prepped. A bypass line was set up across the bridge to recirculate the hot water that was used to cure the liner which took approximately 2 hours. Once cured and after an approximate 1 hour cool down period, the installer entered the access pits at the north and south sides of the river to cut out the excess liner and prep the ends for connection into the new ductile iron pipe. A standard pressure test and bacteriological test per AWWA standards was conducted prior to the new water main being brought back online.

CIPP Liner Installation

At this point, the CIPP installers' job was complete and the general contractor installed the new ductile iron pipe, fittings, gate valves, and hydrant and tied everything into the existing water main on both sides of the river.

CONCLUSIONS

The project examined several trenchless rehabilitation methods in order to avoid costly permitting and geotechnical exploration fees associated with the Mill Road water main repair. While each method discussed was a viable option, the optimal course of action proposed by Tighe & Bond and agreed upon by the Ipswich Utilities Department was to select CIPP lining not only for the drastic reduction in permitting duration and costs, but also to reduce the project's construction timeline. Open cut trench repair could have potentially taken months to compete while the CIPP lining option took only three weeks.

The usefulness of trenchless technologies in costly permitting situations was fully realized during the design and construction of this project. Projects such as river crossings, railroad crossings, busy intersections, or projects under a tight deadline should consider utilizing a trenchless method to repair and extend the life of an existing pipeline.

ABOUT THE AUTHORS:

***Emily Church, PE** is a project engineer and assistant project manager at Tighe & Bond with over five years of experience. Her work focuses on collection system, distribution system, and pipe rehabilitation designs.*

***Daniel Roop, PE** is a Project Manager at Tighe & Bond with 10 years experience focusing on asset management and resiliency for water, sewer, and stormwater systems. Daniel was the ACEC/MA 2021 Young Professional Award Winner and member of ENR's 2022 National Top 20 Under 40.*

SUMMARY: HYDROTESTING HDPE WATER LINES

By: Camille George Rubeiz, P.E., F. ASCE, Plastics Pipe Institute, Inc. (PPI)

High-density polyethylene (HDPE) pipe has been used for municipal and industrial water applications for some 50 years. HDPE's heat-fused joints create a leak-free, self-restraint, monolithic pipe structure. The fused joint will also eliminate infiltration into the pipe and exfiltration into the environment. HDPE pipe has other benefits including chemical, abrasion, fatigue, seismic and corrosion resistance, and is designed for water and wastewater applications meeting the latest AWWA C906 and ASTM F714 standards.

It is advisable to begin testing early during the pipeline installation to confirm adequacy of the fusion, laying, embedment procedures, and then later to progressively increase the length of test section as experience is gained.

Hydrostatic testing is universally known and accepted as the primary means of demonstrating the fitness for service of a pressurized component. HDPE pipelines as long as 3000 feet have been commonly tested.

Hydrotesting can be used on runs of HDPE pipe that are hundreds of feet long

The following is an overview of using hydrotesting and the steps to take before a potable line is put into service. The purposes of hydrostatic field testing of HDPE pressure pipes using water include:

- Assessing the installed structural integrity of the pipeline for acceptability.
- Revealing the occurrence of faults or defects in the pipe laying procedures, as exemplified by damaged pipe or fusion joints non-conforming to the qualified fusion procedures.
- Finding the occurrence of faults in the assembly procedures for pipeline components, as exemplified by tapping bands or saddles, flange sets, or mechanical joint assemblies.
- Validating that the pipeline will sustain an acceptable level of overpressure slightly greater than its design pressure, without leakage.

It is important to note that field testing is not intended to supplement or replace product standard test requirements.

Polyethylene pipe is a lower modulus visco-elastic material that dilates in diameter (creep-strains) when subjected to higher stress during hydrotest. This means that for a fixed volume of clean fill water, the hydrostatic pressure will decline slightly during the test time, as the polyethylene molecular chains stretch and align under high stress. This pressure decline does not mean the polyethylene is leaking. It is a visco-elastic material parameter that requires adjustments to the hydrostatic test procedure as compared to rigid elastic metallic pipes. This effect is more noticeable in larger diameter HDPE pipes, due to the large mass of clean fill water. Alternately, to hold constant pressure, an additional volume of make-up water will be required to fill the expanded volume of the stretched pipe diameter. Neither of the above two observations means that a leak is present in the pipeline.

There are two test methods which can be used, depending upon the objectives of the test program. The easiest and quickest method suitable for all pipe diameters is the Modified Rebound Method originally developed by Lars-Eric Janson in the 1980's. As a similar alternate, ASTM F2164 instructs to fill and then thermally stabilize the pipeline with no air entrapment, pressurize the pipeline at test pressure for four hours, slightly reduce the pressure, and then observe the pressure for one hour to remain essentially constant (within five percent variation) to achieve an acceptable test.

In the US and Canada, the prevailing hydro-test method is ASTM F2164, *Standard Practice for Field Leak Testing of Polyethylene Pressure Pipe Systems Using Hydrostatic Pressure*. The ASTM method is essentially a hydrostatic "pressure rebound method" and is referenced in the AWWA M55 (2020), *PE Pipe- Design and Installation* and is summarized below:

- Test pressure: Up to 1.5 times the working pressure and is taken at the lowest point in elevation along the pipe's test section.
- Leak test can be dangerous; restrain test section against movement
- Fill slowly to remove air
- Maintain test pressure for 4 hours; add makeup water as needed to keep the pressure constant; water amount is not monitored
- Reduce pressure by 10 psi and monitor pressure for 1 hour
- Pass if pressure stays within 5% of the reduced pressure

In addition, the AWWA M55 (Chapter 9) describes general hydrostatic testing, based on ASTM F2164.

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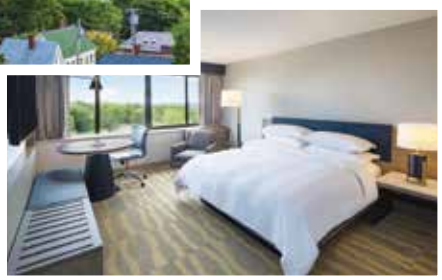

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There are basically six steps to putting a new waterline in service:
- Flushing
- Filling
- Testing for Leaks
- Record Keeping
- Disinfection
- Commissioning

1. Flushing

A new pipeline should be thoroughly flushed prior to testing. This will help to prevent any damage to valves or other fitting from any foreign material left in the pipeline. This can be done by opening and closing hydrants, blow-offs or drains with flow velocities sufficient to flush the foreign material from the pipeline. A minimum of 3ft/s is suggested.

2. Filling

Slowly fill the pipeline to limit the flow to low velocities that prevent surges and air entrapment. Also, air valves at high points should be opened to allow air to escape as the water level increases inside the pipeline. Temporary valves can be installed. Do not loosen flanges or connections to bleed air from the system. The critical filling rate for pipes with air vents is usually based on five to fifteen percent of the pipe design flow.

3. Testing for Leaks

Leak testing can be done either inside or outside the trench. Because joints for HDPE pipe are fused together, leakage should be zero. Leak tests need to be conducted in accordance with ASTM F2164. For HDPE pipe, a pressure of 1.5 times the design working pressure at the lowest point in the test section is used as the test pressure. Acceptance is found by reducing the test pressure by 10 psi and monitoring the pressure for one hour. If the pressure remains steady – within five percent of the target value – for one hour, leakage is not indicated.

4. Record Keeping

Test records should include:
- Name of person conducting the test, including company and contact information
- Test medium – usually water
- Test pressure
- Test duration and data
- Pressure recording chart of pressure log
- Pressure vs. makeup water added chart
- Pressure at high and low elevations
- Elevation at the point test pressure is measured
- Ambient temperature weather conditions
- Pipe and valve manufacturers
- Pipe specifications and/or standards such as AWWA C906-21
- Description of the test section length, location and components
- Description of any leaks, failures and their repair/disposition
- Test times and dates

When disinfecting an HDPE potable waterline, it is important that purging applies to distribution mains as well as each service line and service connection.

5. Disinfection

All new potable water pipelines require disinfection in accordance with ANSI/AWWA C651. This should take place after the initial flushing and after pressure testing the line. Disinfecting solutions containing chlorine should not exceed two percent active chlorine. As soon as the normal pipe disinfection period is over, the disinfection solution should be purged and/or neutralized, and the pipeline filled with fresh, clean water. Remember, purging applies to distribution mains as well as to each service line and service connection.

6. Commissioning

The commissioning of a new or repaired pipeline is normally carried out in the following sequence:
- Cleaning and/or pigging of the pipeline
- Water filling and pressure test
- Disinfection
- Flushing, purging, and/or neutralization
- Refilling the pipeline
- Bacteriological sampling and testing
- Certifying and acceptance
- Initiating the pipeline into service

Additional information can be found in:
- ASTM F2164
- AWWA Manual M55,
- PPI's *Handbook of Polyethylene Pipe*
- PPI's newest technical document, *TN-46 Guidance for Field Hydrostatic Testing of High-Density Polyethylene Pressure Pipelines.*

ABOUT PPI:

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

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TRENCHLESS: A NO DIG SOLUTION TO BUILD BETTER UNDERGROUND

UMass Lowell NASTT Student Chapter Report

UNIVERSITY OF MASSACHUSETTS LOWELL

By: Iverson Rodriguez, Travis Cohen, and Dr. Raj Kumar Gondle (Faculty Advisor)

The Bipartisan bill recently passed not only brings a huge investment and competitiveness to our nation's infrastructure, but also encourages a new generation of civil engineering students by creating new opportunities for success. America's aging infrastructure includes wear and tear of roads, bridges, buildings, utilities, and structures below our feet. People and politicians like to talk about bridges or roads in poor condition and often forget to report the state of buried utilities or critical underground civil infrastructure. This is one reason why Professor Raj Gondle believes that many STEM schools focus primarily on above ground structures like bridges or roads when it comes to capturing the interest of teenagers and developing a passion for civil engineering profession. The incoming engineering students are less aware of civil underground and non-cognizant of countless opportunities tunneling into the future.

With cities continuing to expand and grow, the use of subsurface space is more critical than ever before. The use of underground space has now become an absolute necessity to balance the quality of life and address infrastructure challenges faced by urban cities. More cities and towns are adopting underground solutions for transportation and utilities to secure the nation's critical infrastructure. The new infrastructure bill creates potential opportunities for young engineers by opening doors to new civil engineering projects including installations of the underground utilities and rehabilitation of aging underground infrastructure.

Going underground for civil infrastructure requires a greater understanding of risks associated with the design and construction of the project. Risks and challenges associated with the project cannot be always eliminated. Important issues like potential ground movements, changing ground conditions, or possible damage to nearby structures should be always accounted. Digging underground can lead to surface disruptions, traffic congestions, and inconvenience to nearby communities and businesses. Traditional open cut-and-cover methods for new installations or rehabilitation of underground structures can be a time-consuming process. Ground excavation or digging underground can lead to noise, vibrations, or other construction-related issues adding more inconvenience to daily life of residents including safety concerns. An alternative to all these problems is trenchless, a no-dig solution to build better underground.

Trenchless technology is a progressive engineering process for the installation, replacement, or renewal of underground utilities or critical underground infrastructure with minimal excavation or surface disruption. The most important aspect of this emerging multidisciplinary

Students and faculty visiting the microtunneling project site at Springfield, MA

field is the potential value offered by trenchless methods, in terms of reduced construction cost and disruption to the surrounding community. The obvious benefit is eliminating the cost of digging trenches for the installation or replacement of buried conduits or pipes which can be time consuming. Trenchless methods greatly minimize the need of excavation in public right of way and as a result less traffic congestion in dense surrounding areas. Furthermore, in historic places, the use of trenchless methods over traditional open-cut construction activities greatly reduces the risk of potential damage to irreplaceable structures, historic landmarks, or critical underground civil infrastructure. With advancements in geotechnical engineering and underground construction, the scope

EXCITING OPPORTUNITIES ARE OFFERED AS A PART OF EXPERIENTIAL LEARNING AND ENGINEERING EDUCATION OUTSIDE OF THE CLASSROOMS

Students attending live presentations at the trenchless conference held at West Point, NY

of trenchless engineering has expanded from maintaining our existing water and wastewater infrastructure to construction of new public utilities.

Trenchless technologies are also used in installation of natural gas pipelines and power transmission lines. These techniques are now widely accepted industry tools over traditional open-cut methods for new installations of underground utilities and to solve our aging underground infrastructure problems. State-of-the-art products and best practice guidelines are still being developed. However, trenchless technology being a fast-taking center stage comes with a package of associated risks and its own set of challenges. One feasible way to manage such risks and challenges is by continuing to learn through research, education, and outreach. Research opportunities are available for many engineering disciplines to contribute innovative ways to assess, service, renovate, and replace existing conduits and construction of new underground utilities. Students and young professionals can join the workforce to successfully engage in trenchless activities and learn about the best engineering practices. The North American Society for Trenchless Technology (NASTT) is a premier resource for trenchless education and training of best engineering practices. NASTT offers in-depth training in numerous trenchless topics including Horizontal Direction Drilling (HDD), Microtunneling, Pipe Jacking, Pipe Bursting, and new installation methods.

The NASTT and the Northeast board have continuously supported education, training, networking, and recruitment

Pipe Bursting and CIPP lining: Experience live demos on the grounds of West Point academy

opportunities for the Student Chapter at UMass Lowell. Students from the Civil and Environmental Engineering program at UMass Lowell are highly encouraged to join student clubs like the NASTT Student Chapter early on in their university education. The student leaders share the great things and the exciting opportunities offered as a part of experiential learning and engineering education outside of the classrooms. The trenchless industry has shown an interesting and fresh career path to students who had no prior knowledge about trenchless engineering. The involvement with the NASTT has proven that there is truly something for every individual in the industry. Upon graduation, students truly appreciate how the NASTT student chapter has helped them to transition from academia to industry practice. Liam Henderson, now a professional working at Kleinfelder and a recent graduate from UMass Lowell states, "nothing beats experience". He finds himself comfortable and competent with his ability to discuss subjects related to trenchless technologies after his involvement with the NASTT student chapter at UMass Lowell. Liam was able to build his confidence and make meaningful contributions to the trenchless projects he is currently involved in.

Ever since the pandemic started, finding hands-on experience has been more difficult than ever for students. Learning in-person or virtually can only provide theory behind topics in practice. The NASTT student chapter extended experiential learning opportunities that may not have been possible by simply attending classes. In the Fall 2021 semester, these benefits were best exemplified by a site visit to a microtunneling project in Springfield and student participation at the trenchless conference held at West Point, NY.

The visit to Springfield site gave the students a reference to what a career in trenchless technology can look like. The project involved trenchless crossing below an active Amtrak railroad. Students that toured the field site were fascinated to see such a massive project being carried out without disrupting the Amtrak daily operations. Students had a chance to see the entry pit of the microtunnel with Tunnel Boring Machine (TBM). Students were able to see the future site of the York Street Pump Station, the project was complex, considering they had to microtunnel under the Connecticut river and Amtrak. The importance of working with other organizations such as Amtrak was also highlighted at the tour. Individuals who toured the site learnt about the microtunneling approach and the importance of groundwater control and ground settlements. In addition, students learnt about the geologic conditions at the site. A sink hole caused by heavy rain was found the day before the site visit and they had an opportunity to get firsthand learning of how to tackle a real-life problem with unexpected obstacles. Overall, the field site visit and the knowledge gained on the tour made it much easier to conceptualize the information learnt in the classroom. The amount of planning and personnel needed to carry such an immense project surprised students and gave them a

Travis Cohen touring the Academy at West Point, NY

new perspective on the workforce. For engineering students, it was easier to picture what a workday would be like, by going out and experiencing a real-time project.

The trenchless conference offered a way for the students to meet and learn from the industry leaders, project engineers, and vendors. For most students, it was a first-time experience of any sort of professional conference and learn about the industry. Students were able to tour the vendor hall and ask related questions about the emerging technologies. Each vendor, exhibitor, and presenter brought a unique perspective from their expertise greatly benefiting students. For example, one of the presenters at the conference mentioned how they were able to adjust the angle of the pipeline in the middle of the project, by planning beforehand for such uncertainties or unforeseen situations. Also, it was the first-time experience (nerve-racking for some) for students to speak what they are passionate about in front of the massive audience at the conference. As a part of conference activity, Prof. Raj Gondle and his students along with a few NASTT board members were given the opportunity to tour the grounds of the West Point Academy. The student chapter at UMass Lowell is thankful to the faculty at the West Point and NASTT-NE for this excellent opportunity. The student chapter is looking forward to participating at the 2022 No Dig show in Minneapolis and many more conferences to come. Students are extremely grateful for the experiential learning opportunities provided through the NASTT as they provide a great way to learn and see their major subject from a new perspective.

ABOUT THE AUTHORS:

Iverson Rodriguez *is a first-year student in Environmental Engineering program at the University of Massachusetts Lowell. He currently serves as the secretary of the NASTT Student Chapter at UMass Lowell. As a first-generation university student, he is striving to become a successful engineer. Currently, he is also gaining professional experience as an intern at the water treatment center in Methuen, MA.*

Travis Cohen *is a junior in the environmental engineering program at the University of Massachusetts Lowell. He is a member of the NASTT student chapter. Also, he currently serves as the secretary of the New England Water Environment Association (NEWEA)/ New England Water Works Association (NEWWA) student chapter.*

Dr. Raj K. Gondle *is an Assistant Teaching Professor in the Department of Civil and Environmental Engineering at the University of Massachusetts Lowell (UMass Lowell). He serves as a faculty advisor for the NASTT UMass Lowell Student Chapter. He was recognized with the 2020 UMass Lowell Departmental Teaching Excellence Award and the 2017 ASCE ExCEEd teaching fellow.*

FIFTH ANNUAL NASTT-NE NORTHEAST TRENCHLESS CONFERENCE 2021 GREAT SUCCESS!

Scenic West Point NY was the site of the 5th Annual NASTT-NE Trenchless Technology Conference, November 15-16, 2021

Rebound Year after Year Hiatus!

Back in action after a year's hiatus due to the Covid-19 pandemic, the fifth annual NASTT-NE Northeast Trenchless Technology Conference 2021 held November 15 – 16 at the historic Thayer Hotel in West Point NY was a roaring success. A great time was had by all in attendance. It was a happy occasion for everyone to gather in person again as the Covid-19 pandemic continues to wane.

More than 125 trenchless professionals, municipal attendees, industry exhibitors and students gathered together to enjoy a full day of networking and 14 peer-reviewed, presentations in two tracks, detailing environmentally friendly trenchless solutions and cost-saving opportunities for municipalities and utilities. There were also 15 informative trade exhibits showcasing a wide range of leading edge trenchless and condition assessment technologies,

NASTT-NE Board Member Guy Campinha, Town of Wareham MA, and Bob Drake, BETA Group enjoy the view from the historic West Point grounds

UMass Lowell Student Chapter members provide invaluable logistical support for the Conference

Delegates had easy access to industry experts and trenchless technology exhibits featuring innovative new technologies

along with morning and afternoon outdoor trenchless demonstrations.

Attendees were relaxed and in good spirits after a Social Event the Monday night before at the hotel, and the morning's events were moderated with welcoming remarks from Eric Schuler, NASTT-NE Chapter Chair, and Alan Goodman, NASTT Chair. Alan commended the Northeast Chapter members for their tremendous growth and focused outreach activity since the Chapter was founded. These remarks were followed by a brief presentation from the UMass Lowell NASTT Student Chapter on their yearly activities.

After the morning's technical sessions and live demonstration, Andrew Fera P.E., a Professional Engineer with the New York State Department of Environmental Conservation (NYSDEC), gave an illuminating presentation on the Bay Park Conveyance Project, the Department's first design-build project, which will reduce nitrogen loading in the Western Bays. Following his speech, he was presented with a plaque of appreciation by NASTT-NE Past Chair Babs Marquis. Many thanks Andrew for an excellent lunch hour presentation!

Plaques of appreciation were also awarded to NASTT-NE Board Member, Bill Jeffery, TT Technologies, for his work in spearheading the organization of the conference, and to NASTT-NE Past-Chair

Live field demos are a regular conference highlight. Here Centerline Trenchless shows the pipe-bursting process

Tom Loyer ECI Engineers Construction Inc., gives a presentation on the Middlebury VT Microtunneling project

Lis Bissonnette, Kleinfelder, presents an overview of Technology Innovations for the Project Lifecycle

Babs Marquis, McMillen Jacobs Associates, for his years of dedicated service and hard work on behalf of the organization.

A major highlight of the one-day conference were the mid-morning and mid-afternoon live trenchless demonstrations. A crew from Centerline Trenchless Construction located in Blossvale NY gave an impressive pipe-bursting demonstration in the morning. In the afternoon, a Progressive Pipeline Management crew demonstrated CIPL lining of gas pipe using the patented Starline ® liner. They had to scramble to locate and rent a generator set in town after the unit they bought quit! The NASTT-NE Chapter Board extends appreciation to both these companies for taking time from their busy workdays to mobilize crews to share their technology and expertise with conference attendees. We are grateful for their willingness to step up and support our cause.

In keeping with the NASTT-NE Chapter training and educational goals, Dr. Raj Kumar Gondle, lecturer and faculty advisor for the UMass Lowell Student Chapter, along with Dr.Pradeep Kurup, and student members, met industry professionals at their exhibit booths, participated in the conference as presenters, and also provided logistical support for the conference, such as staffing the registration table, and other help as required. The day ended with a concluding remarks from incoming NASTT-NE Chapter Chair Eric Schuler.

The NASTT-NE Chapter Board of Directors thanks everyone for their participation in a very successful fifth annual 2021

Excellent lunch hour presentation by Andrew Fera P.E., on the New York State Department of Environmental Conservation (NYSDEC) Bay Park Conveyance Project was a highlight

Andrew Fera P.E. of the NYSDEC receives a plaque of appreciation from NASTT-NE Past Chair Babs Marquis for his lunch-hour presentation

NASTT-NE Board Member Bill Jeffery receives plaque of appreciation from Past-Chair Babs Marquis for his hard work organizing the conference

Past-Chair Babs Marquis received a plaque from NASTT-NE Chair Eric Schuler for his years of dedicated service to the organization

THE NASTT-NE CHAPTER BOARD OF DIRECTORS THANKS EVERYONE FOR THEIR PARTICIPATION IN A VERY SUCCESSFUL FIFTH ANNUAL NASTT-NE NORTHEAST TRENCHLESS CONFERENCE. WE LOOK FORWARD TO SEEING YOU LATER THIS YEAR IN PORTLAND ME NOVEMBER 14-15!

NASTT-NE Northeast Trenchless Conference. We wish to extend our appreciation to all our presenters, moderators, and attendees for their participation, time and effort. A special note of thanks also goes out to our Premium Sponsors & Exhibitors.

Join us in Portland ME November 14-15 where we continue charting the course towards a bright sunny horizon ahead for trenchless technology in the northeastern US, at another premier educational opportunity for forward-looking underground infrastructure professionals!

For further details and updates please visit:

www.nastt-ne.org

We look forward to seeing everyone again in 2022 in beautiful Portland Maine for the Fifth Annual Northeast Trenchless Technology Conference!!!

Networking and close personal access to industry expertise is an important aspect of the annual NASTT-NE Conference

NASTT-NE TRENCHLESS TECHNOLOGY CONFERENCE 2021 SPONSORS & EXHIBITORS

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APRIL 30-MAY 4 | PORTLAND, OR

NO-DIG SHOW 2023

Call for Abstracts

Submission Deadline: June 30, 2022

The North American Society for Trenchless Technology (NASTT) is now accepting abstracts for its 2023 No-Dig Show in Portland OR at the Oregon Convention Center April 30 - May 4, 2023. Prospective authors are invited to submit a 250-word abstract outlining the scope of their paper and the principal points of benefit to the trenchless industry. The abstracts must be submitted electronically at NASTT's website by June 30, 2022: nastt.org/no-dig-show.

Abstracts from the following subject areas are of interest to the No-Dig Show Technical Program Committee:

Potable Water and Pressure Systems

- Pipeline Inspection, Locating, and Condition Assessment
- Pipe Rehabilitation
- Pipe Bursting
- Emerging Technologies
- Case Studies

Wastewater, Storm water and Non-pressure Systems

- Advanced Pipeline Condition Assessment
- I&I and Leak Detection
- Pipeline and Laterals Rehabilitation
- Pipeline Inspection, Locating, and Condition Assessment
- Cured-in-Place Pipe Lining
- Sliplining
- Pipe Bursting
- Spray Applied Linings
- Grouting
- Manhole Rehabilitation
- Case Studies

Energy Pipeline Systems

- Pipeline Inspection, Locating, and Condition Assessment
- Aging System Rehabilitation
- New Trenchless Installation
- Standards and Regulations

Trenchless Research and Development

- University and Industry Initiatives
- Education and Training

Industry Issues

- Subsurface Utility Engineering
- Submittal Requirements and Quality Assurance/Quality Control
- Project Budgeting and Prioritization
- Funding for "Green" Technologies
- Selection Criteria for Contractors
- Social Costs and Impacts
- Carbon Footprint Reduction
- Sustainable Construction Practices
- Industry Trends, Issues and Concerns
- Differing Site Condition Claims

New Installations – Tunneling, Boring and Pipe Ramming

- New Concepts or Trenchless Equipment, Materials and Methods
- New Applications for Boring Techniques (Auger Boring and Pipe Ramming)
- Pilot Tube Boring (Tunneling)
- Case Studies

Horizontal Directional Drilling (HDD)

- New Concepts and Applications for Horizontal Directional Drilling Equipment, Materials and Methods
- Case Studies

Microtunneling

- New Concepts and Applications for Microtunneling Equipment, Materials and Methods
- Case Studies

Questions?

Please contact:

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For more

information visit
nodigshow.com

The No-Dig Show is owned by the North American Society for Trenchless Technology (NASTT), a not-for-profit educational and technical society established in 1990 to promote trenchless technology for the public benefit. For more information about NASTT, visit our website at nastt.org.

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