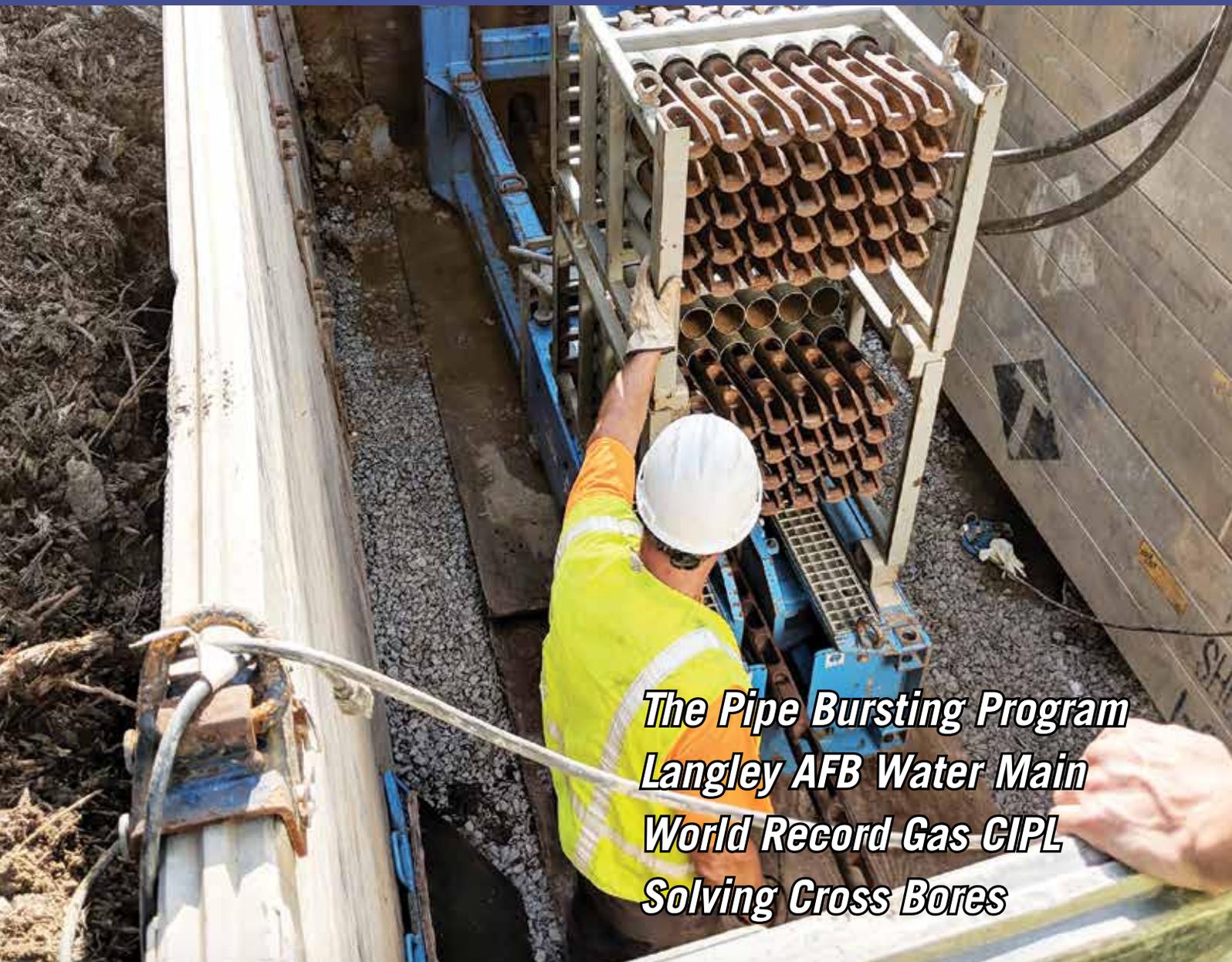




MID ATLANTIC JOURNAL OF TRENCHLESS TECHNOLOGY 2020

OFFICIAL PUBLICATION OF THE MID ATLANTIC SOCIETY FOR TRENCHLESS TECHNOLOGY

MASTT: A NON-PROFIT ORGANIZATION



*The Pipe Bursting Program
Langley AFB Water Main
World Record Gas CIPL
Solving Cross Bores*

6TH ANNUAL EDITION

Here's Why PE 4710 Pipe is the Best Solution for Water Systems



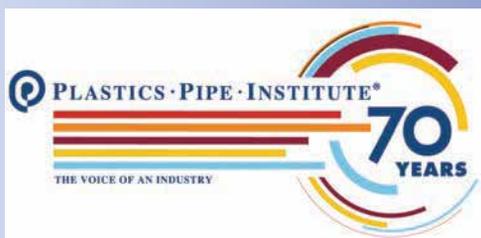
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For more details, visit PPI and MAB websites https://plasticpipe.org/municipal_pipe
PE4710 Pipe: The Best Solution for Water Systems

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10 Getting with the Pipe Bursting Program

Early attempts by the Penn Township Sewage Authority (PTSA) to mitigate I&I were having limited success until the township did a pilot project to look at pipe bursting. The pilot project succeeded in reducing the amount of flow into the system which led ultimately to the PTSA acquiring equipment and training crew for its own in-house pipe bursting program.



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The water and sewer system infrastructure is a critical support for the mission activity at Langley Air Force Base. When one of the ductile iron pipelines crossing under a vital runway area needed replacement, HDD was selected as the best method to allow base operations to continue with minimal disruption, and protect the nearby wetland areas.

16 New World Record 42-Inch Gas Main CIPL

Records are made to be broken, and the world record CIPL in summer 2019 of a 42-Inch Cast Iron Gas Main in a complex layout buried under 8 lanes of the Garden State Parkway in East Orange NJ was a breakthrough technological achievement building upon past experience, and fresh technical innovations. Detailed planning and incredible teamwork were keys to success.



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22 Working Together to Solve Cross Bores

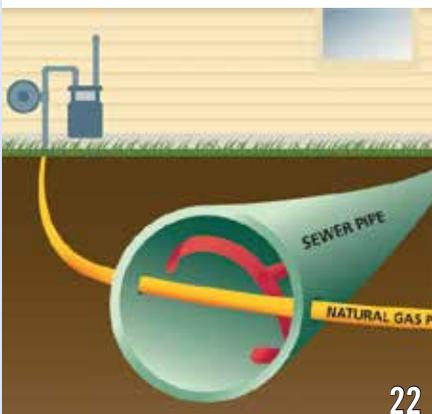
Likened to “ticking time bombs”, legacy cross bores are a preventable hazard. Education, careful design, planning and following HDD best practices are the keys to prevention. Article provides guidelines and recommendations to eliminate the risk of potential cross bores. The process begins with calling 811 before the work begins.

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MESSAGE FROM THE MASTT CHAIR

Richard Thomasson, P.E., MASTT Chair

We are very pleased to produce our sixth publication of the Mid Atlantic Society for Trenchless Technology (MASTT) Journal. The MASTT was founded in 2004 as a Chapter of the North American Society for Trenchless Technology (NASTT) and serves the geographical region of Virginia, West Virginia, District of Columbia, Maryland, Delaware, Pennsylvania, and New Jersey. The region has a huge population and many large municipalities and also, a large industrial base. The infrastructure is very large for water, sewer, stormwater, gas and electric, which in many cases is older and deteriorating. There is an overwhelming need for replacement and rehabilitation of the infrastructure which drives the interest in Trenchless Technology.

There are also a lot of major academic institutions in the Mid Atlantic region which are heavily involved in research on Trenchless Technology. Being close to the nation's Capital, creates a high visibility on infrastructure funding and interest in new technologies which can make tight budgets be used more effectively. There are also major industry leading technology and service companies within the MASTT region. Also, there are major trade associations such as NASSCO, ASCE, NSF, NIST, PPI and others, who are essential in the infrastructure industry. Each has done a tremendous amount of work in asset management being used to manage the replacement and rehabilitation of all infrastructure in the region. Because of the above factors, MASTT is a valuable grassroots resource for education, training, specifications, governance, funding and promotion of the trenchless industry.

Both private and public infrastructure owners across the region have used the new service products and innovation

for trenchless work. Educating and introducing new trenchless technologies and services, MASTT has conducted 32 seminars throughout the Mid Atlantic region. These seminars have been very informative and have introduced Trenchless Technology to many people who were not aware of the information over the last 15 years. We are trying to incorporate some of the NASTT short courses into our seminar schedule. This year we had to cancel the two scheduled seminars due to the Covid virus.

We have an overwhelming opportunity and responsibility to bring the deteriorating infrastructure to an acceptable level of service for the huge populace that we serve. The infrastructure assets we are focusing on are generally out of sight and out of mind until a catastrophic failure occurs. A focus on asset management has started to address these assets in a structured and effective way. The major factors in asset management, such as condition assessment, risk management, safety, economic planning, and social factors flow seamlessly into trenchless technology as a major tool for accomplishing the desired outcomes. Environmental, social and economic factors are all addressed and greatly enhanced through the application of trenchless technology. Focus on performance, sustainability, and resiliency of the infrastructure systems to provide a level of service necessary to maintain a healthy nation are primary drivers in our vision for MASTT.

MASTT can be an integral part of the education of providers and users of the infrastructure which is critical to continued viability in the region. We need your participation and collaboration to be able to provide the resources to

**“STAY STRONG,
HEALTHY AND
PERSEVERE FOR
THE FUTURE.”**

accomplish this vision. Join in active membership in MASTT and be a part of this critical work to enhance the infrastructure in our region.

This has been a very tumultuous and challenging year for everyone. The Covid virus has affected everyone in some way. We need to keep everyone in our prayers as we continue to endure the devastation that occurs in everyone's life while trying to be safe and also serve others in any way we can. Although the trenchless work has been affected to some degree, the utility work has been deemed essential and work has continued although affected in various ways. We look forward to 2021 to gain some type of normal operation whatever that looks like. Stay strong, healthy and persevere for the future.

Thank you,

Richard Thomasson
Chair, MASTT



MASTT SITE



GREETINGS FROM THE MASTT EXECUTIVE DIRECTOR

Leonard Ingram, Sr., PWAM Executive Director, MASTT

I am the Executive Director for the Mid Atlantic (MASTT), Midwest (MSTT) and Southeast (SESTT) Society for Trenchless Technology. Needless to say, Coronavirus 19 has shut down the seminar programs for all three this year. No municipal guest presenter or municipal attendees... no seminar! I was able to get the MASTT Kansas City seminar conducted on March 11, 2020 as everything was shutting down. My wife and I experienced Coronavirus 19 traveling problems while returning home from the Kansas City seminar. Scary and not good!

All MSTT, MASTT and SESTT "Trenchless Technology, SSES and Buried Asset Management" 2020 seminars after Kansas City, were postponed. MASTT, MSTT and SESTT are tentatively planning to conduct all the 2020 postponed seminars in 2021, Coronavirus 19 allowing.

MSTT is conducting a **FREE LIVE** two hour Trenchless Technology webinar through NASTT on Tuesday, December 1, 2020 from 11:00 am to 1:00 pm EST. The webinar contents and presenters will be determined by a survey being sent to the MSTT membership. The webinar will offer PDHs/CEUs. Please contact Leonard

"THANKS FOR THE SUPPORT"

Ingram (334) 327-7007 or leonard@engconco.com to be a webinar sponsor (\$200) ASAP. Limited number of webinar sponsorships are available.

Leonard E. Ingram, Sr., PWAM Executive Director, MASTT, MSTT & SESTT

PLEASE REVIEW THE MASTT, MSTT AND SESTT 2020 PROPOSED SEMINAR, WEBINAR AND JOURNAL PUBLICATION SCHEDULE:

SOCIETY	LOCATION/PUBLISH	PROPOSED DATE	STATUS
MSTT SEMINAR	KANSAS CITY MO	MARCH 11, 2020	CONDUCTED
MASTT SEMINAR	BALTIMORE MD	MAY 6, 2020	POSTPONED
SESTT SEMINAR	SAVANNAH GA	AUGUST 5, 2020	POSTPONED
MASTT SEMINAR	ATLANTIC CITY NJ	SEPTEMBER 16, 2020	POSTPONED
MASTT JOURNAL	PUBLISH DATE (DEADLINE 10/02/20)	NOVEMBER 11, 2020	PUBLISHED
MSTT SEMINAR	CINCINNATI OH	OCTOBER 28, 2020	POSTPONED
MSTT JOURNAL	PUBLISH DATE (DEADLINE 10/23/20)	NOVEMBER 18, 2020	PROPOSED
MSTT WEBINAR	FREE ONLINE (11 am – 1 pm EST)	DECEMBER 1, 2020	PROPOSED
SESTT JOURNAL	PUBLISH DATE (DEADLINE 11/13/20)	DECEMBER 16, 2020	PROPOSED
SESTT SEMINAR	MIAMI FL	DECEMBER 9, 2020	POSTPONED

PLEASE CONTACT LEONARD INGRAM, PWAM, EXECUTIVE DIRECTOR, AT LEONARD@ENGCONCO.COM

OR CALL (334) 872-1012 TO SPONSOR (\$200) THE MSTT WEBINAR ON DECEMBER 1, 2020.

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OR CALL (204) 275-6946 TO ADVERTISE OR TO PLACE AN ARTICLE IN THE JOURNALS.



MESSAGE FROM NASTT CHAIR

Craig Vandaele, NASTT Chair

Hello Mid Atlantic Chapter Members! 2020 has been quite a whirlwind year! Like the rest of the world, the staff and volunteers here at NASTT have been pivoting and evolving on a near daily basis to changes in how we do business due to the COVID-19 situation.

The 2020 NASTT No-Dig Show scheduled for this past April in Denver, Colorado, was affected by the shelter-in-place decrees across the globe. Due to continued government health regulations, the NASTT Board of Directors and No-Dig North Planning Committee also voted to postpone No-Dig North in Vancouver, British Columbia until the fall of 2021.

While these changes are disappointing, we are a resilient industry and we are excited to move forward as we plan for both the NASTT 2021 No-Dig Show in Orlando, Florida, and No-Dig North 2021 in Vancouver, British Columbia.

We are looking forward to these exciting and collaborative events where we will bring together the entire industry from across North America to celebrate our great industry and NASTT's three decades of trenchless advocacy and education. These will be pinnacle events to get out and network and get back to business after these unprecedented times.

We were thrilled with the incredible success of the inaugural No-Dig North conference held in Calgary October 2019. With nearly 600 attendees and 76

**WITH THE
TRENCHLESS MARKET
GROWING SO FAST
NOW IS THE TIME TO
JOIN US.**



exhibitors, I could not be happier with the outcome of this show and the volunteer participation and leadership efforts of our Canadian Chapters. The inaugural conference set the bar high and 2021 is going to be an excellent year to continue the momentum, after this year's hiatus!

As this unprecedented year continues to unfold, NASTT is working diligently to continue to provide the training and education you need to do business and stay up to date with innovations in our industry. In August we launched our NASTT Good Practices Courses as virtual events. These courses are a rescheduling of the 2020 No-Dig Show Good Practices Courses and our entire suite of courses will be available as live training events. Our four-hour courses will take place in one day and our eight-hour courses will be split into two-day sections to allow for schedule flexibility for our attendees. All NASTT Good Practices Courses

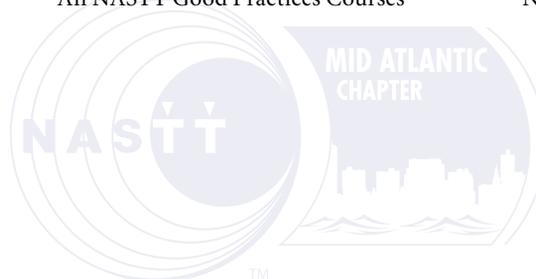
include Continuing Education Units, a training manual and the accompanying NASTT Good Practices Guidelines book if applicable.

Visit www.nastt.org/training/events for the full schedule and registration details.

We look forward to growing and learning from these recent challenges and coming back stronger than ever. Thank you for all your support and dedication to NASTT and the trenchless technology industry. We are only as strong as our Regional Chapters. We are always looking for volunteers and new committee members not only locally but nationally. Don't be afraid to get involved! With the trenchless market growing so fast now is the time to join us.

Craig Vandaele

NASTT Chair





MEMBERSHIP IN NASTT

Carolyn Hook, NASTT Membership Outreach & Database Manager

Whether you're on the job site, at the water cooler or at a conference, you'll want to connect with trenchless professionals. The North American Society for Trenchless Technology can help you make those connections every day with Talk Trenchless.

Talk Trenchless is an exclusive, secure, members-only networking tool designed to connect you with verified NASTT members – your peers and trenchless technology experts throughout North America. Participants can download and share ideas, articles, reports and more in the NASTT Members community.



Establish your professional identity.

Create your profile with your photo and areas of expertise, along with your education and position history. Talk Trenchless is a showcase of NASTT's most valuable assets – its members!



Discuss industry-related hot topics with your peers.

Don't wait for the next meeting. Talk about what's happening today and exchange ideas in a professional NASTT setting.



Increase your network.

Build your own contact list or search for colleagues by name, location, company or region in the NASTT online member directory. Meet others in your area online then connect in person at a regional chapter.



Find answers you need.

Looking for a standard practice or for someone to share their experience with a tool or technique? Post your need and access the ideas and stories of more than 2000 NASTT members.



Pay it forward.

Lend your expertise and give back to the profession when you share your knowledge, innovations, resources and experiences with others.



Access the right tools.

Members can post research, projects, solutions, calculators and videos that will be available at your fingertips in the community library.

**IT'S TIME TO
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How to Get Started

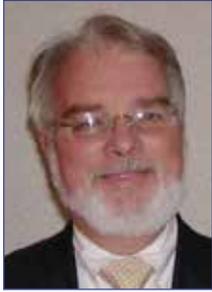
Log in with your nastt.org credentials at talk-trenchless.nastt.org. If you've never accessed the site, you'll be asked to agree to the Community Rules which remind everyone to:

- Stay on topic.
- Don't post commercial messages.
- Be honest, be yourself.
- Submit only your own, original content.
- Keep it clean, keep it friendly.

Next, click your Profile on the top right and add your information. To access the NASTT Members Community, click Communities, My Communities. You'll see the most recent conversations and posts. Join in or start a new one. Send your questions to membership@nastt.org.



2020-2021 MASTT BOARD OF DIRECTORS



Richard Thomasson – Chair

Richard O. Thomasson has over 51 years of experience working in the water and wastewater field. He has been closely involved with Trenchless Technology for nearly his entire career. While at the Washington Suburban Sanitary Commission he directed many uses of new trenchless technologies, retiring

after 31 years as the Director of Construction. He has worked with Parsons Brinckerhoff for 8 years, and Arcadis for the past 12 years, continuing his involvement in numerous trenchless projects. Presently he is an independent consultant working in any way that helps people have a better quality of life through the utility services they receive.

Richard has a B.Sc. in Civil Engineering from Virginia Tech, a M.Sc. in Civil Engineering and a MPP in Public Affairs from the University of Maryland. He is a licensed P.E. in Virginia, Georgia and Maryland.

As a Founding Director and the very first Chair of the North American Society for Trenchless Technology (NASTT), Richard believes fully operational water, wastewater systems, gas service, electric service and storm water systems are crucial assets for a healthy growing nation. In 2016 Richard was inducted into the NASTT Hall of Fame.



Dennis Walsh – Secretary

Dennis M. Walsh, P.E. is a Senior Project Manager – Horizontal Directional Drilling for Public Service Electric & Gas in New Jersey. Dennis is a 1972 graduate of the University Of Dayton, Ohio with a B.S. in Civil Engineering and a 2002 graduate of the Polytechnic University of New York with a M.S. in Technology. He retired

from KeySpan Energy Company in 2005 after a 28 year career in the gas utility field with a background in engineering, operations, construction, Quality Assurance and HVAC. He led KeySpan's efforts to expand the use of trenchless technology in the early 1990's to decrease its main and service installation costs. Prior to joining PSE&G, he was a consulting engineer for various consultants in the natural gas industry.

Dennis is a past Board member for NASTT, as well as a Board member for the NASTT Mid-Atlantic Chapter and on the Annual No-Dig Committee. He has designed numerous HDD installations for various utilities; including a 1,800 foot HDD for a 30 inch gas main under a tidal basin in Brooklyn, NY; a 2,000 foot 12 inch HDD under an environmental sound in south NJ; a 400 foot long Jack & Bore installation in Newark, NJ; and a 1900 foot HDD of a 30 inch steel pipeline for a 69kV electric system. Dennis is a licensed Professional Engineer in New Jersey. When he is not involved in trenchless projects, he enjoys traveling, and trying to play golf.



John Hrabosky – Vice Chair

John Hrabosky is the Technical Support Manager for HammerHead Trenchless in the Rehabilitation & Replacement (R&R) division. Drawing on his nearly 30 years of experience in the trenchless industry, John provides project and equipment consultation, training and support to

customers worldwide.

He specializes in pipe ramming, pipe bursting, point repair and CIPP lining solutions. John holds a degree in management and marketing from Duquesne University in Pittsburgh, PA.



Mike Hoffmaster – Treasurer

Mike Hoffmaster is the Marketing Manager for both Pleasants Construction and Reline America®. He is responsible for educating municipalities and engineering firms on the benefits of a variety of trenchless rehabilitation products and increasing the market share of these products.

Mike has a Bachelor of Science degree from Shepherd University and has over 33 years of experience in the construction industry. Prior to his employment with Pleasants Construction and Reline America®, he spent 25 years, working in a variety of roles, for a major precast concrete company. Mike has played a vital role in obtaining product approvals and specification writing for products he has been associated with. He is an active member of Chesapeake Water Environmental Association (CWEA) where he currently serves as Chair of the Collection Systems Committee, Maryland Rural Water Association (MRWA), Virginia Rural Water Association (VRWA), Pennsylvania Rural Water Association (PRWA) and Water Environment Federation (WEF). Mike enjoys cooking, photography, traveling and volunteering with the Special Olympics - which is something he has been involved with for over 30 years.

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PENN TOWNSHIP SEWAGE AUTHORITY:

Getting with the Program, the Pipe Bursting Program!

By: TT Technologies



The township found renting the static pipe bursting equipment to be the most fiscally sound for their needs. Here crews connect the hydraulic power unit

Penn Township has developed a comprehensive in-house bursting program. Crews use a Grundoburst 800G static pipe bursting system from trenchless equipment manufacturer TT Technologies, Aurora, IL

The Penn Township Sewage Authority (PTSA), Penn Township, Pennsylvania is taking on that old familiar problem of inflow and infiltration (I&I) with strong dedication to trenchless technology. The township has a population of 19,600 and covers a total area of approximately 30 square miles. In 1994, it was placed under a Corrective Action Plan (CAP) to eliminate sewage overflows and basement backups.

Early attempts to alleviate the ongoing I&I issues did not solve the problems. According to Trenchless Specialist Mike Schultz, from trenchless equipment

manufacturer TT Technologies, Aurora, Ill., those disappointing attempts eventually led to a pipe bursting solution.

He said, "About 5 years after the Authority tried to mitigate problems in a select group of sewer mains, they realized through flow monitoring that the efforts had failed and did not solve the issue. So, the township did a pilot project to look at pipe bursting. That project ended up being a success and reduced the amount of flow into the system. That laid the groundwork for a 20-year pipe replacement plan, which includes pipe bursting, along with some traditional open cut."

It wasn't until the PTSA decided to do additional pipe bursting and bring the work in-house that the program began to take shape. The PTSA was able to perform

the work, save money and eliminate I&I. For the pipe bursting the PTSA utilizes a Grundoburst 800G static pipe bursting system from TT Technologies.

60 YEARS IN OPERATION

As its service area has grown and changed over the past 60 years, the PTSA has continued to meet the changing needs of the community. Originally incorporated in 1956 as an Authority under the Municipal Authorities Act, it operates independently of the Penn Township Commissioners, however the members of the Sewage Authority Board are appointed by the Penn Township Board of Commissioners for five-year terms.



Static pipe bursters allows for the use of a variety of product pipes. Penn Township has been using Certa-Flo® PVC pipe on numerous bursting projects

CREWS IMPLEMENTED TIME AND DISRUPTION SAVING TECHNIQUES WITH THE STATIC PIPE BURSTING EQUIPMENT.

overflows and basement backups. This also led to the establishment of the Penn Township Sewage Authority as an active authority in 1997, becoming responsible to complete the CAP and also update and maintain the system into the future.

On the heels of its first pipe bursting projects, the PTSA calculated that it would be able to perform pipe bursting in-house for 0.40 cents on a dollar versus contracting out for services. When the in-house pipe bursting program was formally established,

The organization can establish rates and plan, construct and fund projects related to providing municipal sewer service to the residents of Penn Township. Currently providing sanitary sewer services to approximately 5,724 customers throughout Penn Township collection and conveyance system consists of 83 miles of sanitary sewer lines ranging in size from 8 inches to 24 inches in diameter, 3,000 manholes and 17 pumping stations. The PTSA does not operate a treatment plant, however. Wastewater treatment services are provided by a regional sanitary entity.

PTSA maintains a staff consisting of three office clerks, five field workers, one Field Supervisor and a Manager. The PTSA Manager oversees the overall day-to-day operation of the Authority. The staff, including the Field Supervisor, reports directly to the manager.

PIPE BURSTING PROGRAM: RENTING IT RIGHT!

After being placed under a Corrective Action Plan, the PTSA had to develop the plan that would eliminate sewage

WHERE THE CONSTRUCTION INDUSTRY GOES FOR TRENCHLESS SOLUTIONS



PIPE BURSTING



HDD ASSIST



HORIZONTAL BORING



COMPACT HDD



PIPE RAMMING



SLICK BORE



SPLIT & PULL



WINCH APPLICATIONS



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HDD ASSIST
GRUNDORAM®



STATIC PIPE BURSTING
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Typical bursting runs range between 270 and 300 feet in length and average 1.5 to 2 hours to complete

CHOOSING THE RIGHT BURSTING METHOD

While pneumatic pipe bursting has become a widely accepted and utilized trenchless pipe replacement method, static pipe bursting has gained tremendously in popularity over the years and is the method of choice for the Penn Township Sewage Authority. In the static process exit and launch pits are used in the same way they are for pneumatic bursting. First, the hydraulic bursting unit is positioned in the exit pit. Then the bursting rods are pushed through the host pipe and into the launch pit.

The entire configuration is pulled back through the host pipe by the hydraulic bursting unit. The bladed rollers split the existing pipe, while the bursting head and expander displace the fragmented host pipe into the surrounding soil. The new pipe is pulled into place simultaneously.

Another advantage of the static method is its capability to utilize a variety of product pipe materials. Schultz said, "Static pipe bursting is unique in the fact that it is able to install fusible pipes, as well as a variety of restrained joint pipe materials. This can be done with special adapters and tooling. Pipes like restrained joint ductile iron pipe, restrained joint PVC pipe, and fPVC pipe, among others are viable with static bursting. Penn Township has been using Certa-Flo® PVC pipe on numerous bursting projects."

A MODEL IN-HOUSE BURSTING PROGRAM

Priority for determining pipe bursting projects is established annually through extensive flow monitoring. Once a segment is identified, the lines and laterals are televised in the selected replacement area. All manholes are also replaced within the area. Pipe bursting equipment rental is scheduled once the next area for pipe bursting is designated. A recently completed project in the Sunrise Neighborhood included bursting and replacing 2,500 feet of existing 8-inch terra cotta sewer main to 8-inch Certa-Lok® PVC pipe.

Size for size replacement is typical of most PTSA bursting projects with

a few featuring small upsizes. Ground conditions consist of challenging rocky soils. For the Sunrise project, crews established 14-foot trench boxes for the launch pits and 16-foot trench boxes for machine pits. With sewer mains at depths of 17 feet or more, constant dewatering was required. Typical bursting runs ranged between 270 and 300 feet in length and average 1.5 to 2 hours to complete. Crews pulled back 10-foot sections of PVC at a time during bursting operations.

According to Schultz, crews implemented time and disruption saving techniques with the static pipe bursting equipment. He said, "Depending upon specific jobsite layouts, the hydraulic bursting unit can be positioned in the middle of a main line bursting run. This allows PTSA crews to complete a bursting run in one direction, turn the machine 180 degrees and burst in the other direction. It's a nice disruption mitigation technique, not to mention a time saver. In optimal conditions crews can even rod the next run at the same time the first one is being completed by feeding the bursting rods out of the back of the machine and into the next pipe segment directly."

PTSA also uses restrained joint PVC to reduce the amount of room needed to stage the pipe older neighborhoods with narrow lots, further limiting disruption to residents. Once the bursting was finished, Inserta Tees® were used to reconnect the laterals, and final restoration work was completed.

Schultz said, "This is a good example of what an in-house program can be when properly planned and implemented. The Penn Township group really has a handle on the process and is making great strides towards eliminating its I&I problems." †

ABOUT TT TECHNOLOGIES:



For more than 45 years, TT Technologies has been the worldwide leader in trenchless technology. Each year, more trenchless sewer, water, gas and electric rehabilitation and replacement projects are successfully completed with trenchless equipment from TT Technologies than any other. TT Technologies is the leader in trenchless!

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LANGLEY AIR FORCE BASE WATER MAIN REPLACEMENT PROJECT

Air Force embraces use of Fusible PVC® pipe and horizontal directional drilling

By: Ed Lobello, Underground Solutions, Inc.

Langley Air Force Base (AFB) covers approximately 3,000 acres including 600 acres of wetlands just north of Virginia Beach, Virginia. The base has a rich military history dating back to 1916 and is home to the 633rd Air Base Wing (originally referred to as the 633rd Combat support Group), the 27th Fighter Squadron and the 94th fighter squadron, the last of which included Eddie Rickenbacker, famed WWII ace. Langley AFB has remained a necessary part of the United States military base system. Rehabilitation and maintenance on base is a mission priority due to the stress on its physical infrastructure thanks to the robust training, support, and deployment schedule of the base occupants. This is especially true for the aging water and sewer system.

The base provides a great deal of space for mission activity. The water and sewer system that supports that activity is critical to daily support, however, maintaining operations while addressing critical upgrades is essential to any work being planned. Typically, aging pipes would be dug up and replaced in kind. "Dig and Replace" methods were deemed by planners to be undesirable in multiple locations where environmental concerns as well as disruption of base activity would not allow this approach. To minimize environmental impact and operational disruption, Scott Borges of Kimley Horn Associates, the design engineer for this rehabilitation effort, had to consider modern trenchless solutions.

PROTECTED THE WETLAND AREAS & ALLOWED BASE OPERATIONS TO CONTINUE WITH MINIMAL DISRUPTION.

One of the ductile iron pipelines that crossed a vital runway area was failing and needed attention. Borges reviewed the viable trenchless options to either repair, replace or rehabilitate the pipeline and found that horizontal directional drilling (HDD) used to install a new replacement pipeline would best fit the challenges of the installation. HDD methodology uses steerable drilling equipment and

techniques to create a borehole under an obstruction or an area where excavation is not desired. A new pipeline is then pulled through this borehole and reconnected at either end. The new pipeline is then placed into service. This method limits excavation and surface disturbance because reconnections to the old pipeline are performed at entry and exit pits at either end of the new pipe being installed by HDD. This method drastically reduces land disturbance and any subsequent environmental or operational impacts. With proper planning, HDD installations are performed while roads, parking lots, airstrips, and even rail lines are in use. Depending on conditions, restoration costs are minimized while pipe installation productivity is enhanced.

HDD methods require a pipe material and joint that can handle tensile loading as well as adequate critical buckling pressure to resist stresses created by drill fluids. Kimley-Horn chose Fusible C900 PVC® pipe for use on the project. In consultation with the Langley AFB Civil Engineering office, Fusible C900 PVC® Pipe was offered for both Potable Water and Force Main replacement upgrades. Base personnel were comfortable with the durability and performance of Bell and Spigot C900



Installation by HDD continues during Air Force operations



Birdseye view of the airfield at Langley AFB

generally. Fusible C900 PVC is well known for compatibility with standard waterworks fittings such as MJ connectors, saddle taps, and Ductile Iron valves. Since service on C900 does not require in-field fusion skills and equipment, maintenance and operations personnel were on board with Fusible PVC® pipe because they were familiar with its use and maintenance.



Fusible PVC® pipe is staged through a parking lot for just a few hours before installation begins



Strategic location of pits reduced costs & disruption to base operations

Once all the stakeholders were on board with the choice of HDD pipe, the design could move forward.

Initially, only a small section of pipe installed in the wetland area was planned to be HDD. When Borges and the Air Force considered the ease and economy with which the HDD of Fusible PVC® pipe could be accomplished, they chose to install all the pipe using HDD and Fusible PVC® pipe. This choice not only protected wetland areas, but it also allowed base operations to continue with minimal disruption. Ultimately, given the site conditions, geotech information, potential restoration costs, and operational demands of the base, HDD turned out to be the best option economically as well.

MEB was the General Utility Contractor and Atlantic Boring was the HDD driller for the project. Entrance and exit pits were strategically located to minimize environmental impact and double as necessary excavations for valves, fittings and other appurtenances. Locating these pits strategically further reduced costs



Final reaming and insertion of the Fusible PVC® pipe occurred simultaneously

and client disruption. Wesley Dunks of Atlantic Boring was one of the first Directional Drillers in the country to install FPVC. He has since completed countless miles of installations and well situated to take full advantage of the pull strength in order to ensure an efficient and cost effective installation of both the water and force main pipes.

Fusible PVC® pipe utilizes standard waterworks fittings with restrainer glands so tie-ins were simple with no special fusion equipment or knowledge required. In all, Atlantic Boring installed over 5,000 feet of 8-inch, 10-inch, and 12-inch Fusible PVC® pipe on the project saving, time, risk, operational impact and cost. †

ABOUT THE AUTHOR:



Ed Lobello is responsible for Sales in VA, DC, MD, DE, NJ and Eastern PA. He has 20 years of experience in consultative sales, business development,

and product development in the civil engineering community. Previously Ed served as Business Development Manager for Water Reclamation Solutions. Additionally, he served as Sales Engineer and Plant Manager for Lane Enterprises, Inc. in the Mid Atlantic area. Ed earned a Bachelor of Science Degree from Virginia Tech.

New World Record CIPL Achieved with Planning, Experience and Networking

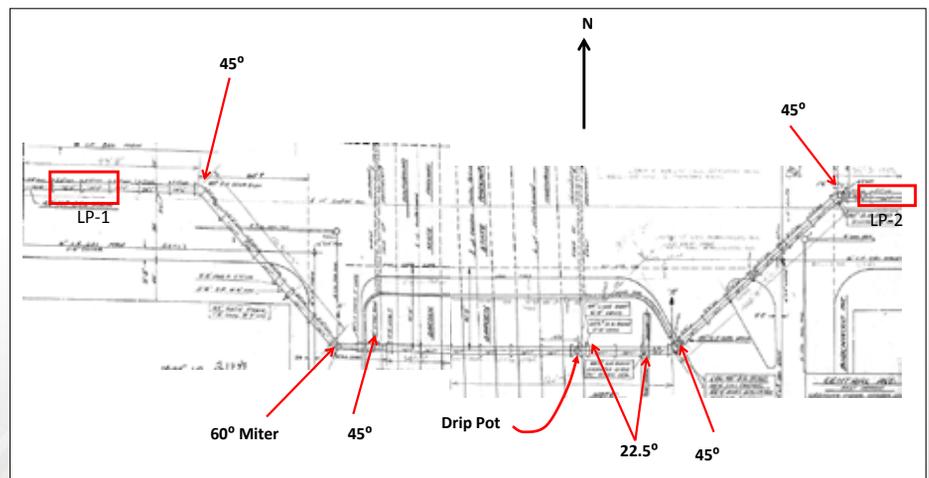
Challenging Renewal of 42-Inch Trunk Gas Main under the Garden State Parkway in East Orange, NJ Sets New World Record

By: George Ragula, Public Service Electric & Gas



“A TREMENDOUS WIN FROM A WELL-ENGINEERED PLAN!”

-DAVID WICKERSHAM, PRESIDENT/CEO, PROGRESSIVE PIPELINE MANAGEMENT



Pipe segment was inaccessible and difficult to repair with seven bends in total

A new world record diameter milestone set on July 19, 2019 lining 573 feet of 42-inch high pressure cast iron (CI) gas main crossing under the Garden State Parkway (GSP) at the Central Avenue Bridge in East Orange, New Jersey was due to meticulous planning and lessons learned on previous

jobs with lining contractor Progressive Pipe Management (PPM) of Wenonah NJ, in overcoming challenges on previous CIPL projects. Our breakthrough milestone was also helped with expert advice from NASTT industry colleagues.

LAYOUT

The 42-inch main runs directly under Central Avenue, the main artery through East Orange, which crosses over the GSP at the Central Avenue Bridge. Installed



It was important that Central Avenue and the Bridge remained open during construction



In 1954, the 42-inch main descends down a steep embankment before the bridge to cross the Parkway at roughly 7 feet below the freeway lanes. The freeway itself is situated 25 feet below grade level from the surrounding streets. After crossing underneath the GSP, the pipe climbs back up under the opposite highway retaining wall, snaking westward after a series of bends directly below Central Avenue.

To negotiate the steep grade change and cross under the below grade eight-lane GSP, the 42-inch pipe was originally built in a shallow basin shape, a flattened “u-tube” configuration. This segment of pipe was a very complicated layout to repair with seven bends in total. Additionally, the section of pipe crossing under the freeway lanes was a low point in this area for the gas distribution system, which meant there was also a drip pot fitting for liquid collection and removal, a holdover from the early days of wet manufactured gas. The drip pot created a 48-inch gap in the pipe, which we bridged with a custom fabricated steel structural reinforcement sleeve (SRS).

With the East Orange Hospital nearby, it was imperative that Central Avenue and the Central Avenue Bridge remained open during construction. Using CIPL provided the advantage of being able to locate the sending and receiving pits on each side of

the GSP far enough away to minimize any interference with the simultaneous Central Avenue Bridge reconstruction work.

INNOVATIONS

Close proximity to the bridge reconstruction, and requirement for traffic flow to stay open along Central Avenue for the duration of the project, were key considerations in planning.

A detailed game plan was critical, and considerable time was invested in a comprehensive design effort to prepare for the lining work. Our ingenuity and resourcefulness were stretched to meet the challenges posed by the diameter, geometry and inaccessibility of the main. Innovative solutions were found during the design phase that were used for the first time on a gas pipe CIPL project:

- New inversion drum & transport hose to handle large diameter liner
- Injected curtain grouting preventing water penetration into depressurized pipe
- Robotic self-propelled sandblasting unit for cleaning pipe
- Dust collectors (64,000cfm) used for high velocity post-clean grit removal

to prevent stranded grit issues.

- Largest fabricated steel SRS ever built to bridge 48-inch long drip pot gap
- Inverting a large diameter liner through seven bends & multiple grade changes
- Additional reinforcement to liner tail and catch end.

INVERSION DRUM

After the locations of the sending and receiving pits along Central Avenue were established on either side of the bridge, a total of 700 feet of liner was ordered from the German manufacturer, Karl Weiss Technologies GmbH, well within the capacity of the new custom built inversion drum.

The new inversion drum incorporated lessons learned from previous large diameter lining projects including a world-record setting 36-inch gas main CIPL renewal project two years ago in nearby South Orange.

Featuring a transport hose for the liner which reduced the top-side equipment footprint, and size of the sending pit, the new equipment protected the liner from inadvertent chafing due to angle of entry during inversion. Increased liner capacity, and a redesign of the drum outlet mechanism were additional new improvements reducing set-up time and greatly increasing crew efficiency during liner installation.

GROUTING FIRST

Before cleaning the pipe interior, it was important to first ensure the inner



More than 70 gallons of water collected in the drip pot a week after main abandoned



First-ever application of curtain grouting from inside a gas main required man-entry

pipe wall was dry, and eliminate any water inflow. Due to the high water table, and pipe depth over 30 feet below grade where the main crossed under the GSP, we expected substantial water intrusion once pressure was off the line.

The main was abandoned June 26, and when the pipe was CCTV inspected a week later during the contractor move-in on July 3, we found the drip pot at the low point had already collected over 70 gallons of water inflow. Close inspection located the source of inflow at the 45-degree mitered steel bend on the short section of steel pipe.

Several potential solutions to stop water inflow had been closely examined during the planning phase and the preferred method selected was curtain grouting, which injects an expanding hydrophilic grout into the surrounding soil. The grout forms a dense semi-rigid foam barrier around the pipe exterior preventing water intrusion from the outside.

This was the first time the curtain grouting method had ever been used on a gas main to prevent water entry. Man entry was required for the grouting operation, so extensive safety precautions were taken, with rescue harnesses, fresh air circulation, gas monitoring equipment and a confined space rescue team onsite. A body board and pulley system was employed to get workers down to the



Grout pumped into soil through check valves stopped inflow from heavy rainfall

infiltration site, at the mitered steel elbow. Crews then injected the grout into the soil surrounding the area of inflow by pumping it through check valves in multiple 3/8-inch holes drilled into the pipe.

Surprisingly, after pumping only five gallons of grout into the soil surrounding the pipe, the water inflow stopped. This was confirmed the next day when, following a significant overnight rainfall of more than 2 inches, the pipe interior was still completely dry at the infiltration site. This innovation is an important milestone certain to be used in future projects as a crucial step before cleaning, where water intrusion is encountered in depressurized pipe.

GRIT CLEANING

Thorough cleaning of the pipe interior to remove debris and residue ensures proper bonding of the installed liner to the



Maintaining a minimum 45mph velocity was an achievement, considering pipe diameter and geometry

host pipe. Sufficient air velocity to first sandblast clean the inside of the pipe, and then recover the leftover grit, was expected to be a significant challenge, considering the diameter and geometry of the pipe, combined with the effects of gravity. After extensive testing and assessment of different configurations of vacuum equipment during planning, we found the optimal equipment configuration for maintaining adequate airflow velocity.

After extensive consultations and discussions, we opted to use two dust collectors, with an equivalent 64,000 cfm vacuum capacity, in lieu of eight vacuum trucks. This decision significantly reduced our onsite equipment footprint and potential impact to traffic. Additionally, we determined that upsizing the inlet hoses from 8- inch to 16-inch created better airflow. Using realtime airflow monitoring for the first time on a CIPL job, we were able to maintain a minimum 45mph velocity throughout the cleaning and grit recovery process.

For the first time we deployed a self-propelled robotic sand blast unit, to clean the pipe. It efficiently cleaned the metal down to a bright-white NACE 2 finish. According to Dave Wickersham, President of PPM, "It worked brilliantly. The video camera on the unit allowed real-time views of results during cleaning. Very quick set-up, the crew was cleaning within



Resourceful Miller Pipeline crew successfully installed largest SRS bridge ever fabricated



Self-propelled robotic sand blast unit, “The Beast” efficiently cleaned the metal to a NACE-2 finish

10 minutes. We’ll be using it again on large diameters. Another progressive step up for gas CIPL.”

LARGEST SRS

After post cleaning CCTV inspection confirmed the inner pipe surface was ready for lining, one final critical step was necessary before installation could begin. Using man-entry, with all the necessary safety protocols, a 6-foot prefabricated SRS made from ¼-inch thick carbon steel, was installed by Miller Pipeline crews to bridge the 48-inch drip pot gap. It took time and effort to position the bridge

within the pipe, however the experience and resourcefulness of the Miller Pipeline crew were instrumental in the successful installation of the largest SRS bridge ever fabricated to date.

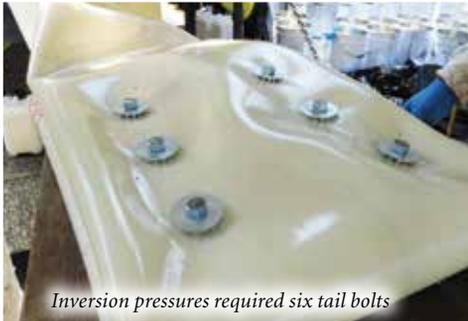
SUMMER HEAT

Because of the heat wave in the northeast, there was concern the resin could cure prematurely, so a 4am job start was planned on the day of the liner installation, Friday, July 19. We hoped to get the liner wet-out and inversion completely done well before onset of the mid-afternoon heat. The wet-out process involved mixing 40 cans of two-part epoxy, which is then poured into the liner, saturating it. The saturated liner is then squeezed through pinch rollers so that the epoxy is spread out evenly.

This intricate and tightly choreographed assembly line process involved many people spreading the 2,000 pounds of resin, folding the liner and loading it into the inversion drum. Large amounts of lubricant were applied to minimize the



Sending pit, Central Avenue East



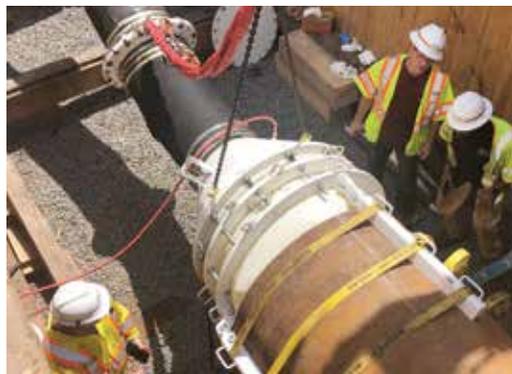
Inversion pressures required six tail bolts



Receiving pit, Central Avenue West



Careful planning ahead of time helped the liner installation run perfectly



Because of summer heat-wave, work began at 4am installation day



New custom built inversion drum has transport hose for liner

Finally, the renewed 42-inch main was successfully gassed-in on Thursday, August 22nd, and everyone involved with the project breathed a sigh of relief for meeting the tight outage window deadline of September 1.

Wickersham summarized, “The successful permanent renewal of this difficult and inaccessible stretch of 42-inch main set a new World Record for largest diameter gas main ever renewed using CIPL technology! A tremendous win from a well-engineered plan!” ✚

ABOUT THE AUTHOR:



George Ragula is the Distribution Technology Manager at Public Service Electric & Gas (PSE&G) with over 42 years of experience in gas industry engineering,

operations, construction, research/development/deployment and management. George is a noted authority on trenchless applications for the gas industry having spent 32 years specifically focused on trenchless. He received his B.S. in Mechanical Engineering from Polytechnic Institute of Brooklyn in New York. George is a past Chair of NASTT and serves on the NASTT No-Dig Show Program Committee. He also teaches several NASTT courses on various trenchless technology topics, including CIPL for the Gas Industry.



Final post-lining CCTV

the liner ambient cured, which took only two days because of the heat wave. Next Monday, July 22, both ends of the liner were cut and trimmed flush to the pipe.

Final post-lining CCTV confirmed the liner was very smoothly bonded with the host pipe, entirely free of anomalies. The final pressure test was done immediately in order to prevent any potential water infiltration causing liner disbondment. Test of 22.5 psig held steady overnight.

Pressure at 10 psig was then used to maintain positive pressure within the pipe until tie-in scheduled 3 weeks later.

friction from the seven bends and two vertical inclines the liner would traverse during inversion. Six tail bolts were installed in the liner tail to prevent a blow-out at the catch end.

SEVEN BENDS

Inversion began at approximately 1 pm, and took one hour for the liner to hit the catch end at the receiving pit on the west side of the GSP. In total, the 570-foot 42-inch liner was inverted through 7 bends and two steep slopes on either side of the GSP.

The transport hose was removed and nitrogen hooked up to supply make up air to maintain 8-10 psig inside the pipe while



Detailed planning and incredible teamwork were keys to success. From left to right: Holger Turloff, Karl Weiss GmbH, Shane LoPresti, PPM, George Ragula, PSEG, Tom Nestoras, PPM

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WORKING TOGETHER TO SOLVE THE PROBLEM OF CROSS BORES

Practical Tips for Dealing with a Hidden Issue

By: Norm Parrish, Pennsylvania 811

At 8:53 a.m., on August 29, 1976, an explosion and fire destroyed a house at 6521 20th Avenue in Kenosha, Wisconsin. Two persons were killed, four persons were injured, and two adjacent houses were damaged. The destroyed house was not served by natural gas. However, natural gas, which was escaping at 58 psi pressure from a punctured 2-inch plastic main located 39 feet away, had entered the house through a 6-inch sewer lateral. The gas was ignited by an unknown source. After the accident, the

National Transportation Safety Board's investigation disclosed that the gas main had been installed by boring through the bottom of the sewer tile; the gas main was perpendicular to the sewer tile.

The day after the accident Wisconsin excavated four sewer laterals near the ruptured gas main. Two of these laterals had been damaged during the gas main construction when the gas main was installed partially inside the sewer laterals, creating what is now known as a Cross Bore.

A Cross Bore is created when a new underground facility is installed using a trenchless Horizontal Directional Drilling (HDD) excavation method and there is an existing non-pressurized facility within the installation path that is breached during the installation process.

By the late 1990s there began to be an awareness across the country that underground distribution lines (electric, gas and cable) were being drilled, moled or plowed into sanitary sewers, storm sewers and other utilities. Initial concerns were primarily of damage to the lines, but Sewer authorities began to complain that



Legacy cross bores are likened to "ticking time bombs"

newly constructed sewer lines were being damaged when underground utility lines were installed because of poor Horizontal Directional Drilling construction practices.

Cross Bores have been related to a number of incidents across the United States and Pennsylvania in the past several years. They are considered "ticking time bombs" due to the associated element of



Hidden cross bores can lead to a catastrophic event



PA One Call implemented the “Call Before You Clear (CBYC)” ticket notification in 2016

surprise for Contractors, Drain Cleaners and Plumbers while attempting to clear a clogged sewer.

In 2013 Pennsylvania Gas Operators decided to self-report incidences of cross bores found. In addition, the Pennsylvania Public Utility Commission (PA-PUC) had sent a letter (FL 3-13) to Pennsylvania Gas Operators asking for information about their plans to mitigate cross bores. From these efforts a Pennsylvania Cross Bore Task Force (CBTF) was established. The CBTF was tasked with making recommendations for how to mitigate the existing legacy cross bores, and develop a process to prevent cross bores in the future.

In 2015 the CBTF adopted the following recommendations: to develop a “Call Before You Clear” 811 ticket type; develop education and outreach material for plumbers & sewer operators and key stakeholders; develop a specific trenchless excavation module; develop a strategy to address the marking of sewer laterals when a One Call is placed; promote specifications for sewer lateral installations that would include a requirement to be locatable using standard industry technologies; and develop an “automated response” to a One Call notification, where trenchless excavation is the method of installation (i.e., HDD, missiles).

To support these recommendations, Pennsylvania stakeholder, People Gas, created an education brochure for plumbers, sewer operators and other key stakeholders highlighting the steps they should take to mitigate the dangers of potential cross bores.

Plus, in 2016 the Pennsylvania 811 Board of Directors created and implemented the “Call Before You Clear

EDUCATION AND A ROBUST PROCESS ARE THE KEYS TO AVOIDING UNNECESSARY DAMAGES AND POTENTIAL INJURIES.

(CBYC)” ticket notification. When a professional drain cleaner, plumber, or homeowner are attempting to open a clogged drain with a cutting tool, it may expose them to the hazardous risk of an electric shock or natural gas leak that could result in a fire or explosion if a cross bore exists.

The CBYC ticket notification allows that professional drain cleaner, plumber, or homeowner to call 811 if they suspect that a cross bore may exist. Dialing 811 will connect you to Pennsylvania’s One Call System and you should use the phrase “sewer clearing” or “drain cleaning” and the Customer Service Representative will take all the applicable information to create a CBYC ticket notification. This notification will be sent as an emergency notification to all of the local underground utilities to respond immediately.

The task force also had recommendations for prevention of cross bores in the future. Prevention begins with good planning and following all the applicable HDD, Common Ground Alliance (CGA) Best Practices, and Pennsylvania Underground Utility Protection Act of Pennsylvania (UULPPA):

1) Good planning starts with a good underground excavation design.

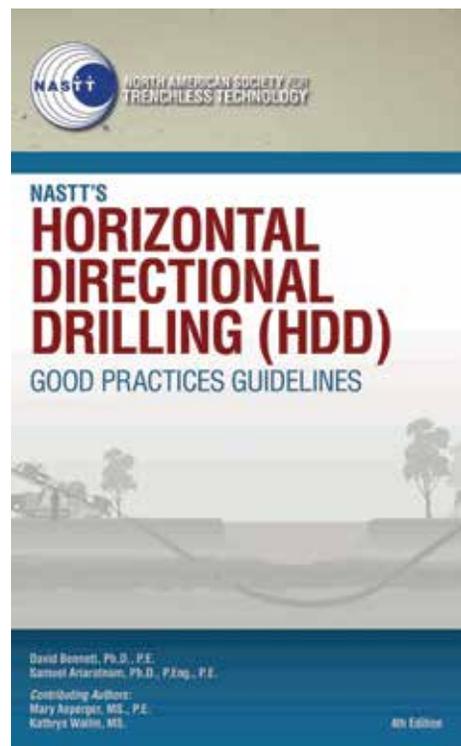
Designers in Pennsylvania should follow the Designer Effectiveness Guidelines found on the PA One Call Website. An effective Underground Project Design includes consideration of all existing underground facilities. The Designer should make a reasonable effort to prepare the construction drawings to avoid damage to and to minimize interference with a facility owner’s facilities in the construction area by maintaining the clearance as provided for in the applicable easement shown on the plan, or an 18-inch clearance from the edge of the facility

owner’s facility if no easement restriction exists.

2) **Using the appropriate level of Subsurface Utility Engineering (SUE) on large underground projects and designers following the applicable stages of a good design.** The first stage of the design process “knowing,” the second stage consists of “appropriately designing” and the final stage of effective design is “effectively communicating the location of all underground facilities provided by facility owners to the excavator and in association with excavation activities.”

3) The prevention process begins with Calling 811 in advance of your excavation.

State and federal laws obligate excavators to notify underground utility companies of their intent to excavate. The national 8-1-1 three-digit number is reserved for this use. Laws vary state-to-state, but in



NASTT HDD Good Practices Guidelines. Following Best Practices is critical

Pennsylvania excavator must call 811 three days in advance of the start of excavation work.

4) Following HDD Good Practices is critical. The operator must identify every facility near or across the proposed bore path. With the work site marked, every utility and service lateral must be identified and accounted for. If the HDD bore does not follow an exact planned path, then it is critical to know what's below, above, around and across the proposed bore path in the event the cutter head deviates from plan.

5) Expose every facility near or across the proposed bore path. Vacuum excavation and hand digging (potholing) are used to expose every facility that may cross or is near the proposed HDD bore path. Without exposing the facility, the operator will not be able to visually confirm that the new installed facility does not compromise and existing facility in the ground. Some facility owners may insist on having a representative onsite during the planning and excavation, to ensure their facilities are not damaged and that backfilling occurs according to their specifications.

6) Adjust the plan as necessary. The path or depth may need to be adjusted based on the location and depth of existing facilities within the planned alignment. Some facility owners may have clearance minimums between their facility and anything installed in the right of way near

their facilities. When in doubt, a telephone call or face-to-face meeting with the facility owner is prudent.

7) Use a spotter. When the actual excavation takes place, a spotter should be used when the cutting head is anywhere near an existing facility. Visually check the drill head as it passes through potholes, entrances and exit pits. The spotter should be empowered to halt the drilling operations at any time.

8) Inspect existing underground facilities. After drilling is complete and the new facility is installed, inspect the existing facilities before backfilling. If any facilities have been damaged (such as a nick, or a hole, or a crack, or a cross bore), the appropriate facility owner must be contacted for inspection and repair before backfilling is completed.

Following all these HDD guidelines will prevent future cross bores during the construction phase of an underground project. But, what should folks do if they suspect that a cross bore may already exist? A cross bore that is found to be already existing is also known as a legacy cross bore.

Again, legacy cross bores are considered "ticking time bombs" due to the associated element of surprise for Contractors, Drain Cleaners and Plumbers while attempting to clear a clogged sewer.

Pennsylvania's Call Before You Clear" is an emergency One Call ticket type developed by Pa One Call. The ticket

is voluntary and is use to alert facility owners of a potential cross bore. In response to this emergency ticket, Pennsylvania facility owners treat this ticket as an emergency situation and they respond accordingly to support a resolution. That resolution would include locating and marking their facilities to determine if their lines intersect with the sewer lines. Once the locate of facilities is completed, if the remedy requires excavation to determine if a cross bore exist, that excavation can be safely done without the need of a second one call ticket.

In summary, Pennsylvania underground stakeholders recognize that to avoid cross bore situations from happening in the future, all stakeholders, i.e. project owners, designers, facility owners, and excavators must follow all Designer Effectiveness Guidelines, HDD Good Practices, Common Ground Alliance (CGA) Best Practices, and Pennsylvania Underground Utility Protection Act of Pennsylvania (UULPPA).

Unfortunately, these guidelines were not followed in the past and legacy cross bores will continue to be problematic going forward. However, the Pennsylvania underground stakeholder community and PA One Call recognize the gravity of the issue and are working together to ensure homeowners, plumbers, and excavators are educated on the potential dangers that may exist. This education and having a robust process in place will give potential excavators the ability to alert anyone of a potential cross bore. Education and robust process are the keys to avoiding unnecessary damages or potential injuries from legacy cross bores. †

ABOUT THE AUTHOR:



Norm Parrish is the Manager of Education for Pennsylvania 811. Norm has been with Pennsylvania 811 for 7 years. Prior working for Pennsylvania 811, he spent 31 years at

Verizon in various management positions, he also served on Pennsylvania 811 Board of Directors and Executive Board for 9 years.

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Some excavators make judgement calls on the jobsite



- 42%** Working on an expired ticket
- 52%** Verifying the location of marked facilities
- 49%** Working when marks are no longer visible

Many factors influence decisions made on the jobsite, but safety should come first.



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What motivates behavior change among excavators?



- Fear of physical harm to self or others (77%)
- Financial reasons (71%)
- OSHA citation (69%)

Reinforce these risks of not following damage prevention Best Practices in excavator outreach.



Every job, every time.



Don't leave 811 out of your excavator education.

Reasons excavators don't always request locates prior to digging:

- Project was in an area that didn't require marking (30%)
- Already aware of location of buried utilities (29%)
- Not digging deep enough (23%)
- Lines run overhead (23%)



Every job, every time.

Make your **Mark** on Safety!

Call **811** before you dig.

AN OVERVIEW OF HDPE ELECTROFUSION PIPE JOINTS: PIPE SURFACE PREPARATION

By: Camille 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 almost 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.

Heat fusion can be used to join sections of HDPE pipe, including high-performing

PIPE PREPARATION IS AMONG THE MOST IMPORTANT ASPECTS OF MAKING A SOUND ELECTROFUSION JOINT

PE4710 pipe, while electrofusion is used to add couplings, tapping tees, branch saddles and other fittings. Proven to be an extremely reliable joining system, an electrofusion joint is heated internally, either by a conductor at the interface of the joint or by a conductive polymer. Heat is created as an electric current is applied

to the conductive material in the fitting.

All heat fusion joining methods require that there is no water flowing or standing in the pipe that can reach the fusion surfaces. De-watering of the site may be required to prevent ground water from reaching the fusion and contaminating the surfaces to be joined.



TIP:

Some practical temporary methods for stemming water flow and avoid the need to disinfect the line, are the use of organic absorbent materials, such as bread, which can later be flushed from the system at downstream hydrants.



Typical Electrofusion Joint



Electrofusion has proven to be an extremely reliable joining system

TIP:

Tip: Dry ice placed in the pipe upstream of the fusion location will temporarily freeze small amounts of flowing water until the fusion process can be completed. In smaller diameter pipes inflated latex balloons also provide good temporary stoppage of trickling water. The balloon will burst during pressure testing and can be flushed from the system at a downstream outlet.

In repair or cut-in situations, flowing water in the pipe may be present due to leakage of valves. Flowing water in contact with the fusion surfaces during the assembly or fusion cycle must be avoided as it can cause voids as the moisture turns into expanding steam during the fusion process. PE squeeze-off tools can be used to control the flow of water in cases where a valve is not present or will not shut off completely - refer to ASTM F1041.

Electrofusion fittings can be installed in ambient temperatures as recommended by the manufacturer. A typical qualified temperature range for installation is 14°F minimum to 113°F maximum. Some manufacturers have lower and/or higher temperature limits and will state their qualified range in the technical specifications. Contact the fitting manufacturer to verify.

Improper pipe preparation is overwhelmingly the leading cause of unsuccessful electrofusion joint attempts because the installer may not completely understand the goal of pipe scraping,

which is to remove a thin layer of the outer pipe surface to expose clean virgin material beneath.

Pipe surfaces exhibit surface oxidation from the extrusion process, transportation, and outdoor exposure. Surface oxidation is a normal chemical reaction that results in a physical change to the molecular structure of the polymer chains on the pipe surface. Oxidation acts as a physical barrier and therefore those surfaces cannot be heat fused. Simply roughing the pipe surface is not sufficient. In order to achieve fusion, this layer must be removed. Even new pipe must be properly scraped before a fusion will be successful.

The outer oxidation layer on a pipe surface is very thin. It does not increase in depth of more than a few thousandths

of an inch even over long periods of exposure, so regardless of the amount of time the pipe has been stored before scraping, the scraping depth requirement is the same. An adequate minimum amount of material that must be removed is just seven one-thousandths of an inch (.007 inches) -- approximately the same thickness as two sheets of ordinary paper.

Sandpaper, emory cloth, or other abrasives should *never* be used to prepare a pipe surface for electrofusion. Abrasives don't adequately remove material, and can redistribute contaminants on the surfaces, and the grit left behind forms another barrier that will also prevent proper fusion.

The only tools used for surface preparation are those that are specifically designed for electrofusion scraping and peeling, which can peel the pipe surface to a controlled depth. Tools with serrated blades are also available. These tools physically scrape the pipe surface by pulling the serrated blade across the pipe in a perpendicular position. Serrated blades sometimes mask the pipe surface by leaving behind score marks that make it difficult to visually tell if all of the original surface material has been removed.

Types of scrapers that are *not* recommended are "hand scrapers" such as wood rasps and metal files. Using these will result in inconsistent surface preparation and difficulty in mastering skills required for uniform surface preparation.

No matter what type of tool is used, it is strongly recommended that witness marks be made on the pipe surface prior to scraping with a permanent marker, such as a Sharpie® marker or another brand that dries fast and contains no oils. (Some markers that dry slowly or contain oils that can spread onto the fusion surface and should not be used.) Any marking that remains after scraping is evidence that areas were missed or that more scraping is required.

TIP:

A visual indicator can be very helpful to ensure that the entire surface has been scraped, and that an adequate amount has been removed. Marking the pipe surface with a permanent marker is a simple and effective way.

Avoid all possible recontamination of the prepared surface. This includes handling or even touching the scraped pipe surface or the inside of the coupling as body oils and other contaminants can affect fusion joint performance. If the surfaces become contaminated, clean thoroughly with a clean, lint-free towel and a minimum 96 percent concentration of isopropyl alcohol and allow to dry before assembling. Do not use alcohol with any additives other than water.

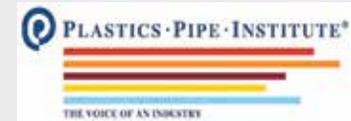
Gouges that are deeper than the scrape depth may also require extra attention when scraping the pipe to ensure that any debris or contaminants embedded in the gouges are removed; use of a hand tool to scrape the gouge may be necessary. If the gouge exceeds 10 percent of the pipe wall thickness, that pipe section should be cut out and replaced to maintain the maximum pressure rating of the pipe.

Two guides detailing the steps for electrofusing joints and couplings for HDPE

pipelines are available for free. Published by the Municipal Advisory Board - MAB - , the two documents are: *MAB Generic Electrofusion Procedure for Field Joining of 12 Inch and Small Polyethylene (PE) Pipe (MAB-01-2017)* and *MAB Generic Electrofusion Procedure for Field Joining of 14 inch to 30 Inch Polyethylene (PE) Pipe (MAB-02-2017)*. MAB serves as an independent, non-commercial adviser to the Municipal & Industrial Division of the Plastics Pipe Institute, Inc. (PPI). The mission of the MAB is to improve the design, installation, and operation of municipal HDPE water piping systems through the creation of partnerships among utilities, researchers, designers, contractors, and the HDPE industry.

The direct link to download MAB-01-2017 is: <https://plasticpipe.org/pdf/mab-generic-ef-110515.pdf> while the link for MAB-02-2017 is: <https://plasticpipe.org/pdf/mab-02-generic-electrofusion.pdf>

ABOUT THE AUTHOR:



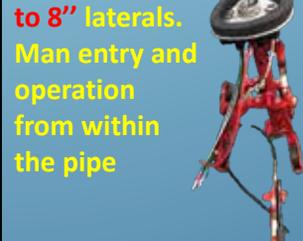
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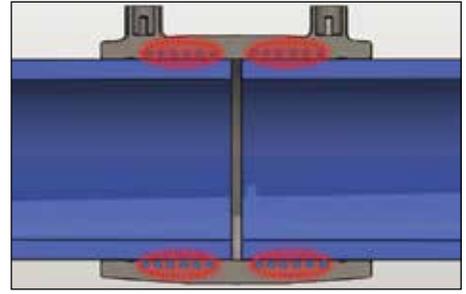
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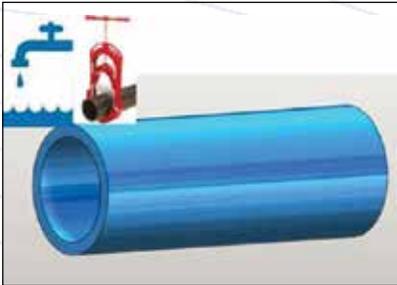
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HDPE ELECTROFUSION PIPE SURFACE PREPARATION

COUPLING ELECTROFUSION



Typical Electrofusion Joint



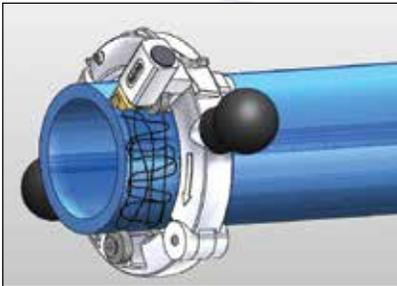
Clean pipe with clean water and cut squarely as much as possible +/- 3 degrees



Measure and mark the stub ends on both pipe ends



Mark the pipe surface to be scraped with a crisscross pattern



Mount the scraper over the area to be scraped

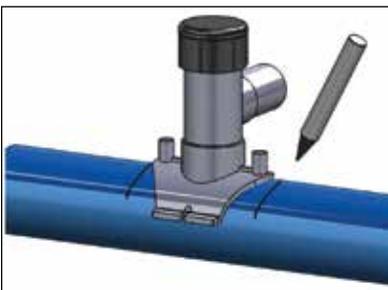


Scrape or peel the pipe to remove the surface layer and expose clean virgin pipe beneath

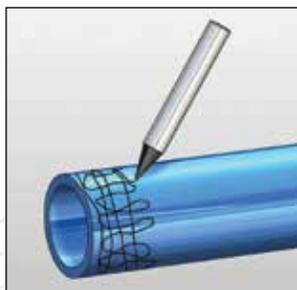


Inspect the scraped pipe surface thoroughly to ensure that all marks are removed and that only virgin pipe surface is exposed

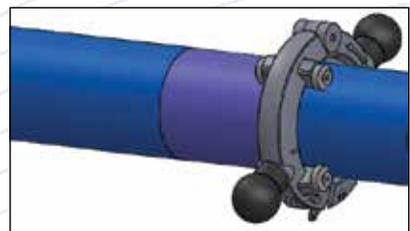
SADDLE ELECTROFUSION



Mark position of saddle



Mark pipe surface in area to be scraped



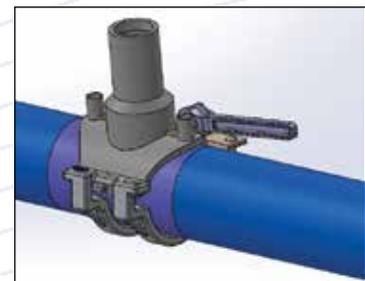
Scrape or peel the pipe to remove the surface layer and expose clean virgin pipe beneath and inspect thoroughly to ensure that all marks have been removed, and that only virgin pipe surface is exposed



Clean surfaces with Isopropyl alcohol if necessary, avoid touching cleaned surfaces and clamp saddle to the scraped pipe using only the clamp provided or recommended by the fitting manufacturer



Inspect the scraped pipe surface



Clamp saddle to the scraped pipe using only the clamp provided or recommended by the fitting manufacturer

TIME TO GIVE BACK!

Simple. Powerful. Affordable



By: Mike Young, Underground Magnetics



In the late 1980s, there were only a handful of individuals and manufacturers producing horizontal directional drilling equipment for the utility construction industry. One of those early companies was Straightline Manufacturing and co-owner Mike Young. Throughout the next decade, there would be several larger manufacturers throw their hat in the ring like Charles Machine and Vermeer Mfg. These companies are today the dominant players in the HDD drill rig industry. With the advancement of drill rigs through the last 30 years there have also been several companies that produced the electronic guidance systems which are vitally important to the success of the HDD industry. Without these HDD locators, there would be no directional in Horizontal Directional Drilling.

For the last 25 years, there has for the most part been only two companies supplying HDD locators to the industry. These locators have become very advanced, giving contractors the ability to log their bores and within minutes of finishing the project, send that information directly to the home office. All these advancements now come with a big price tag. Early locators cost less than

\$10,000 but today many of the locators sell for close to \$30,000. With only two manufacturers in the US offering these systems, there has been little pressure to offer customers a less expensive product.

That however has changed in the last five years says Mike Young President of Underground Magnetics. Mike, after 30 years in the HDD industry, owning and working for many of the well-known drill rig manufacturers and HDD guidance system producers, is still helping innovate new products for the HDD industry today. Underground Magnetics in 2019 introduced the new Mag 8 locating system which is simple to use, powerful around active interference and affordable. That combination is long overdue says Mike Young. Underground Magnetics with a core group of three who combined, have over 70 years' experience in servicing, engineering and producing HDD locating equipment, is shocking the industry says Mr. Young.

The new Mag 8 locating system was developed from the ground up to be simple, powerful and affordable. Most of the contractors Mike spoke with during the development of the Mag 8, felt they had no choice but to purchase more than they needed because there weren't any

other options. UM's philosophy was to offer a commonsense locator that was developed to be easy to use but powerful. Many of the first users of the Mag 8 expected a lesser locator because the price was so reasonable. The new Mag 8 has more than exceeded their expectations however.

The system includes a 10 frequency transmitter that has a real depth and data capability of over 200 feet. The "Drill to" function allowing contractors to set the locator out front and drill to it, has a distance of up to 100 feet. The simple part comes in once you start drilling, says Mike Young. This is the simple powerful Mag 8 and Mike believes it's about time to give back to the Industry. †

ABOUT THE AUTHOR:



Mike Young, President, Underground Magnetics Inc. has a thirty year history in the HDD industry, owning and working for many of the well-known drill rig

manufacturers and HDD guidance system producers. Mike is still helping innovate new products for the HDD industry today.



Underground Magnetics

**SIMPLE
POWERFUL
AFFORDABLE**



**MAG 8 HDD LOCATOR
PERFORMING WHERE OTHERS CAN'T**

- Sonde Range: 130 feet to 360 feet
- Battery Life: 30 - 120 Hours
- Frequency: 12 Frequencies 4kHz ~ 41kHz
- Single Ball Technology

“ With this system in place, the bore shot was completed with no issues on the first attempt. Our crews at Eris Underground are believers in the Underground Magnetics system and recommend it wholeheartedly. ”

**Chris Allen, General Manager
Eris Underground LLC**



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-PRESS RELEASE-

BAMI-I

Buried Asset Management Institute - International

Purdue University's CEM EPCoM Partners with BAMI-I, WTC-Indy & IIS to develop a 1-day track in Dubai on developing underground space and asset management.

International Conference on Building Materials and Construction Technologies (BMCT) will be held on April 06-08, 2021 in Dubai. The theme of the conference is "Explore the latest innovations in Building Materials and Civil Engineering". BMCT Dubai 2021 primary objective is to exchange ideas and experiences directly with the speakers and also provide various networking opportunities. The Civil Engineering conference is going to provide a great opportunity for the people who are interested to be as an entrepreneur in the field of construction. BMCT Dubai 2021 will create a premier interdisciplinary platform for all Civil Engineering professionals and students to give presentations and discuss the most recent innovations, trends, and concerns, as well as practical challenges, encountered and solutions adopted in the field of Civil Engineering.

World Trade Center Indianapolis (WTC-Indy), Construction Engineering and Management Purdue, Buried Asset Management Institute – International (BAMI-I), and International Infrastructure Solutions (IIS) will be coordinating a 1-day track on the Development of Underground Space & Asset Management in conjunction with the BMCT Conference in Dubai.

For more information please contact Dr. Tom Iseley, diseley@purdue.edu, (404) 386-5667.

Construction almost always begins without a 100 percent complete design. Sometimes this is because of policy decisions by a project owner regarding percentages of planning versus design versus construction fees. Sometimes this is because of site-specific variables that are unknown or uncertain to the designer. Sometimes it is a project timetable issue. Regardless of the reasons, without

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Building Materials and Construction Technologies

Supportive Organizations

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Buried Asset Management Institute - International

ISI
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Dubai, UAE

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Construction Engineering and Management

More details @ <https://bmctdubai.org/>

BMCT Dubai 2021

a complete design, safety factors that could be addressed in design may not be. Additionally, engineers may not wish to take on construction safety issues in their design especially if they have no responsibility for managing the construction.

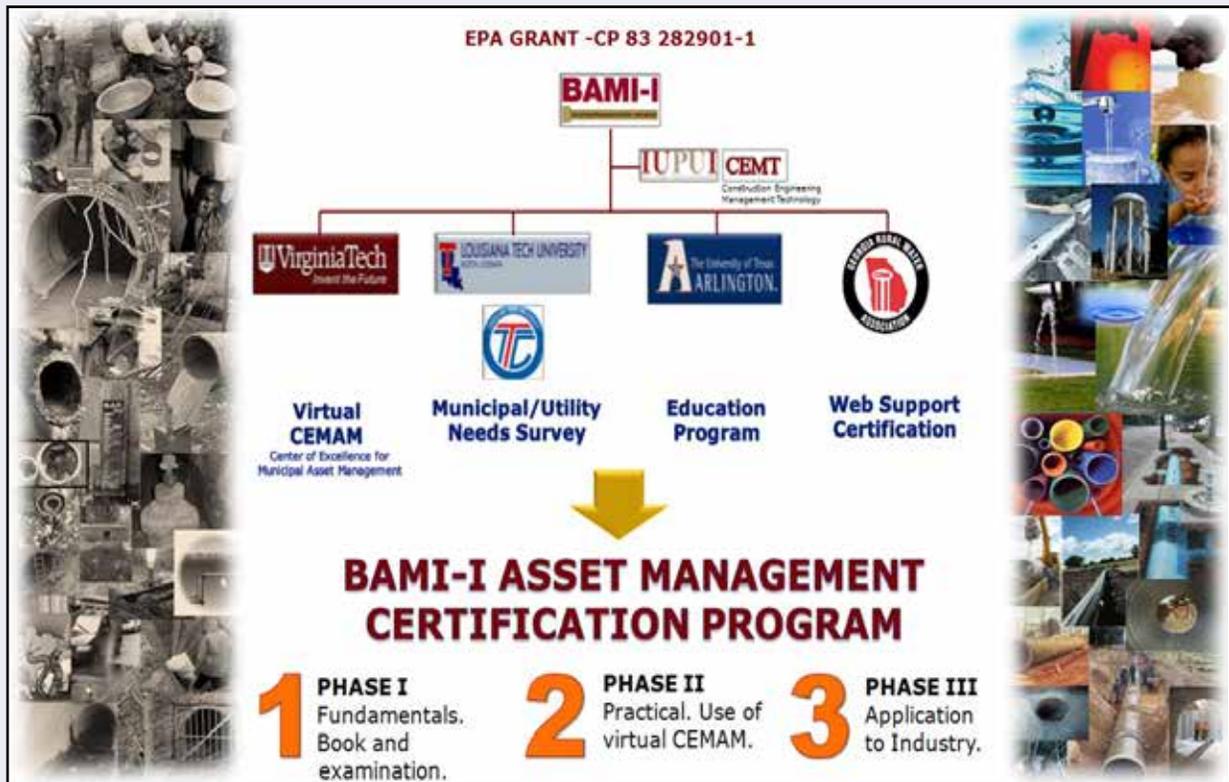
One aspect of construction safety that traditionally straddles the design-construction world is that of existing utilities. Although we have mandated One-Call (811) damage prevention statutes that put the onus of working safely around existing utilities on the constructor and utility owner, engineers can, and should, play a larger role in incorporating knowledge and investigation of the existing project conditions, including utilities, into their design. After all, the engineers' mandate is to protect the public health, safety, and welfare. All three of these items are impacted by existing utilities and should not be expressly disclaimed without good reason.

On Nov 2, 2020 the EPCoM (Engineering, Procurement, Construction, Operations and Maintenance) Consortium at Purdue conducted the first webinar on the "Safety: Intersection of the Design & Construction". More than 200 individuals attended this webinar. EPCoM provides

a resource for advancing project life-cycle management through utilizing an industry/university consortium. This Safety Webinar looked at utilities throughout the life-cycle of a project. It looked at traditional actions by the various stakeholders (Utility Owners, Project Owners, Engineers, Surveyors, and Contractors) in providing safety for existing utilities, and how that safety can be enhanced through engagement of risk management principles during the planning, design, and construction phases of a project. This was the 1st of a Purdue Safety Webinar (PSW) series. EPCoM plans to offer one every other month.

Due to the holidays coming up, the next one will be on January 11, 2021. The CEM (Construction Engineering & Management) was established in the College of Engineering at Purdue University over 40 years ago to prepare leaders in construction engineering to produce successful projects. This means safety must be top priority. In addition, it is important to continuously learn about emerging technical and management solutions; therefore, the CEM program plans to produce a PTW (Purdue Technical Webinar) series similar to the PSW series. The first PTW is planned for February 8, 2021.

**For more information please contact Dr. Tom Iseley
diseley@purdue.edu | (404) 386-5667**



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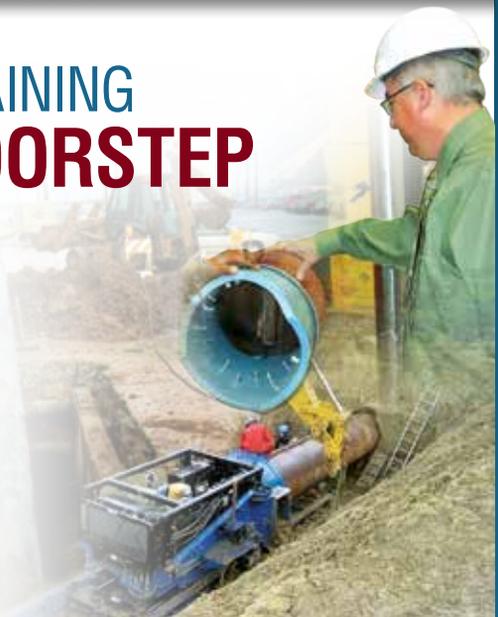
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The background of the advertisement is a photograph showing the silhouettes of three workers wearing hard hats, working inside a large, circular pipe tunnel. The lighting is dramatic, with bright light coming from the end of the tunnel, creating a strong contrast and highlighting the workers' forms. To the right of the main text, there are three inset images of different pipe relining products: a grey corrugated pipe, a black smooth pipe, and a white smooth pipe.

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