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The Official Magazine of the North American Society for Trenchless Technology

2021 NO-DIG SHOW

Orlando, FL

SUMMER 2021
Volume 11 • Issue 2

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TRENCHLESS NORTH AMERICA

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SUMMER 2021 – VOLUME 11, ISSUE No. 2

SUN SHINES AGAIN ON THE NASTT 2021 NO-DIG SHOW

Returning to sunny Orlando for the first time since 2014, the NASTT 2021 No-Dig Show had six tracks of 160 peer-reviewed presentations, over 120 trade exhibits, and excellent networking opportunities. One of the premiere underground construction conferences in North America.

16

FEATURES

DEPARTMENTS

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PE4710 Pipe: The Best Solution for Water Systems

WELCOME BACK
to IN-PERSON TRENCHLESS NETWORKING!

A single but important word was added to the NASTT Vision statement recently as part of our ongoing strategic plan review – networking: *"To be the premier resource for knowledge, networking, education, and training in trenchless technology."*

As we have relied on and adapted to virtual meetings, digital media and social distancing those human connections and interactions have proven ever more valuable. The huge undertaking to put on the NASTT 2021 No-Dig Show in Orlando provided that opportunity to network and demonstrated how important our industry relationships are.

Over 1,300 people showed their agreement and support by registering for the NASTT No-Dig Show in Orlando in a different schedule to accommodate restrictions. Over 150 technical presentations were delivered with more than 100 exhibitors and sponsors. Each fist pump "Hello", those first words face-to-face and catch up proved that value in networking and felt an endorsement of an industry ready to improve and build the essential infrastructure North America is investing in.

Each fist pump "Hello", those first words face-to-face proved that value in networking...

We are looking forward to rolling out even more networking initiatives including increased visibility for your company or organization through this membership magazine, our website and our on-line community. Being actively involved in your Regional or Student Chapter allows you to work with many of our members from other parts of the industry and broadens your knowledge. We also invite you to become involved with our national sub-committees and have an input in shaping your Society.

This issue of Trenchless North America reviews many of the activities that our members and volunteers are involved with, projects and industry updates. Enjoy your read!

Thank you for your support,

Matthew Izzard

Matthew Izzard, Executive Director
North American Society for Trenchless Technology (NASTT)
mizzard@nastt.org

> *"To be the premier resource for knowledge, networking, education, and training in trenchless technology."*
>
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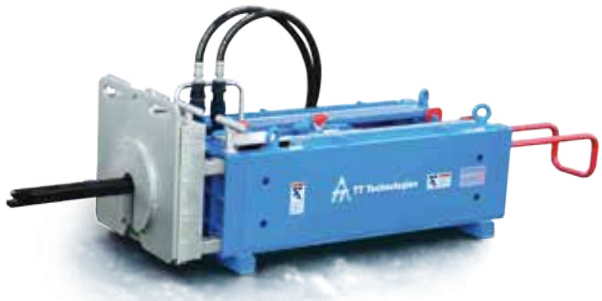

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INNOVATION AND RECOVERY
in the Trenchless Industry

Infrastructure is Essential! The trenchless industry is strong and resilient and here to stay!

The NASTT 2021 No-Dig Show held in Orlando this past March was an extremely successful event as we lead the industry in returning to in-person, safe networking, and educational events. Take a look throughout this issue for a recap and overview of the 2021 show and make sure to mark your calendars so you can join us in Minneapolis in April 2022 for another outstanding show.

With over 1,300 attendees after an unprecedented year in 2020, it was a busy and fun week for all, including the university students from our Student Chapters and Municipal Scholarship recipients from all across North America. Thank you to our Technical Program Committee Members and the 2021 No-Dig Show Chair, Dr. John Matthews of the Trenchless Technology Center and Vice Chair, John Milligan of Vermeer for all your time and efforts. Our volunteers are the backbone of this society and we are grateful and appreciative of everyone's contributions to making NASTT what it is today.

On Monday evening we had the opportunity to socialize and network with our peers during the 20th Annual Education Fund Auction. This event is always a hit and we have a great time while we raise money for our educational initiatives. To all the volunteers, bidders, donors and sponsors who helped us raise over $60,000 in one night: Thank you! Since 2002, we've raised over $1.1 million dollars. These are the funds we use to sponsor our university students, fund our Municipal Scholarship Program, publish industry training guidelines and more! We couldn't do any of this without our generous supporters.

The NASTT 2021 No-Dig Show was a wonderful opportunity to get back to 'normal' and reconnect with our trenchless colleagues that are so important to our industry and are just a great group of folks! We are already in the planning stages for next year in Minneapolis. Minneapolis is a trenchless hub in the Midwest and we are excited for our first time holding the NASTT No-Dig Show in this location.

We are also excited that the Canadian Regional Chapters have joined forces to present the second annual No-Dig North Show, coming to Vancouver this November. The show will consist of two days of technical paper presentations and industry exhibits, along with awards presentations, pre-conference training courses and plenty of networking opportunities. Join us at the Vancouver Convention Centre, November 8-10, 2021.

It is an exciting time in the trenchless industry and we are happy to help lead the way in training, education and research. There may be uncertainty in our world, **but one thing we know for sure, Infrastructure is Essential**. The trenchless industry is strong and resilient and here to stay!

Alan Goodman

Chair
North American Society for Trenchless Technology (NASTT)


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Q&A with Todd Kilduff PE

Todd Kilduff PE is founder and President of Kilduff Underground Engineering Inc. (KUE), a design and construction management firm specializing in tunneling, underground project design, and construction management services across North America. Based in Denver CO, KUE has recently opened an office in Red Bank NJ to better serve the growing Mid Atlantic trenchless market. Todd served on the NASTT No-Dig Program Committee in 2020 and was also a Technical Track Session Leader.

KILDUFF UNDERGROUND ENGINEERING, INC.

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

I had always been interested in buildings and technical drawing. I started my college career at The Ohio State University in Architecture but it was a bit too liberal for me. After transferring into Civil Engineering I felt much more comfortable. I had my first work experience through a summer internship with a geotechnical design firm in Ohio. I enjoyed it and continued to work part-time until I graduated. After graduating I wanted to work in a big city and found I had some pretty good experience on my resume already and went with that. I never thought that first summer internship would lead to what has now amassed into a 27-year career in underground design.

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

I already had some experience with microtunneling early in my career but in 2001 while with Mueser Rutledge in New York City the firm was providing trenchless and geotechnical support to Hazen & Sawyer on a pretty substantial sewer project in Queens, NY. Because of environmental regulations and a desire to minimize impacts to pedestrians there was a strong push to utilize trenchless methods for several thousands of feet of the sewer system. On that project I was tasked with researching and reviewing almost every trenchless method available at the time and to utilize the most appropriate methods for the construction. The project ultimately did result in a substantial microtunneling portion of over 2,200 linear feet and more than 4,500 linear feet of directional drilling. My understanding of these technologies was further cemented when after leaving Mueser Rutledge I went to work for the General Contractor, EE Cruz, who built the project. Designing and then constructing with trenchless technologies was a unique opportunity that has given me a strong perspective on utilizing these methods.

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

In 1998 I worked for Malcolm Pirnie in White Plains, NY (now Arcadis). We had a project in Birmingham, AL that required rehabilitation of a high hazard dam including replacement of a low level outlet pipe through the dam. Our design team proposed a microtunnel through the embankment with a wet recovery that would float the machine to the reservoir surface with air bags. I thought it was the coolest engineering solution I had ever heard of at the time. I was hooked on microtunneling after that and jointed NASTT during that process.

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?

Over the past 20 years, I have seen the industry advance

"Our college institutions need to provide more research relevant to trenchless design and to develop curriculums that offer courses more directly related to the design work currently being performed in the Trenchless Industry."

substantially with regards to new technologies and advancing existing ones. The industry is still relatively young and there is a lot of room for continued advancements. Our college institutions need to provide more research relevant to trenchless design and to develop curriculums that offer courses more directly related to the design work currently being performed in the Trenchless Industry. With the exception of a few institutions, most colleges still offer very little design experience directly related to the trenchless industry. Most students come from a geotechnical background and learn trenchless design directly on the job from their employers. As a business owner I would really like to see the students come out of these institutions ready to work. We spend a significant effort training our staff to provide trenchless design services.

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?

I don't think there is a problem attracting civil engineering students to the trenchless and tunneling industry. It's one of the coolest industries in the profession and I think a lot of young engineers when introduced to it like it. Attracting students to the civil engineering profession I think is a bit more challenging. I think there may be a lack of exposure to engineering professions in High School and reaching these students at that time is key to get them into STEM programs at the University level.

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

I think the water/wastewater design firms need to realize they may be stepping into an area that requires expertise. I have seen many projects make it to bid where there is clearly a lack of knowledge of the trenchless technology and its capabilities. If these projects are bid at all it really requires a lot of risk on the Contractors end to be able to clean up the designs and provide a buildable project. I think there are several sophisticated owners out there that understand this and do a good job getting the right people to the table but I also think there are many more smaller owners that don't. What small Owners need to realize is that getting a Trenchless professional involved in your project doesn't mean breaking the bank. There is an appropriate sized design effort no matter what size the project. Owners just need to reach out and get us involved.

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

I enjoy being able to look at a project and going through the conditions to apply the most appropriate technology. It's really cool how all these trenchless methods have a place but only one or maybe two at most are the most appropriate solution for the given ground conditions and project constraints. Identifying the challenges and applying the most appropriate solution is really satisfying. Seeing the technology in action is also fun.

Multi-Segmental Fiberglass Lining History and Future

Channeline Multi-Segmental 16-Foot Fiberglass Sewer Liner Installed in Detroit this Summer

By: Andy Sherwin

Logistics

Back in 1984, when Channeline was incorporated to start manufacturing Structural Fiberglass, non-circular sewer liners, the impetus was towards the aging Egg shaped sewers of the UK and Europe. They were extremely successful in this market and as the Brand grew both locally and internationally, it became apparent that the technology being specified for ever larger sewers and culverts.

The dilemma became, how do you ship large-diameter custom manufactured egg-shaped pipe liners overseas when they do not fit into a standard shipping container?

The Solution we found to this logistical problem was a Tapered Tongue and Groove Jointing system. This system offered a way to break the geometrically complex pipe liners down into multiple component segments, while still maintaining structural integrity and load capacity when finally installed.

Channeline patented this proprietary Tapered Tongue and Groove Jointing system back in the 1990s and found that they were not only able to ship for increasingly large projects, but as they were able to secure the smaller pipe segments onto pallets, they could reduce the overall shipping cost of the lining system.

In many cases with very large structures, it is desirable for the pipe panels to be manufactured in two or more longitudinal sections. The panels are then bonded onsite using a structural adhesive above ground and a bell and spigot radial gasket or sealant joint. Once the segments are assembled, the Channeline GRP Structural Lining System provides the same structural performance of a Channeline manufactured single piece pipe with a stand-alone service life of 100 years.

Things have come a long way since the 90s and the Tapered Tongue and Groove Jointing system now has benefits, not only in reducing shipping costs, but for rehabilitation projects that have difficult access such as lining through manhole or maintenance chambers, where the same structural liner can be installed using fully trenchless methods. The Channeline Multi-segmental system has now been tested and approved for use by The Water Research Centre in the UK as well as many Cities in North America such as The City of Los Angeles, The City of Cleveland, City of Detroit, City of Toronto, City of Hamilton and The Regional Municipality of York to name a few.

Proprietary system offered a way to break the geometrically complex pipe liners down into multiple component segments to dramatically reduce shipping costs, while still maintaining structural integrity and load capacity

Oakland-Macomb County, Detroit MI

A new milestone, and our most recent triumph, was the inclusion of the Multi-Segmental Liner in a Pilot Project for the North Interceptor, East Arm (NI-EA) PCI-4, Oakland-Macomb County in Detroit, which included the proposed use of 3 different lining system for a 17.5-foot diameter sewer pipe with a 16-foot ID Liner.

The NI-EA was constructed in six (6) contract sections over a period from 1969 until 1978. The NI-EA conveys sanitary and combined sewer flows from the Oakland and Macomb County communities serviced by the Oakland Macomb Interceptor Drain Drainage District (OMIDDD) north of the City of Detroit, with interconnections for the Conant – Mt. Elliott, Meldrum, and First-Hamilton Sewers that serve the north central portions of the City of Detroit. The interceptor has an approximate total length of 79,380 feet.

In April, 2015, NTH was engaged by DWSD to perform a confined space entry inspection of the portion of the NI-EA constructed under DWSD Contracts PCI-4, 18 and 19. The distress noted during the inspection of the sewer included loss of concrete liner thickness up to 6 inches in depth at locations along the crown of the sewer, exposed circumferential and horizontal reinforcing steel, scaling, and cracks. Based on the observed deterioration of the interceptor, recommendations were given to repair the first 1,500 feet of the NI-EA extending downstream from the NESPS.

In 2019, an NTH Engineering led team was engaged by OMIDDD to perform another confined space entry inspection of the portion of the NI-EA sections to provide an updated condition assessment of the existing interceptor. Using the NASSCO Pipeline Assessment Certification Program (PACP) inspection reports and photographs, NTH compared the 2019 observed conditions with historical inspection data presented in the January 8, 2016 NTH report. The overall condition of PCI-4 sewer reaches was considered fair to poor.

In June 2020, the Pilot Project was put out to bid for 1560 LF of the PCI-4 Interceptor and three technologies were specified as mandatory rehabilitation methods leaving the contractor to decide which of the three would manufacture the majority of the lining system. Low-bid contractor Marra Services of Cleveland Ohio chose Channeline to supply 1280LF of multi-segmental fiberglass liner with the proprietary Tapered Tongue and Groove Jointing system. Two remaining manufacturers were given 180LF each.

The liner is a 4 piece multi-segmental lining with a 16ft internal diameter. Having been designed using AWWA M45 Direct Bury calculations, the liner has a 3-inch wall thickness. Contractor

"As far as we are aware, this the largest Fiberglass sewer liner ever built to date."

Marra Services were flown over to Dubai to visit the factory and work with the manufacturing team to fine tune the assembly and installation process, and spent the week getting to know the Channeline Team. The liner is currently in production and first containers are due to arrive in Detroit in mid-August 2021. As far as we are aware, this the largest Fiberglass sewer liner ever built to date.

Andy Sherwin is the Technical Sales Director, North & South America, for Channeline International, a manufacturer of geometrically complex GRP Structural Lining Systems based in Dubai UAE.

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View nomination details at nastt.org/no-dig-show/hall-of-fame

Completed applications along with three letters of recommendation and biographical information on the nominee should be submitted online and must be received no later than August 31, 2021.

In 2010, the NASTT Board of Directors voted to create a Hall of Fame in order to ensure that the Society's most outstanding and praiseworthy members received due recognition. The intent of NASTT's Hall of Fame is to preserve the outstanding accomplishments of these exceptional individuals and to honor their contributions to the advancement of both the trenchless industry and the Society. Members may be elected from all NASTT membership categories: Manufacturers and Suppliers; Engineers and Consultants; Municipal and Utility Employees; Contractors; and Academia.

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NO-DIG SHOW
2021

Sun Shines Again on the NASTT No-Dig Show!

Trenchless Industry Gathering Returns To Sunny Orlando With A Pandemic-Smashing Success!

The world's largest Trenchless Technology Show returned to sunny Orlando from March 28 – 31 looking to recapture momentum after a year's hiatus due to the Covid-19 pandemic. As one of the first premier in-person industry events held as the pandemic releases its chokehold on civic life, the NASTT 2021 No-Dig Show was a triumphant return to business-as-nearly-usual, demonstrating once again the foresight, resourcefulness ground-breaking and innovative nature of the trenchless industry, and the people who pursue it with a passion.

As a premier educational opportunity for forward-looking underground infrastructure professionals, the NASTT No-Dig Show can be counted on to provide countless environmentally friendly trenchless solutions and cost-saving opportunities that municipalities and utilities can put to use. With six tracks of 160 peer-reviewed, presentations, over 120 informative trade exhibits and multiple networking opportunities, the NASTT 2021 No-Dig Show again fulfilled its promise as one of the premiere must-attend underground construction conferences in North America.

The NASTT No-Dig Show demonstrated once again that trenchless technology offers both innovative rehabilitation and technically advanced replacement options for communities and utilities looking for cost effective, non-disruptive and environmentally-sound infrastructure solutions.

As preparations get underway for the 2022 No-Dig Show in Minneapolis April 10-14, 2022, NASTT looks forward to continuing steady growth in use of trenchless technology as the premier resource for knowledge, networking, education, and training in trenchless technology all across North America. Charting the course for the bright and sunny future right ahead!

Warm Welcomes at the NASTT 2021 No-Dig Show in Orlando!

Over 1300 delegates were eager to attend one of the first Covid-safe in-person events held since the beginning of the pandemic

After postponing the 2020 No-Dig Show in Denver, NASTT returned to Sunny Orlando for 2021. Cutting the ribbon to launch 2021 No-Dig is NASTT Chair, Alan Goodman (second from left), with NASTT Vice Chair Matthew Wallin (left), NASTT Executive Director Matthew Izzard (second from right) and Past Chair Craig Vandaelle (right)

Daily temperature checks were an entry requirement along with submitting a health assessment in the conference app.

Covid-safe Registration Desk for the hard-working staff

UMass Lowell NASTT Student Chapter members came all the way from the northeast to attend and assist with the NASTT 2021 No-Dig Show, from left to right: Joseph Pietropaolo, Jorge Calmo, Liam Henderson, Violet Smith

Morty traveled in style to get to the 2021 No-Dig Show. Safety always comes first for this sewer rat!

MARCH 28-31 | ORLANDO, FL
NO-DIG SHOW
2021

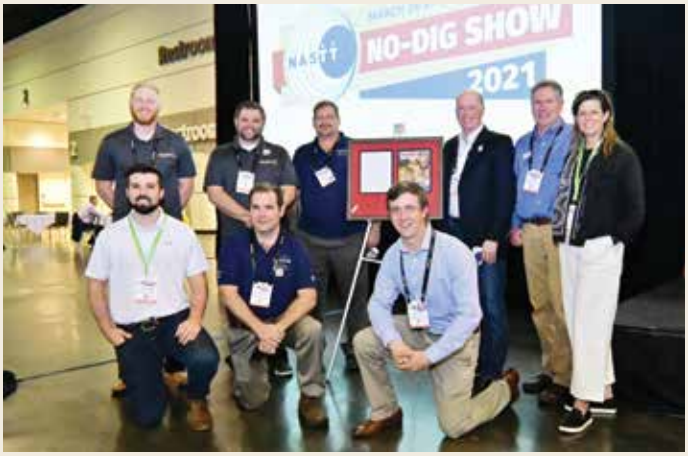
Awards – Opening Lunch

NASTT Chair Alan Goodman welcomed delegates to the Opening Lunch held in the Exhibit Hall

Michels Corporation team members celebrate unprecedented achievement in receiving the 2021 Trenchless Technology Project of the Year Awards for both New Installations and Rehabilitation

Winner of the $5,000 Vermeer prize at the 2021 No-Dig Show, Ms Wei Liao is a Visiting Scholar, Division of Construction Engineering and Management, Purdue University. She presented a paper at the show on "Microtunneling with PVC Pipe."

Lester Bradshaw, President, Bradshaw Construction Corp., (right) receives 2021 Trenchless Technology Person of the Year Award from Bernie Kryzs, Publisher, Trenchless Technology magazine (left)



Members of the Bradshaw Construction team celebrate 2021 Trenchless Technology Person of the Year Award with President Lester Bradshaw

Joe Lane of Aegion and past NASTT Board Member welcomes the winners of the Municipal & Public Utility Scholarship.

Board Chair Alan Goodman salutes incoming NASTT Board members Stephanie Nix-Thomas, P.E., Andrew Sparks, and Jim Williams

Auction Scoreboard displays kept up the excitement for the "Spring Break" Virtual Educational Fund Auction held in conjunction with the NASTT No-Dig Show

MARCH 28-31 | ORLANDO, FL
NO-DIG SHOW
2021

Technical Sessions

The NASTT 2021 No-Dig Show featured over 160 peer-reviewed Technical Papers in six separate tracks encompassing the entire range of trenchless technology topics

The Laterals Forum panel consisted of Jeff Maier of Garver, Lisa Arroyo of Arroyo Trenchless and Jacob Trapani of BLD Services. All No-Dig Show forums encourage audience questions and participation. Great conversations are held during the forums!

Presenters and attendees were required to wear masks during all events throughout the week. Technical Session rooms were set up to allow for 25% capacity and significant social distancing

SPRING BREAK EDUCATIONAL FUND AUCTION

IN CONJUNCTION WITH THE NASTT NO-DIG SHOW

NASTT NO-DIG SHOW

Thank you from NASTT

NASTT's Educational Fund Auction was established in 2002. 100 percent of the proceeds raised for the fund are used to support trenchless training, technical course manuals, university student attendance at the No-Dig Show, and student and municipal scholarships. This fund would not be possible without the generous auction donations made by the following organizations:

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The No-Dig Show Technical Program offers insight from and access to industry thought leaders from all over North America and the globe.

Technical sessions were held in extra-large rooms to ensure safety and social distancing

NASTT 2021 NO-DIG SHOW NETWORKING

World's largest Trenchless Technology conference is recognized as the place where innovative people and technologies get together

MARCH 28-31 | ORLANDO, FL
NO-DIG SHOW 2021

Tradeshow Networking

Hands-on up-close equipment demonstrations are an ever popular feature

Test-driving the latest in condition assessment technology

Always a popular feature, the Newbie Lounge was back for another year, although socially-distanced!

A great opportunity to catch up with old friends and colleagues, especially important this year

No buffet lineup at this Welcome Lunch! All meals were pre-packaged and individually served as part of this Covid-safe event

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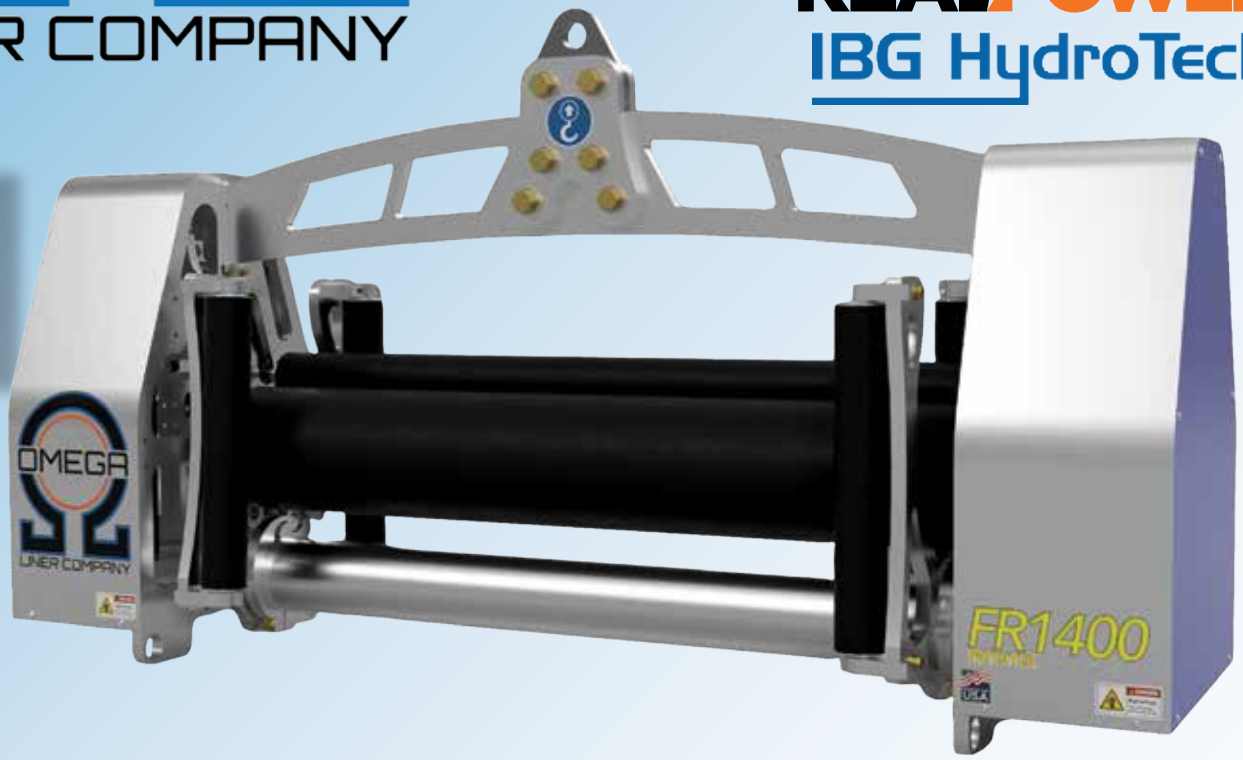

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MARCH 28-31 | ORLANDO, FL
NO-DIG SHOW
2021

Speakers – Leadership

NASTT Board Members, Staff and Conference Delegates welcomed the opportunity to network in person in Orlando

Technical Session are at the heart of the No-Dig Show. We value our industry expert speakers!

Michelle Hill, NASTT Program Director (left) and Tiffanie Mendez, NASTT Board Secretary enjoyed a moment to catch up as the show got underway

MARCH 28-31 | ORLANDO, FL
NO-DIG SHOW
2021

Celebration Reception

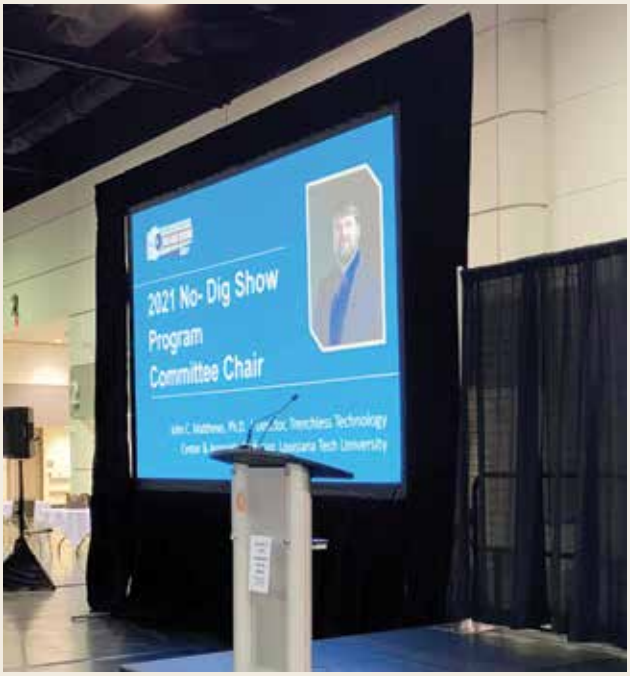
The NASTT No-Dig Show Celebration Reception was held outside on a breezy spring evening in Orlando

NASTT Executive Director, Matthew Izzard (right) and Fletcher Lindberg, Conference Sponsor AOC (left) thank attendees at the Celebration Reception

John C. Matthews, Ph.D., Director, Trenchless Technology Center & Associate Professor, Louisiana Tech University is awarded the NASTT Chair Award for Distinguished Service 2021 by NASTT Executive Director, Matthew Izzard

MARCH 28-31 | ORLANDO, FL
NO-DIG SHOW 2021

Next Year...



Thank you to John C. Matthews Ph.D., NASTT 2021 No-Dig Show Program Committee Chair for all your hard work and a job well done!

Booth space for the NASTT 2022 No-Dig Show in Minneapolis April 10-14 was being reserved, courtesy Conference Sales Person Hannah Stakolich

APRIL 10-14 | MINNEAPOLIS, MN

NO-DIG SHOW 2022

Infrastructure is Essential.

APRIL 10-14, 2022

NASTT 2022 No-Dig Show

Minneapolis Convention Center | Minneapolis, Minnesota

NODIGSHOW.COM

NETWORKING EVENTS

150+ TECHNICAL EDUCATION SESSIONS

EXHIBIT HALL

*NASTT **Celebrate Trenchless** Awards honor the growth and advancements in the trenchless industry. NASTT recognizes the many ways that these individuals contribute significant time, energy and intellect to developing trenchless technology and fostering its success.*

Chair Award for Distinguished Service

Recognizing trenchless professionals that have provided both NASTT and the trenchless industry with meritorious, prominent and long-standing service. One recipient each year is chosen at the discretion of the NASTT Chair.

John C. Matthews, Ph.D.
Director, Trenchless Technology Center & Associate Professor,
Louisiana Tech University

With more than 16 years of experience in the rehabilitation and inspection of infrastructure systems, Dr. Matthews is the Director of the Trenchless Technology Center (TTC) and an Associate Professor of Civil Engineering and Construction Engineering Technology at Louisiana Tech University. Previously, as the Pipe Renewal Service Line Manager at Pure Technologies, he provided clients with guidance on the selection and use of trenchless rehabilitation technologies. He also served as Battelle's Water Infrastructure Management Lead, where he led multiple water and sewer infrastructure research studies.

He has given more than 150 conference presentations and authored more than 220 publications in the area of trenchless technology for which he has received two International Society for Trenchless Technology No-Dig Awards (2005, 2012) and a NASTT Outstanding Paper Award (2015). He has been an active member of NASTT since 2003, serving on the No-Dig Program Committee and various other committees, including current service on the NASTT Board of Directors. He is an instructor of the NASTT Laterals Good Practices and Intro to Trenchless Technology – Rehabilitation Good Practices Courses. He was elected to the ISTT Board of Directors in 2020. In 2013, he was awarded the NASTT Trent Ralston Award for Young Trenchless Achievement. He is a member of the American Society of Civil Engineers and American Water Works Association. He also volunteers on the Editorial Advisory Board for Trenchless Technology Magazine and serves as an associate editor for the ASCE Journal of Pipeline Systems Engineering and Practice.

Celebrate Trenchless Award recipients are recognized at the NASTT No-Dig Show and promoted through NASTT communication outlets which may include nastt.org, social media, NASTT E-News, and NASTT's Trenchless North America. Find out how you can become a NASTT award recipient at nastt.org/awards.

Ralston Award for Young Trenchless Achievement

Applauding savvy members under 36 who have demonstrated excellence early in their career by making valuable contributions to the trenchless technology industry, achieving noteworthy professional success, and actively participating in NASTT or its regional or student chapters. With their talent and ability, these impressive people are the future of trenchless.

Patrick Moskwa, P.Eng.
Project Engineer, Robinson Consultants

Patrick Moskwa is a Licensed Engineer with more than ten years of experience working in the construction and engineering industry. Patrick's experience in trenchless rehabilitation projects includes elevated industry knowledge in contract administration, CIPP design methodologies (Circular and Non-Circular), technical specifications, tender development, condition assessment, and QA/QC of sewer, trunk sewer, watermain, and maintenance hole condition assessment and rehabilitation. Patrick has played integral roles in industry-leading projects, including the Northwest Arm Trunk Sewer Rehabilitation Project, which has won numerous awards, including the 2020 CCE Award of Excellence and NASTT Project of the Year runner-up.

Patrick is among the youngest NASTT training instructors and currently teaches the NASTT Introductory to Trenchless Technologies Course. Patrick has given his volunteer time to the No-Dig North Program Committee, the NASTT No-Dig Show information desk and Young Trenchless events. Patrick has authored/co-authored more seven technical papers that are posted in the NASTT library, including "Quality Control for Sewer Lateral Rehabilitation" and "Rehabilitation of the 1917 NATS Trunk Sewer" which won the NASTT Outstanding Paper of the Year in 2017 and 2019, respectively.

NASTT Volunteer of the Year

Recognizing members who exemplify the mission, vision and core values of NASTT and make an impact in the trenchless industry through their dedication, leadership and volunteer contributions during the past year.

Edward Alan Amber, PE
Owner, AM Trenchless

Edward "Alan" Ambler has 18 years of experience working on engineering projects including the World Islands in Dubai and cruise ship berth construction in Alaska. While an employee at the City of Casselberry, Florida, Alan managed the day-to-day operations of a municipal utility while developing the capital improvement program and executing projects. Alan has designed more than 370,000 linear feet of pipeline projects and is a national leader in trenchless technologies, such as pipe bursting.

Alan joined NASTT in 2013 and serves as a Track Leader on the No-Dig Show Program Committee. Alan is the Chair of NASTT's Pipe Bursting Center of Excellence and a co-author of the Pipe Bursting Good Practices Guidelines, 3rd Edition. Alan also volunteers as an instructor for NASTT's Good Practices Training Courses. Alan has a BS in Civil Engineering, a MS in Environmental Engineering, holds two patents, and is the owner of AM Trenchless LLC.

Alan loves to play guitar, cook for his wife and coach baseball for his three boys.

North American Society for Trenchless Technology Announces

The North American Society for Trenchless Technology (NASTT) announced the 2021 Abbott Innovative Product & Services Award winners at the NASTT No-Dig Show at the Orange County Convention Center in Orlando, Florida. The Abbott Innovative Product & Services Award celebrates companies with a state-of-the-art product or service making a significant impact in advancing the trenchless industry in the areas of rehabilitation or new installation. The award is named for the late Joseph L. Abbott, Jr., an active NASTT member since its founding in 1990 and a champion of innovation.

NASTT Innovative Product Forum was one of the highlights of the No-Dig Show in Orlando March 28-31

The selected winners met the highest-level of standards for each category. No-Dig Products were judged on Innovation (concept, method, development); Value (need, advantages, cost); and, Impact (sustainability, social/environmental responsibility and potential). "Honoring these leaders of trenchless technology innovation recognizes how important their contributions are to our organization, the industry and their customers," said Matthew Izzard, NASTT Executive Director. "The Innovative Product & Services Award is a testament to the skill, ingenuity and vision of the creative teams that research, develop, design, market and operate these products."

"The Innovative Product & Services Award is a testament to the skill, ingenuity and vision of the creative teams that research, develop, design, market and operate these products."

- Matthew Izzard, NASTT Executive Director

NASTT Abbott Award - New Installation

DIGITAL CONTROL

DIGITAL CONTROL INC. - TeraTrak R1

In the category for New Installation, the award was given to Digital Control Incorporated for its **TeraTrak R1**, a terrain-mapping tool with an accompanying mobile app to quickly solve one of the biggest challenges remaining in HDD. Submitted by product manager Anders Mantere, Digital Control's R1 is a tool to enable a crew to quickly gather continuous terrain data with a bore plan to get around terrain changes and cross utilities with confidence. "There are a lot of smart people with clever solutions working in the HHD product space, all focused to innovating and pushing the industry forward," said Mantere. "We hope that the R1 embodies the spirit of the Abbott award making contractors more productive and safer than before." For more information, visit digital-control.com/teratrak/r1.

North American Society for Trenchless Technology Announces

NASTT Abbott Award - Rehabilitation

LOGIBALL

LOGIBALL, INC.- Long Span Grouting Packer

In the category for Rehabilitation, the award was given to Logiball, Inc. for its **Long Span Grouting Packer**, a structural stabilization technique, which prevents pipe joint defects from progressing by eliminating the erosive effects of water infiltration and solidifying the pipe bedding. Submitted by Logiball President, Marc A. Anctil, these custom-made packers are being used by specialty contractors to seal longitudinal cracks and fractures in municipal sewers. "We're feeling proud, humble, and grateful for NASTT's recognition of Logiball's ability to make an impact, expand the industry, and complement all trenchless technologies," said Anctil. For more information, visit logiball.com/products/test-and-seal-packers/long-span-flexible-grouting-packers.

AWARD FINALISTS - New Installation

Ditch Witch: JT24 Directional Drill

Ditch Witch's JT24 directional drill is equipped with boosted power, stability and productivity in a compact, innovative design for increased efficiency and uptime on a variety of jobsites. Engineered from direct customer feedback, the JT24 is manufactured to effectively maneuver and traverse urban areas where much of the utility and rehabilitation work is happening today. The JT24 provides a 101-gross horsepower, 3,000ft-lbs of torque and 24,000 pounds of thrust and pullback at a size that easily fits in tight jobsites. ditchwitch.com

AWARD FINALISTS - New Installation

Kondex Corporation: Drill Defender HDD Boring Bits

Kondex Drill Defender HDD boring bits are revolutionizing the life and steerability of underground horizontal directional drilling operations. This patent-pending line of HDD bits currently includes a variety of dirt bits and cobble bits that are compatible with both Ditch Witch and Vermeer machines. Their patent-pending laser cladding wear protection delivers superior life expectancy and better retains near net shape for greater overall steering and maneuverability. kondex.com

AWARD FINALISTS - Rehabilitation

Infrastructure Product Group: Spiral Wound Liner

Spiral Wound Liner is a product/system of rehabilitating culverts and pipes, trenchless. The profile is made of proprietary PVC. It is a massive cost saving rehabilitation process, due to it can be installed from the right of way, trenchless/no dig with little to no traffic control, the time it takes to complete a job and the cost of the product profile. Installed correctly with grouting, the life of the product is 60-70 years. It can be installed in wet conditions, 25-30 percent water flow, unlike most systems on the market today. ipgco.com

Omega Liner Company, Inc.: FR Series Powered Feed Rollers

The Omega Liner Company FR series powered feed rollers are a new, patented approach to handling of larger or heavier liners. Available in 1400mm and 2800mm widths, these feed rollers provide effective and efficient handling of liners up to 72". The highly compact, rugged and easily transported units use commonly available worksite generators for power. With onboard storage for power and control cables and a rugged aerospace aluminum chassis these units are built to handle the most extreme environments and demands. omegauvpipe.com

Resinating LLC: Expand-In-Place Integration Technology

Expand-in-Place Integration Technology (EIPI), a breakthrough process for rehabilitating manholes and pipes using Resinating Fiberglass Expansion Liners, was awarded a patent in June 2020. By cutting a liner axially we are able to compress it so that it fits easily into a manhole or pipe where it is positioned and expanded against a bonding agent that has been applied to the substrate. The result is an integrated structure with a 100+ year useful life that is 100 percent leakproof, warrantied for 20 years, and is 50 to 100 percent stronger than the structure was when it was new. resinatingllc.com

Presentations about each product were made at the Innovative Products Forum at the 2021 NASTT No-Dig Show and are available online at talk-trenchless.nastt.org. Marc Anctil commented, "I applaud NASTT for evaluating risk/reward and choosing to honor safety with masks and social distancing to minimize risk while recognizing education is essential and face-to-face instructing is most effective." To learn more about NASTT awards, visit nastt.org/awards.

ARA
American Rental Association

American Rental Association Forecast Shows Equipment Rental Segment Moving from Relief to Recovery

Equipment rental revenue expected to exceed peak totals in 2022

Equipment rental revenue, comprised of the construction/industrial and general tool segments, is expected to explode past its peak totals in 2022 according to the forecast released in May by the American Rental Association (ARA).

The updated May 17 forecast calls for equipment rental revenue to reach just under $47.7 billion in 2021, up 3.1 percent after a decline of 9.1 percent in 2020. However, the forecast calls for a robust 12 percent increase in construction/industrial rental revenue in 2022, taking the combined total for the two segments up to nearly $52.3 billion.

The growth rate is expected to be consistent at between 2 and 5 percent for the next three years according to the forecast with combined equipment rental revenues reaching $57.5 billion in 2025.

"The equipment rental segment is moving like the rest of the macro economy from relief to recovery. We are seeing a good uptick in business activity that is going to bring rental revenues back to pre-pandemic levels in 2022," says John McClelland, Ph.D., ARA vice president for government affairs and chief economist.

"The biggest concern going forward is the slump in nonresidential construction. However, a robust infrastructure bill from Congress would provide a significant long-term boost to that sector as well," McClelland says.

The new ARA forecast calls for construction/industrial rental revenue to grow 3 percent in 2021 to nearly $34.5 billion and then jump 12 percent to $38.5 billion in 2022. In 2023, the segment is forecast to grow another 5 percent to nearly $40.3 billion, followed by growth of 2 percent in 2024 to $41.5 billion and 3 percent in 2025 to $42.5 billion.

"While the overall U.S. economy is recovering strongly, the sectors that drive equipment rental are coming along more slowly. In particular, the nonresidential construction and infrastructure sectors are still contracting and may not see growth until the end of the year. However, leading indicators, such as the Architectural Billings Index have begun to show strong improvement," says Scott Hazelton, director, economics and country risk, IHS Markit, Andover, Mass., the economic forecasting firm that partners with ARA to provide data and analysis for the ARA Rentalytics subscription service for ARA members.

"Construction activity follows architectural design by 12 to 18 months, which suggests a strong rebound in 2022. The energy sector has also begun to recover but will improve further next year as major economies in Europe and Latin American emerge from the pandemic and air traffic returns to something approaching 2019 levels," Hazelton says.

"Further stimulus via an expanded infrastructure bill could push growth higher. The key takeaway is that we expect equipment rental revenue to recover to 2019 levels in 2022; it is a multi-year event, with the strongest recovery expected in 2022," he says.

The forecast for Canada calls for double-digit equipment rental revenue growth for both the construction/industrial (11 percent) and general tool (13 percent) segments in 2021 to reach a combined total of $3.98 billion.

Canada's equipment rental revenue for the two segments also is expected to grow between 5 and 8 percent in 2022 to reach $4.29 billion, surpassing the previous peak revenue of $4.04 billion in 2018. Growth is expected to slow down to 2 to 3 percent in the next years of the forecast to reach $4.73 billion in 2025.

Robbins
A GLOBAL TBM COMPANY

Mega-Sized Crossover Machine Ramps up in Turkey

Robbins XRE TBM bores Eşme-Salihli Railway Tunnel

A Robbins 45-foot Crossover XRE TBM launched recently in spring 2021 in Eşme, Turkey. The large machine is boring the 1.9-mile Eşme-Salihli Railway Tunnel through mixed conditions including sandstone, gravelstone, claystone, and siltstone.

The titanic TBM was launched after more than seven years in storage, and following a few upgrades to systems to ensure they meet the newest safety and efficiency standards. "I am very happy that the TBM has been launched. Up to now, the machine has bored nearly 1,600 feet in gneiss and mudstone. This is an opportunity for Robbins to prove that large diameter TBMs can bore in such tunnels, even in very complex geology and difficult ground conditions," said Yunus Alpagut of ATES, Robbins' Turkish subsidiary.

To get through the challenging conditions, the large diameter XRE has a number of unique features. The large diameter design enables both a screw conveyor and belt conveyor to remain in place, enabling swift conversion between modes, and operation in 100 percent EPB and hard rock modes.

In EPB mode, the screw conveyor operates as in any typical EPB machine. The screw features a replaceable inner liner and replaceable carbide wear bits for abrasion protection. A mixed ground cutterhead is fitted with knife bits that can be switched out with disc cutters in harder conditions. The machine design includes a man lock for cutterhead inspection and changes, and mixing bars inside the mixing chamber.

To convert to hard rock mode, the mixing bars and initial portion of the screw conveyor can be optionally retracted. EPB knife bits are then replaced with disc cutters on the cutterhead,

and the EPB scrapers on the cutterhead are replaced with bucket lips. Muck paddles are installed in the cutterhead to allow the muck to fall into the muck chute. A hydraulic muck ring allows a chute attached to the bulkhead to move forward and down at a diagonal angle, allowing rock chips to be deposited in the chute and through the screw conveyor onto the TBM belt conveyor. To keep up production rates in both modes, the Robbins Torque-Shift System is used: a two-speed gearbox that enables efficient tunneling in hard, mixed, or soft ground.

The Eşme-Salihli Railway Tunnel is part of the Ankara-şzmir High Speed Railway Project for the Turkish State Railways (TCDD). 316-mile line will eventually connect Polatlı in Ankara Province to Izmir, the third most populous city in Turkey, surpassing the Istanbul-Ankara High-Speed Railway as the longest rail line in the country once complete. The double-track railway system will convey passengers at top speeds of 160 mph, completing the journey between the two cities in 3.5 hours—a journey that would normally take 6.5 hours by car.

KONDEX®

Kondex Launches Online Store for HDD Products

Kondex Corporation recently launched its online store, kondexparts.com, featuring its Drill Defender™ horizontal directional drilling (HDD) product line. The store offers HDD contractors an easy-to-navigate source for purchasing underground boring components. The site currently includes a variety of dirt and cobble bits, with starter rods and collars soon to be added.

"What sets our products apart from alternatives on the market is our wear prevention," commented Kondex VP of Sales John Wagner. "We are using a laser cladding additive that exceeds the limits of hard face welding that's traditionally used in this industry. Not only is laser cladding a more durable and carbide-dense protection, but the application method utilized also allows us to add laser cladding to product areas that otherwise could not be protected."

Kondex has more than 10 years of experience with laser cladding technology, and historically sees its use increase product life by an average of 2-3 times. This is true for drilling applications, as well as laser cladding on its agricultural and lawn and turf products.

"Our goal with laser cladding is to greatly reduce how quickly a product wears by shielding the base material," Wagner explained. "As a product wears, its performance also degrades. So, the longer we can maintain near net shape, the longer our products

will perform at optimal levels. This is a tremendous value in underground drilling, as it reduces the amount of down time otherwise needed to replace worn parts."

Kondex manufactures high-wear metal components used in off-highway industries. Its advanced manufacturing technologies and design innovations improve product life and functionality. For our OEM customers, this elevates market share; for end users, it boosts product performance and usability. For additional information, please visit **www.kondex.com** or **www.kondexparts.com.**

PLASTIC PIPES CONFERENCE ASSOCIATION

PPXX In-Person Event Confirmed

Plastics Pipe Conference and Trade Show to be Held September 6 – 8, 2021 in Amsterdam

The Plastics Pipes Conference Association (PPCA) Board of Directors recently announced that PPXX will be held as an in-person event at the Hotel Okura in Amsterdam, September 6-8, 2021. Details about the revised technical program and registration information can be found on the PPXX website at **www.ppxx.eu**.

Held every two years, the event is hosted by the PPCA members: PE 100+ Association, Plastics Pipe Institute, Inc. (PPI) and The European Plastic Pipes and Fittings Association (TEPPFA). According to David M. Fink, president of the Plastics Pipe Institute, Inc. and PPCA chairman, "There is sufficient interest from sponsors, exhibitors, speakers, and registrants to warrant holding the conference in person following the postponement of last year's conference, and we are extremely excited that it will be held as originally planned."

Country and hotel guidelines for social distancing and other COVID-19 guidelines are under development by the PCCA and will be communicated in the coming months for those attending the conference. Speakers who are not able to attend in person, due to specific travel restrictions or company policies, will be offered alternative options.

"The revised technical program for PPXX includes new papers presenting topics of interest to the industry," stated Sarah Patterson, the PPXX Organizing Committee co- chair and technical program manager. "In addition, the opening technical session focuses on the use of plastic pipe systems for the transportation of hydrogen – a very relevant topic supporting the growth of sustainable energy."

"We're also happy to announce that the PPCA Board of Directors has launched Conference Partners," Fink said. "This significant new initiative acknowledges the valued efforts of plastic pipe trade associations actively involved with our conferences. We are pleased to recognize the China Plastics Piping Association (CPPA), the European Council of Vinyl Manufacturers (ECVM), the Plastics Industry Pipe Association (PIPA), the PVC Pipe Association (PVCPA), and the Southern African Plastic Pipe Manufacturers Association (SAPPMA). These groups have acted as ambassadors for the PPCA conferences by encouraging the submission of papers, participating on the organizing committees and also with spin-off conferences."

Alternating between the United States and Europe, the three-day Plastic Pipes Conference and Exhibition is the largest event of its kind. Key subjects to be covered at PPXX include the introduction of new technologies, sustainability, standards, manufacturing equipment, technical aspects relating to materials and ingredients along with the design and development, testing, installation and operation of plastic pipe systems.

RAGULATECH

NASTT Hall-of-Fame Member George Ragula Founds New Consulting Company

RagulaTech specializes in all aspects of gas utility engineering, operations and construction

NASTT Hall of Fame Member George Ragula recently founded RagulaTech LLC, a new consulting company specializing in all facets of utility engineering, operations and construction, focusing on providing innovative solutions to challenging projects. As a recognized leader in the industry, Ragula has a very diverse and comprehensive background in gas distribution engineering and operations. He now brings this vast storehouse of knowledge, and unique skill-set from his extensive 43-year career, into his new company.

RagulaTech LLC services include project planning, management and inspection, cast iron risk assessment, asset management and natural gas leak detection survey practices, investigation and equipment. A major area of focus is construction means and methods, including applications and solutions involving HDD design, vacuum equipment, pipe bursting and extensive cured-in-place-pipe expertise where major innovations have been designed resulting in many industry firsts, and world-records. Technology evaluations, transfer, implementation and improvement are core services along with the provision of technical reviews and feedback related to evaluating equipment and/or processes. RagulaTech LLC also offers specific expertise in site restoration, backfill and flowable fill. Overall, RagulaTech LLC provides innovative solutions to unique and challenging problems in engineering, operations and construction.

Ragula is a noted authority on trenchless technology applications for the gas industry, with much of his dynamic career specifically focused on the development and application of various trenchless technology methods for use in the gas industry. Prior to starting RagulaTech, he worked at Public Service Electric and Gas and was responsible for evaluating cutting edge technologies that increase efficiency and effectiveness of operations through his leading role in gas industry research, design, development and deployment where he has been directly involved with the development and implementation of many innovative technologies utilized by the gas industry. His many years of work in this area, combined with his extensive practical knowledge of day-to-day operations, have specifically focused on the development and technology transfer of various trenchless technologies for gas industry applications. Before joining PSE&G in 1988, Ragula held various positions at Brooklyn Union Gas in engineering, operations, construction, R&D and management.

As a member of the American Gas Association (AGA) Ragula served as Chair of the Construction Operations Committee. His is also member of the American Society of Mechanical Engineers, Society of Gas Operators where he served as President from 2014-2015, and the New Jersey Society of Asphalt Technologists. He serves as Treasurer of the Northeast Gas Distribution Council and was actively involved as a Project Advisor for the Gas Technology Institute Operations Technology Development Program. Ragula served as Chair of the Board of Directors for the North American Society for Trenchless Technology (NASTT) from 2011-2012 and pulled double duty when he served as Program Chair for the Annual No-Dig Conference in 2012. In addition, he served as Chair of the NYSEARCH – Northeast Gas Association R&D Committee from 2004-2006 and served as a technical project advisor for that group. He also previously served as a Distribution Project Advisor for the Gas Research Institute for over 15 years.

Ragula has published over 75 papers and reports and has presented numerous papers. He has been honored with numerous industry awards including the 2009 John B. McGowan Sr. Research Award for his overall R&D contributions to the gas industry. He also teaches several NASTT courses on various trenchless technology topics, including CIPL for the Gas Industry. For more information visit **www.ragulatech.com**.

Barbco INC.
UNDERGROUND MANUFACTURING SPECIALISTS

Barbco, Incorporated Leads Training Class during the June 2021 Trench Safety Month

June 2021 was declared "Trench Safety Month" by the National Utility Contractors Association. This declaration of safety further highlights the association's innovative educational and safety program, the "Trench Safety Stand Down" week, which was held June 14 - 18, 2021.

On June 5th, 2021, Scott Fisher, International Sales Manager and Corporate Trainer of Barbco, Incorporated led an on-site seminar with a full crew from, horizontal boring specialist, R.G.T. Construction from Berlin, Pennsylvania about the importance of proper safety protocol and procedures when working in and around trenches.

Working in a trench is one of the most hazardous jobs in construction. Hundreds of people and thousands are seriously injured each year due to cave-ins.

Did you know that one cubic yard of soil can weigh as much as a small pickup truck? If a person is buried during a trench failure, there is little chance of survival. Therefore, before entering a trench, the trained, competent person at the jobsite must inspect the trench and the protection system to ensure that the trench is safe to enter.

Both OSHA and NUCA recognize Barbco, Inc. and R.G.T. Construction for their participation and safety commitment during this very important training session.

WARREN ENVIRONMENTAL

Celebrating Danny Warren's Legacy and the Promotion of New Leadership

Warren Environmental Founder Retires after Lifelong Coatings Manufacturing Career

Warren Environmental's former President Danny Warren retired June 14, 2021, after being in the business all of his life. His contributions to our company have been numerous. Danny and Jane are entering the most exciting time of their life—retirement. We wish them well. Danny will be working with Warren Environmental on a consulting level, as needed, for special projects and unique epoxy opportunities.

Founded in 1996, Danny had a vision of creating environmentally safe epoxy solutions. Now 25 years later, Warren Environmental celebrates Danny's legacy and enters the next chapter with the promotion of new leadership. As Danny steps down, former Vice President of Warren Environmental, Brian Brandstetter, transitions into his new role as President.

Backed by 23 years of experience in the construction industry, Brian brings a breadth of valuable industry knowledge and relationships to the team. His previous experience includes working for a leading provider of temporary liquid handling solutions including pumps, tanks, and filtration systems. Having served as Warren's Vice President over the last two years, Brian has played an instrumental role in the strategic planning of Warren's acquisition and the company's growth nationwide. As President, Brian will be responsible for the overall management of Warren Environmental. He will carry on the company's legacy of success by ensuring team members have needed resources and act with integrity, upholding the strict quality, and safety standards that our business was built on.

Friends and colleagues have congratulated him on the promotion—"Congratulations, Brian. We know you will continue to selflessly shepherd Team Epoxy forward!" said John Fernandi, PE – Manufacturer's Representative. Operations Manager – Quality and Control, Lisa Barrus, said "Congratulations on your new promotion! I know I can speak for all of us when I say that we admire your courage, persistence, determination, and guidance as our leader and we thank you for being the driving force of Warren. It has been a pleasure working under your direction and I look forward to what lies ahead." CEO, Greg Harris, said "Even before the acquisition, I knew Brian would be the right person to lead Warren long-term. Congrats BB!!!"

About Warren Environmental

Warren Environmental is a manufacturer of proprietary epoxy blends and patented application technologies. Since 1996, we have protected or rehabilitated municipal and private client's infrastructure throughout the United States. We have quickly become the industry's trusted epoxy manufacturer due to our concentration on quality and safety for the environment, workers, and the communities we serve.

educate • train • research • publish

NORTH AMERICAN SOCIETY *FOR* TRENCHLESS TECHNOLOGY

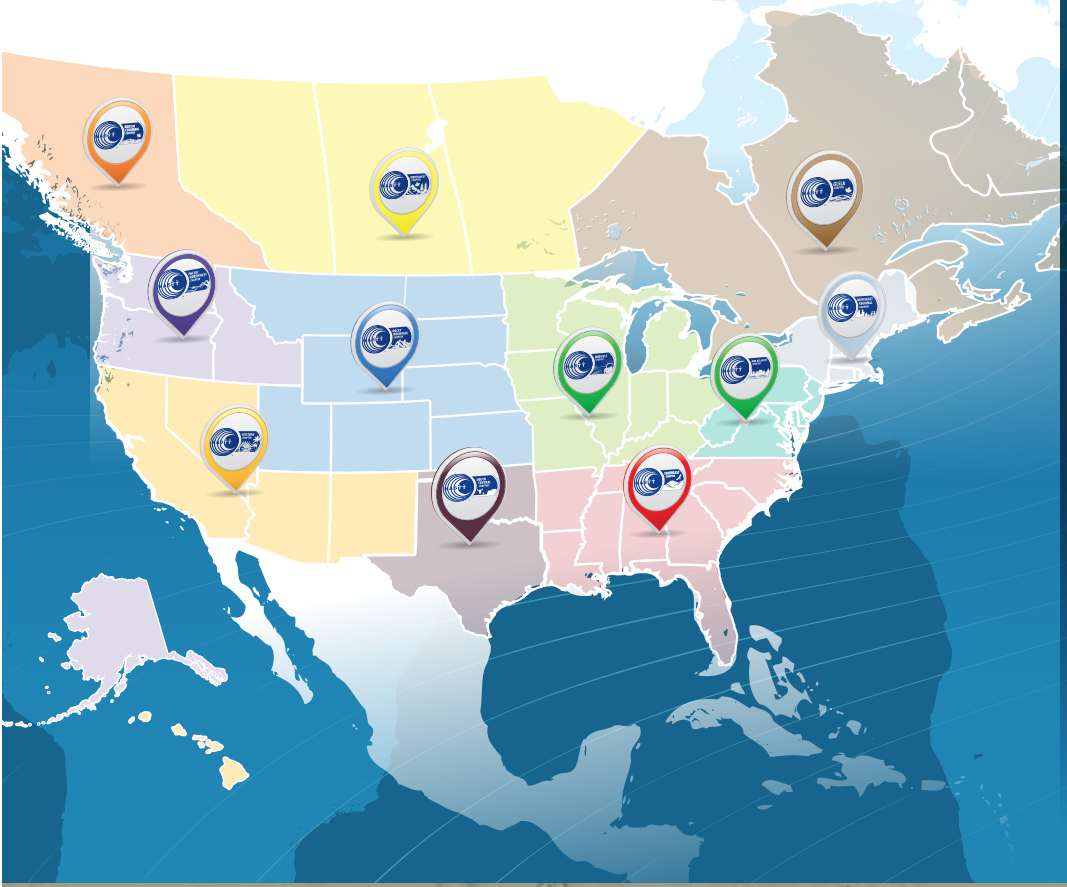
NASTT REGIONAL CHAPTERS

REGIONAL ISSUES, INTERNATIONAL SUPPORT

Contact your regional chapter today.

The grassroots of NASTT is a network of eleven regional chapters throughout the United States and Canada. Regional chapters network at the local level, share infrastructure challenges and develop new ideas. Regional chapters hold various events throughout the year, and like NASTT, are dedicated to the advancement of trenchless technologies for the benefit of the public and the environment.

With your NASTT membership you are automatically enrolled not only in the national and international organization, but also in your regional chapter. So join today and get to know the "local heroes" that are making their communities better places through the innovative engineering solutions of trenchless technologies.



REGIONAL CHAPTERS

British Columbia
nastt-bc.org
British Columbia

Great Lakes, St. Lawrence & Atlantic
glsla.ca
Ontario, Quebec, New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland and Labrador

Mid-Atlantic
mastt.org
Delaware, Maryland, New Jersey, Pennsylvania, Virginia, West Virginia and District of Columbia

Midwest
mstt.org
Illinois, Indiana, Iowa, Kentucky, Michigan, Minnesota, Missouri, Ohio and Wisconsin

Northeast
nastt-ne.org
Connecticut, Maine, Massachusetts, New Hampshire, New York, Rhode Island and Vermont

Northwest
nastt-nw.com
Alberta, Manitoba and Saskatchewan

Pacific Northwest
pnwnastt.org
Alaska, Idaho, Oregon and Washington

Rocky Mountain
rmnastt.org
Colorado, Kansas, Montana, Nebraska, North Dakota, South Dakota, Utah and Wyoming

South Central
Oklahoma and Texas

Southeast
sestt.org
Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Puerto Rico

Western
westt.org
Arizona, California, New Mexico, Nevada and Hawaii

nastt.org
North American Society for Trenchless Technology
14500 Lorain Avenue #110063 • Cleveland, Ohio 44111
Phone: 888-993-9935

MICHELS®
An Energy & Infrastructure Contractor

Michels Corporation NASTT No-Dig 2021

In addition to exhibiting in one of the larger booth spaces on the floor, Michels gave two presentations during the conference: Creating Efficiency for Project Success: Zach Osborn; and Using UV-cured CIPP to reline 8.5 miles of sanitary sewer in Guam: Lee Zubrod and John Manijak.

Michels Corporation was heavily involved in the NASTT 2021 No-Dig in-person show in Orlando, FL, March 29-31, 2021

During the show, Michels received two Project of the Year awards from *Trenchless Technology* magazine. The Project of the Year for New Installation was given to Michels Bakken Missouri River Crossing, which featured a record-setting 2.5-mile horizontal directional drill. The Project of the Year for Rehabilitation was awarded to Michels Northern Interceptor Rehabilitation Sewer, which utilized ultraviolet light (UV) cured-in-place (CIPP) pipe liners for pipe rehabilitation of 43,984 linear feet of sanitary sewer pipes, making it among the largest UV projects in the United States. Winning both awards in one year was a great honor and a first-time occurrence for their company, their crews and their leadership teams.

As a premier trenchless service provider in the industry, Michels offers fully customizable solutions. Utilizing a tool case of trenchless options, they listen to you, and work in conjunction to propose the best feasible option for your project. They offer complete rehab and new build solutions. Visit **www.michels.us/trenchless** to find out more.

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Introducing New Vermeer Quickfire® HD Connection System

Make fast and efficient HDD tooling connections while working in harsh ground conditions

The new Vermeer QuickFire® HD connection system for utility horizontal directional drills (HDD) helps reduce the labor involved with changing over from pilot bore and pullback tooling. This new connection system builds upon the original Vermeer QuickFire system introduced to the market more than 10 years ago.

"The QuickFire HD system expands the types of ground conditions contractors can use this type of quick connection system for," explained Jason Zylstra, product manager for Vermeer Lifecycle products. "Crews familiar with the original QuickFire system will recognize the same 4-turn makeup on the QuickFire HD system, only they'll now have some new ease of use of and reliability-minded enhancements."

The new Vermeer QuickFire HD system uses two heavy-duty roll pins to secure the locking collar over the non-torqued threaded connection. Resembling other proven Vermeer designs, this retention feature has performed well in extensive field tests. Also, the QuickFire HD allows the collar to be assembled at any orientation to avoid having to rotate the collar to align it with the retention bolt hole, unlike some other systems.

The new Vermeer QuickFire HD system is available in three sizes:

- QuickFire HD 300 for HDDs in the 10,000-pound (44.5-kN) drill range — Vermeer D10x15 S3 or Ditch Witch JT10 HDD
- QuickFire HD 400 for HDDs in the 24,000-pound (106.8-kN) drill range — Vermeer D23x30 S3 or Ditch Witch JT30 HDD
- QuickFire HD 460 for HDDs in the 40,000-pound (177.9-kN) drill range Vermeer D40x55 S3 or Ditch Witch JT40 HDD

Also, Vermeer offers weld-on connection options to cost-effectively convert existing tooling to the QuickFire HD connection system.

For more information about the new Vermeer QuickFire HD Connection System, contact your local Vermeer dealer, and visit borestore.com.

About Vermeer Corporation

Vermeer Corporation delivers a real impact on the way important work gets done through the design, manufacture and support of high-quality industrial and agricultural equipment that helps connect people to the necessities of life, manage natural resources and feed and fuel communities. With a reputation for being built tough and built a better way, that equipment is backed by localized customer service and support provided by independent dealers around the world. To learn about Vermeer Corporation, products, the dealer network, financing options and careers, visit www.vermeer.com.

MICHAEL BYRNE MANUFACTURING
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international

Michael Byrne Manufacturing Names Kevin Slarb International Sales Director

Kevin Slarb has been named as the Inside and International Sales director for Michael Byrne Manufacturing. Kevin has over 20 years' experience in the Trenchless Technology industry and has proved to be a valuable resource for many trenchless contractors in locating parts or other options to problems. Kevin was the go to guy for many International customers while at American Augers and will continue that role with Michael Byrne Mfg. Michael Byrne continues to look to strengthen their team and name with the addition of employees like Kevin Slarb, welcome aboard!

WHITE ROCK
My City by the Sea!

City of White Rock Annual Trenchless Rehabilitation Program

By: Mike Hill, Binnie

Beginning in 2015, the City of White Rock has conducted an annual Trenchless Rehabilitation program that investigates and repairs storm and sanitary infrastructure through Trenchless methods. Binnie has partnered with the City since the program's inception to design and administer the works.

The program starts with an annual CCTV inspection program of between thirty and fifty kilometers of mainline in a defined area of the City. In White Rock this amounts to approximately 20% of the City's infrastructure being inspected each year, which leads to a 5-year cycle of inspection of any particular section of pipe. Every meter of CCTV video is viewed an analyzed by Binnie staff, noting defects in both structural and maintenance categories. A summary report is generated which prioritizes the manhole-to-manholes pipe sections by severity of defects and incorporates the City's repair budget in recommending locations and strategies for the upcoming Trenchless Rehabilitation program.

The rehabilitation program is developed with City staff, selecting mains that can be repaired by trenchless methods and that will provide the most benefit to the community by being upgraded. These methods can range from sliplining, to Cured-in-Place-Pipe (CIPP), to pipe bursting, among many options. Each pipe defect is matched with the appropriate rehabilitation strategy to achieve maximum efficiency for the City. Binnie creates maps and contract documents for a public tender and runs the construction process. We work with the chosen contractor as contract administrator and as construction inspector, keeping the project on budget and reporting on progress to City staff.

White Rock long ago recognized the efficiency that trenchless construction techniques can provide: less invasive repairs that minimize property damage and restoration, carbon credits from the provincial government that can be applied against their daily emissions, and overall lower-cost repairs of pipelines in their mid-life stages that can extend or entirely reset the lifespan of the infrastructure.

Binnie has a dedicated team of personnel that partner with municipalities throughout BC to inspect, analyze, and rehabilitate their networks of underground utilities. One of the major future objectives of communities in BC will be sustainable infrastructure management, and Binnie has the resources and processes in place to assist in that goal.

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Spot Repairs: Adding Value to Your Arsenal of Tools

Whether you are a seasoned veteran or just starting out in the trenchless rehabilitation world, spot repairs are a great way to add value and job flexibility to your tool chest. When you're growing your business, whether it be drain cleaning or as a full-time trenchless contractor, spot repairs are a great way to add value to your service offerings. They are simple and effective with a wide range of useful applications.

Spot repairs use a fiberglass woven material with a two-part silicate resin that is applied to the material. This is then wrapped around an inflatable Packer and pushed into place. This type of repair has many different functions. It can stop inflow and infiltration (unwanted groundwater coming into a sewer line) or it can seal large voids in pipes as well as large cracks in pipe lines. Many municipalities prefer the use of spot

repairs to seal off abandoned laterals as well as sealing off the end of open mainlines that are no longer in use. Spot repairs have proven to be a very effective solution in residential applications as well, anywhere there is a void or crack in a waste line.

Often when a contractor is cleaning or televising, they will come across defective wastewater pipes that are difficult and costly to access. This is where spot repairs add real value. With the use of specialized inflatable packers, the contractor can push the spot repair to the point of the broken pipe. Once in place the packer is inflated. After the spot repair has cured the Packer can be deflated and removed. The spot repair provides an amazing and structurally sound repair to the existing pipe.

Another advantage to spot repairs is the low cost to getting started. Most sewer contractors already have a jetter and camera. Adding the cost of an inflatable packer and pushrods can be very reasonable on the residential side. On the municipal side the cost structure goes up due to the size of the packers, however it still extremely cost-effective when compared to other systems out there to repair holes in large diameter pipes.

Take the time to learn about this useful way to add value and flexibility to your tool chest! For more information, case studies, and project videos, please visit **www.ippsolutions.com**.

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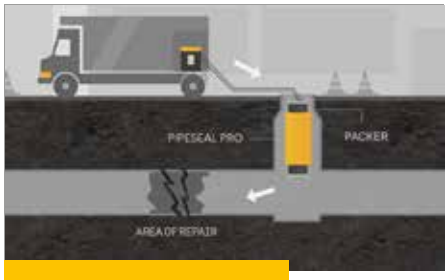

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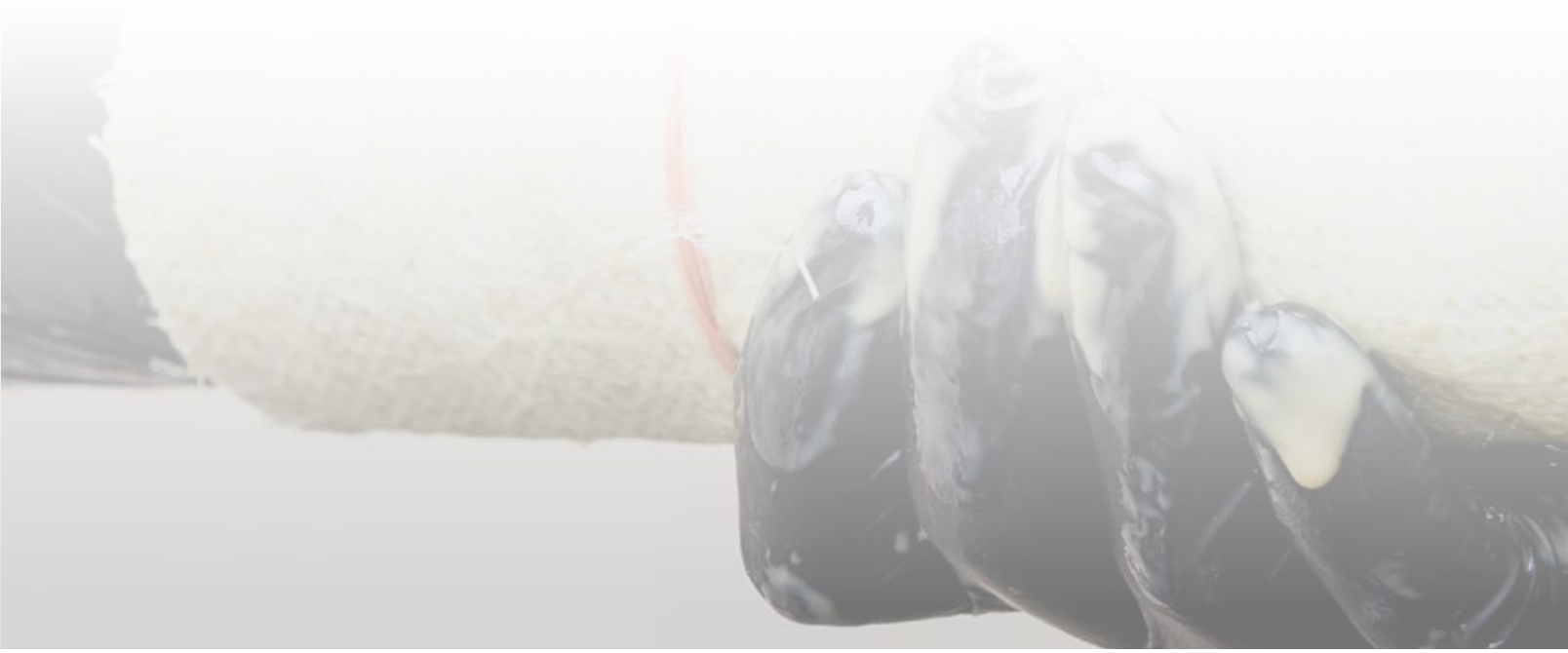
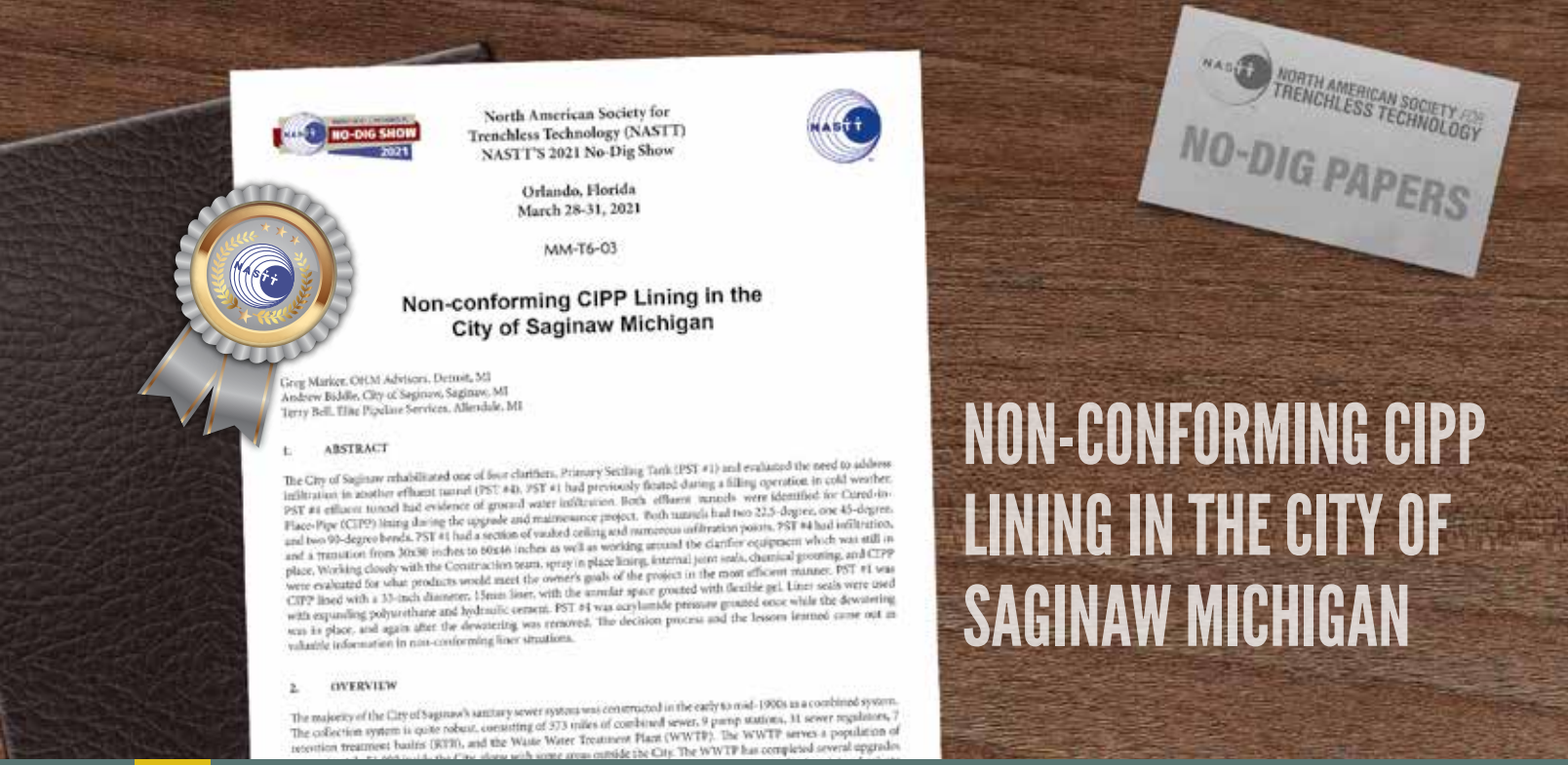
STEP 4: CURING





NON-CONFORMING CIPP LINING IN THE CITY OF SAGINAW MICHIGAN

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1. ABSTRACT

The City of Saginaw rehabilitated one of four clarifiers, Primary Settling Tank (PST #1) and evaluated the need to address infiltration in another effluent tunnel (PST #4). PST #1 had previously floated during a filling operation in cold weather. PST #4 effluent tunnel had evidence of ground water infiltration. Both effluent tunnels were identified for Cured-in-Place-Pipe (CIPP) lining during the upgrade and maintenance project. Both tunnels had two 22.5-degree, one 45-degree, and two 90-degree bends. PST #1 had a section of vaulted ceiling and numerous infiltration points. PST #4 had infiltration, and a transition from 30x30 inches to 60x46 inches as well as working around the clarifier equipment which was still in place. Working closely with the Construction team, spray in place lining, internal joint seals, chemical grouting, and CIPP were evaluated for what products would meet the owner's goals of the project in the most efficient manner. PST #1 was CIPP lined with a 33-inch diameter, 15mm liner, with the annular space grouted with flexible gel. Liner seals were used with expanding polyurethane and hydraulic cement. PST #4 was acrylamide pressure grouted once while the dewatering was in place, and again after the dewatering was removed. The decision process and the lessons learned came out as valuable information in non-conforming liner situations.

This paper was awarded Most Attended Presentation at the 2021 NASTT No-Dig Show in Orlando. NASTT No-Dig Papers are available for download, free to members, at www.nastt.org

Non-conforming CIPP Lining in the City of Saginaw Michigan

2. OVERVIEW

The majority of the City of Saginaw's sanitary sewer system was constructed in the early to mid-1900s as a combined system. The collection system is quite robust, consisting of 373 miles of combined sewer, 9 pump stations, 31 sewer regulators, 7 retention treatment basins (RTB), and the Waste Water Treatment Plant (WWTP). The WWTP serves a population of approximately 51,000 inside the City, along with some areas outside the City. The WWTP has completed several upgrades over the last 15 years and the capacity of the plant exceeds the demand due to decreased volume of industrial and private users over the same time period. Currently the WWTP discharges treated effluent to the Saginaw River.

The Saginaw WWTP is designed to handle an average daily flow of 32 MGD. During wet weather events, the plant influent flow can reach 72 MGD. The 40-acre plant site includes 16 buildings. The plant processes include fine screens, a multiple tray grit removal system, primary settling, aeration basins, secondary settling, disinfection using chlorine gas, and de-chlorination with sulfur dioxide.

3. BACKGROUND

OHM Advisors and Soils and Materials Engineering (SME) worked with staff at the Saginaw WWTP to study the possibility of rehabilitating one of the six Primary Settling Tanks (PST #1) shown in Figure 1. PST #1 was out of service, drained and empty. Only a portion of the plant remains in service at any time, and tanks not in service are drained and empty. During a filling operation in cold weather, the filling effluent froze and lifted the tank with hydraulic pressure preventing primary influent from properly filling the tank. This tank had been out of service since 2014 due to cracking of the walls and base slab, and damage to the clarifier mechanism. The City elected to move forward with rehabilitating the tank versus total tank replacement after looking at the life cycle

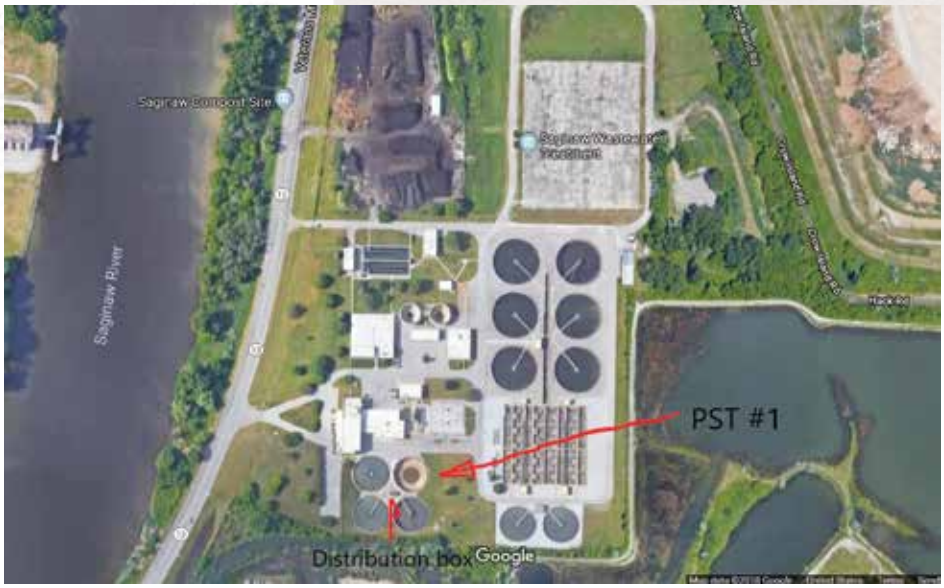

Figure 1. Saginaw WWTP with PST #1 and the distribution box identified

and anticipated remaining useful life of the tank. In addition to repairing the existing tank walls and slab, along with replacing the mechanism, the square influent conduit between the distribution box and PST #1 needed repair due to infiltration and damage to the conduit precast top panels.

During rehabilitation of PST #1 conduit, the City also wanted to address infiltration that was later verified by CCTV in figure 2 below and exfiltration from the influent conduit in PST #4. Prior to issuing bid documents for rehabilitation of PST#1, the plant observed exfiltration of primary influent through the pressure relief valves in the base slab of PST #4 when placing the tank into service. It was suspected that PST#4 influent conduit joints were leaking. Therefore, lining on the PST#4 influent conduit was a late plan addition to the construction documents.

Figure 2. CCTV showing point of infiltration in effluent tunnel from PST #4 to distribution box

Figure 3. Example of bends in the tunnels and existing conditions after cleaning

Proposed repair method for PST #4 - 80 lft	Cost	Scope, i.e. Pros and cons
Carbon Reinforced liner	$260,000	Extensive work to get to clean and dry environment. Longest lasting repair.
Spray on lining	$158,000	600 Mill Polyurea, not structural, however would seal the conduit and protect it from degradation. Would need grouting. Extensive work to preapre surface and control environment.
CIPP liner	$42,000+$20,000 in claims	Originally scoped and quoted in bid. Same repair method being used on PST#1 already. Not possible without removing clarifier which is not included in costs and is a $250,000 event and not in scope of this project.
Mechanical seals	$39,000	Has a physical presence in the tunnel (1" lip). Well established system with long life span. Only covers spcific locations.
cementitious lining with crystalline waterproofing component	$90,000	Potentially may not address specific concerns in this tunnel without grouting or other product.
Chemical Grout	$7,000	Relatively easy to apply, shorter life span than all other methods.

Figure 4. Possible repair methods evaluated for influent tunnels

Both influent conduits were identified for cured-in-place pipe (CIPP) lining during the rehabilitation project. Both conduits were 80 feet long and had one vertical 22.5-degree bend, one horizontal 22.5-degree bend, a 45-degree bend, and a 90-degree bend between the influent entrance in the bottom center of the tank and the square entrance to the distribution box with slide gates for controls (Figure 3). PST #1's concrete conduit had a missing section of vaulted ceiling and numerous infiltration points. PST #4 had infiltration and a transition from a 30x30-inch to 60x46-inch, as well as the clarifier equipment was still in place.

4. EVALUATION, PLANNING, AND SUBMITTALS

The project was bid for CIPP lining of both conduits. RAM Construction was the prime Contractor for the entire project with Elite Pipeline Services subcontracted for CIPP lining. Elite worked closely with CIPP Services Inc. for the supply of CIPP materials and support. After CCTV investigation of both conduits, PST #4 presented several challenges. The clarifier equipment was intact and not scheduled to be removed and replaced and there was variation in internal dimensions.

Spray in place lining (SIPP), internal joint seals, and chemical grouting were evaluated based on product viability, extended life-span and cost. The City of Saginaw's goal was to minimize the possibility of exfiltration of primary influent to extend useful life of the primary settling tank. Upon evaluation of the options, the owner recognized that the PST #4 clarifier equipment would require replacement in the next 10-15 years; therefore, they choose to delay rehabilitation until removal of the clarifier offered the opportunity for more thorough evaluation during a future project. Until then, leaking joints were addressed via the less involved option of chemical grouting.

For PST #1, the rehabilitation for the bottom of the tank was scheduled to be a 3-inch hydrolazing with a new bottom being poured. Hydrolazing (hydrolasing, hydrodemolition, or water jet hydro cutting) is the use of high pressure water, in this case 25,000 psi, to remove concrete in the bottom of the tank without damaging or disturbing the steel in a uniform manner and depth (+ or – one (1) inch). It has the advantages in this case of being able to remove the concrete around the reinforcing steel without damaging it, while also cleaning the steel to make it ready for evaluation and additional reinforcement where needed prior to the upcoming replacement. It made rehabilitation of the effluent tunnel underneath it via a trenchless method the optimal choice for the City of Saginaw. After considering spray in place, chemical grouting, person-entry repair, or CIPP, it became clear that CIPP was the best choice for the PST #1 effluent tunnel.

Due to the unique nature of this project, planning of the lining activities was critical to the success. The planning included:

- Several site visits by Elite to gain a thorough understanding of the unique challenges of the project
  - Determine procedures for accessing the conduit
  - Identify safety concerns of working in confined spaces at an operating wastewater treatment plant
  - Identify impacts on the WWTP operations
  - Coordinate shutdown of WWTP operations and isolation of areas impacted by construction activities
- Detailed submittals and review of submittals of materials and proposed means, methods, and procedures prior to construction
- Pre-install meeting with the Owner, Engineer and Contractor to discuss the plans and challenges
- Field verification of conduit sizes and conditions prior to release of materials for fabrication
- Follow up conference calls to ensure all parties understand the plan

5. CONSTRUCTION

One of the more challenging aspects of the project was pulling the liner through PST #1. While inversion techniques were considered, Elite and CIPP Services determined inversion posed additional risk with the conduit configuration. Once

Figure 5. Preparing to load liner into tunnel in PST #1

the liner arrived, insertion took nearly 15 hours to winch, pry, and shift into place. The liner was lowered to the bottom of the basin and traversed nearly 40 feet to enter the manhole connecting the tunnel. The wet-out liner weighed over 85 pounds per foot with a total weight exceeding 7,000 pounds. To ease drag and aid in installation, the liner was pulled over lubricated plywood using a 5-ton winch. Liner stability was maintained with over 400 pounds of ice throughout the pull-in (Figure 5).

In addition to three sets of rollers inside the conduit for the bends, the winch cable negotiated a 90-degree bend at the bottom of the distribution box and pulley at the top to maneuver the 7,000-pound liner. The pulley was secured to a telescopic handler that was rested on a slide gate I-beam frame that transferred the 5-ton pulling force to the surrounding reinforced concrete walls (Figure 6).

Figure 6. Winch set up at the distribution box

Throughout the installation, the winch cable was repositioned at various hold-points along the liner. Vegetable oil was applied as a lubricant continuously throughout the process. This was a time-consuming process made challenging due to the entry configuration (bends) and liner weight making it a slow process. Curing started immediately after the liner was in place and lasted well into the morning hours. The liner was inflated with air to 8 psi and held under pressure for over an hour before introducing steam to elevate internal temperature. After a couple hours of pressure stabilization where the liner went from 110 to 140 degrees F, the air/steam mixture was transitioned to full steam for cure. Thermocouples were placed at the "A" and "B" stations (Figure 7) to confirm the exothermic reaction. After three hours of processing, steam was transitioned to air for an additional three hours as the temperature was reduced to below 140 degrees F during cool down. The post CCTV inspection confirmed that the anticipated rounded corners were reduced to a very close-fitting liner. The patience of the contracting team during the equalization, heating, and cool down periods allowed time for the liner fibers to expand before the resin reacted and formed a solid composite. That time allowed the liner to hold its form and not shrink due to careful, steady, and patient cooldown. This resulted in better than expected conformance to the square profile ensuring the tightest fit possible with negligible shrinkage.

The specifics of the inflation, heating, cure, and cool down that created a tight fit include the following details. The initial hour under 8 psi without any steam let the liner go from 40 degrees Fahrenheit (F) to the ambient temperature 75F. This ensured the liner made a close fit to the existing pipe, especially in the corners. The liner was brought from ambient to 140F over the next two hours (hours 1 to 3).

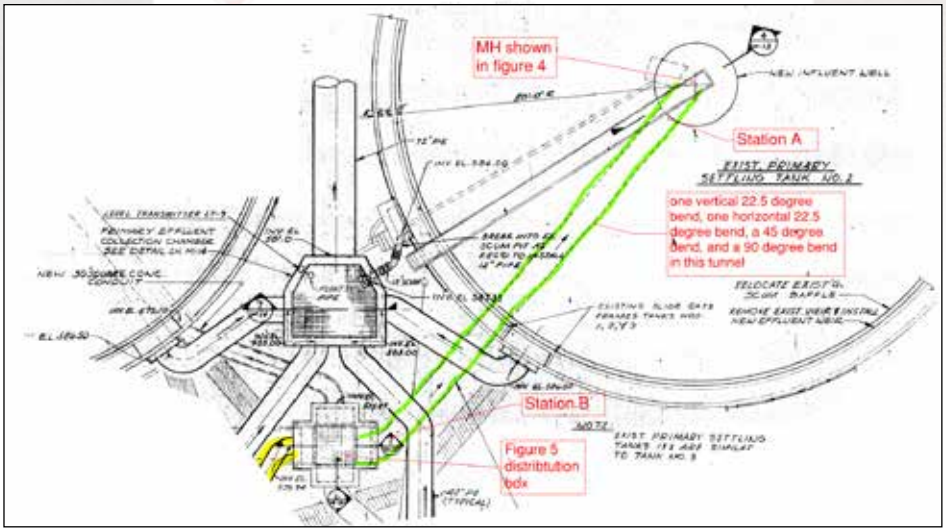

Figure 7. Plan view of PST#1 influent conduit

From hour 3 to hour 6 full steam was used and the temperatures slowly rose until the exothermic reaction began to occur a little over 170F and the temperature made a quick jump to 185F. For a period of three hours, air and steam was carefully mixed from hours 6 to 9 slowly lowering the steam to bring the temperature down from 180F to 140F. Three more hours of air movement from hours 9 to 12 carried the temperature down below 110F and the ends were cut off and all equipment removed. The next day the liner was post televised. Two days after the liner was completed, flexible grout was attempted to be pushed into the annular spaces in the corners from both sides (eight points). Less than 10 gallons of flexible grout was able to be pumped into all eight corners (four from each side). The day after (day four after installation) the ends were trimmed and end seals were placed with expanding urethane being placed and hydraulic cement tying new liner to the existing concrete. The slow and patient step by step inflation, heating, curing, cool down, and time before sealing the ends helped ensure close liner conformance. Waiting for a few days after the installation balanced the timeline of the project that was waiting for us to finish with the benefit of three days for the liner to do any shrinking before having the annular space attempted to be filled. Waiting till the fourth day for the end seals maximized the time for the liner to acclimate before they were installed.

6. RESULTS

It's important to recognize that not all non-conforming or non-circular CIPP installations have the same outcome or challenges. Each vary depending on project parameters and installation approach selected. While CIPP is an excellent rehabilitation technology, understanding project challenges, risks and results are essential. In this case, it was originally anticipated that there would be a 3-inch radial void in the corners that would require pressure grouting to fill. The actual radiuses were 1-inch in the corners on the inside. A discussion for how to fill and seal the ends reviewed mechanical seals, hydraulic cement, chemical grout, and expanding urethane as potential options. To eliminate potential water migration through the annulus void, it was elected to seal the ends with hydraulic cement after the essential pathways were filled with flexible chemical grout. Voids of this nature are common due to the square-corner host configuration and inability of liners to form sharp corners.

PST #1 was successfully lined with a 33-inch diameter 15mm liner as shown in Figure 8. PST #4 was acrylamide pressure grouted while the dewatering system was in place then touched up again after the dewatering was removed. PST #4 influent conduit is on the lining list for rehabilitation when the clarifier equipment is removed and replaced in the future.

7. LESSONS LEARNED

The decision process and the lessons learned came out as valuable information in non-conforming liner situations.

- The pull-in process became the single greatest difficulty for this project. Despite significant challenges during the work, the contracting team completed the project successfully. This can be attributed to pulling around directional changes with winching impingements. The greatest impact on the pull in was identifying optimum set up of the winch. The winch configurations at the top of the distribution box needed to be rearranged many times to take advantage of pulling capacity and minimize conduit damage.

Figure 8. Before and after lining of the vaulted precast ceiling in tunnel from PST #1 to the box

Figure 9. Post lining photos of 45- and 90-degree bend showing folds in the liner

- Wrinkles and folds did occur in the finished liner at corners. While these were anticipated, the wrinkles are prominent as they come into view with post-video inspections Figure 9. Hydraulic modeling by the design team in agreement with the operators of the plant showed the additional intrusion would not affect the flows in the system.

8. CONCLUSION

In the end, a thorough submittal process that was based on collaborative communication ensured the right fixes and the right materials were selected for each problem. Careful construction techniques for the pull in, inflation, stabilization, heating, and cooling ensured the best possible product for the site constraints. The construction ran into some hurdles that had to be overcome onsite and led to a 24-hour construction day, however the final product met the intent of the owner for each of the respective conduits.

9. REFERENCES

Bradley Marin, Aaron Bruce, and Jeff Nyenhuis (2018) - CIPP for the Hespeler Trunk Sanitary Sewer, TM1-T1-05, NASTT 2018

Justin DeMello and Paul Costello (2019) - Not on My Watch - Using CIPP to Ensure Disaster Doesn't Strike, MA- T5-01, NASTT 2019

Evans Bantios, Fritz Klingler, Nicholas Bassett, Joseph Alberts, Zachary Carr, Curtis Rozelle (2019) - Holiday Surprise! Emergency Repair and Lining of the PCI-12A Interceptor in Macomb County, Michigan, TA-T5-01, NASTT 2019

Jay Ferguson, Alex Sharpe, and Sanjay Patel (2011) - Purdue Pipeline Fix: Large-Diameter Cipp Solution, B-5-01, NASTT 2011

James W. Shelton, and Robert K. Lee (2009) - Pipe Line Grouting - What Engineers And Contractors Need To Know To Make It Work, B-3-03, Nastt 2009

Erez Allouche, Shaurav Alam, Jadranka Simicevic, Ray Sterling, Wendy Condit, Ben Headington, John Matthews, Ed Kampbell, Tom Sangster, and Dec Downey (2011) - A Retrospective Evaluation of Cured-in-Place Pipe (CIPP) Used in Municipal Gravity Sewers, Contract No. EP-C-05-057 Task Order No. 5, National Risk Management Research Laboratory, U.S. Environmental Protection Agency

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charlottenapwong@gmail.com

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The British Columbia Chapter (NASTT-BC) was established in 2005 by members in the province of British Columbia, Canada.

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www.nastt-nw.com

Chapter Contact
Ben Campbell
ben@neptunecoring.com

Elected Officers
Chair - Ben Campbell
Secretary - Jeff Galloway
Treasurer - Keith Moggach

The Northwest Chapter was established in 1995 by members in the provinces of Alberta and British Columbia, Canada, and in Washington state. In 2005, the members in BC established the NASTT-BC Chapter. In 2009, members in Washington state established the Pacifc Northwest Chapter and the Northwest Chapter adjusted the geographic area to include members in the provinces of Manitoba and Saskatchewan.

Pacific Northwest
www.pnwnastt.org

Chapter Contact
Carl Pitzer
Phone: (971) 227-3920
cpitzer@thompsonpipegroup.com

Elected Officers
Chair - Carl Pitzer
Vice Chair - AJ Thorne
Secretary - Glen Wheeler
Treasurer - Heidi Howard

The Pacific Northwest Chapter was established in 2009 by members in the states of Alaska, Idaho, Oregon and Washington.

Rocky Mountain
www.rmnastt.org

Chapter Contact
Benny Siljenberg
Phone: (303) 625-9502
benny@lithoseng.com

Elected Officers
Chair - Benny Siljenberg
Past Chair - Chris Larson
Secretary - Swirvine Nyirenda
Treasurer - Stephanie Nix

The Rocky Mountain Chapter was established in 2009 by members in the states of Colorado, Utah, Montana and Wyoming.

South Central
www.nastt.org

Chapter Contact
Justin Taylor
Phone: (281) 686-1430
justin.taylor@cciandassociates.com

Elected Officers
Chair – Jim Williams
Vice Chair – Justin Taylor
Secretary - Luis Cuellar
Treasurer – Josh Kercho

The South Central Chapter was established in 2015 to serve the members of NASTT from Texas and the south central area of the United States.

Western
www.westt.org

Chapter Contact
Lisa Arroyo
Phone: (805) 564-5412
lisa@arroyotrenchless.com

Elected Officers
Chair - Lisa Arroyo
Vice Chair - Kate Wallin
Secretary - Rachel Martin
Treasurer - Tim Taylor

The Western (WESTT) Chapter was established in 2003 by members from the states of Arizona, California, New Mexico, Nevada and Hawaii.

Southeast
www.sestt.org

Chapter Contact
Leonard Ingram
Phone: (888) 817-3788
leonard@engconco.com

Elected Officers
Chair - Jerry Trevino
Vice Chair - Ed Paradis
Secretary - J. Chris Ford
Treasurer - Ed Diggs

The Southeast (SESTT) Chapter was established in 2001 to serve the members of NASTT from Alabama, Arkansas, Florida, Georgia, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee and Puerto Rico.

For quick links to all NASTT Regional Chapters, visit

www.nastt.org/about/regional-chapters

NASTT Student Chapters

There are many benefits for students who belong to a NASTT Student Chapter – scholarships, networking opportunities, education and career opportunities, to name a few. Members of NASTT Student Chapters attend and participate in regional events and the NASTT No-Dig Show where they present trenchless research posters, participate in competitions, and provide event support, monitoring the technical paper sessions.

Arizona State University
Tempe, Arizona
Advisor:
Dr. Samuel T. Ariaratnam
Email:
samuel.ariaratnam@asu.edu

Bowling Green State University
Bowling Green, Ohio
Advisor:
Dr. Alan Atalah
Email:
aatalah@bgsu.edu

California State Polytechnic University, Pomona
Pomona, California
Advisor:
Dr. Jinsung Cho
Email: jinsungcho@cpp.edu

Clemson University
Clemson, South Carolina
Advisor:
Dr. Kalyan Piratla
Email:
kpiratl@clemson.edu

Indiana University - Purdue University Indianapolis
Indianapolis, Indiana
Advisor:
Dr. Dae-Hyun (Dan) Koo, P.E.
Email:
dankoo@iupui.edu

Kent State University
Kent, Ohio
Advisor:
Dr. Lameck Onsarigo
Email:
lonsarig@kent.edu

Louisiana Tech University/ Trenchless Technology Center
Ruston, Louisiana
Advisor:
Dr. Shaurav Alam
Email:
shaurav@latech.edu

Montana Tech
Butte, Montana
Advisor:
Scott Rosenthal
Email:
srosenthal@mtech.edu

Oklahoma State University
Stillwater, Oklahoma
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Ilchung Park
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Advisor:
Brad Wham
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University of Massachusetts at Lowell
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Email:
jongkim@unf.edu

University of Texas at Arlington/CUIRE
Arlington, Texas
Advisor:
Dr. Mo Najafi
Email: najafi@uta.edu

To learn more about the 18 NASTT Student Chapters, please visit:
www.nastt.org/student-chapters

NASTT Events Calendar

NO-DIG SHOW

Since its inception in 1991, NASTT's No-Dig Show has been the premier North American conference and trade show for the trenchless technology industry. Thousands of professionals from around the globe attend to learn new methods and systems that will save money and improve infrastructure. This conference provides attendees an opportunity to learn trenchless methods, network with peers and gain knowledge from vendors during exhibit hall hours. NASTT's No-Dig Show is the ideal event for municipalities, contractors and engineers.

APRIL 10-14 | MINNEAPOLIS, MN
NO-DIG SHOW 2022

April 10–14, 2022

Minneapolis Convention Center
Minneapolis, Minnesota

APRIL 30-MAY 4 | PORTLAND, OR
NO-DIG SHOW 2023

April 30–May 4, 2023

Oregon Convention Center
Portland, Oregon

What is the cost to exhibit?

NASTT Member Rate:
$2,300 In-line 10'X10'
$2,500 Corner/Island 10'X10'

Non-Member Rate:
$3,800 In-line 10'X10'
$4,000 Corner/Island 10'X10'

Sponsorships:
There are a variety of sponsorship opportunities for every price range:

- Gala Awards Dinner Event Sponsor
- Closing Luncheon Sponsor
- Mobile App Sponsorship Opportunities
- Pre-Gala Reception Sponsor

To sponsor or exhibit at any of these events, please contact NASTT:
888-993-9935

Upcoming Conferences, Courses & Events

August 18
Municipal Grouting Good Practices Course
VIRTUAL

August 29-31
Visit NASTT in booth 1908 at PWX
St. Louis, MO

September 13-14
South Central Trenchless Technology Conference
Sugar Land, TX

September 17
Laterals Good Practices
VIRTUAL

October 13-14
New Installation Methods Good Practices Course
VIRTUAL

October 27
RMNASTT Trenchless Elevated 2021
Denver, CO

November 8-10
No-Dig North
Vancouver, BC

November 15-16
Northeast Chapter Trenchless Technology Conference
West Point, NY

Index to Advertisers

APRIL 10-14 | MINNEAPOLIS, MN

NASTT NO-DIG SHOW 2022

The NASTT 2022 NO-DIG SHOW

MUNICIPAL & PUBLIC UTILITY SCHOLARSHIP PROGRAM

The NASTT 2022 No-Dig Show Municipal & Public Utility Scholarship Award has been established to provide education and training for North American municipalities, government agencies and utility owners who have limited or no travel funds due to restricted budgets.

Selected applicants will be awarded complimentary **full conference registration** to the NASTT 2022 No-Dig Show in Minneapolis, Minnesota, April 10-14, 2022. One day conference registrations will also be available. Registration includes full access to all exhibits and technical paper sessions… all you have to do is get yourself to the conference! Selected applicants will also be eligible to receive overnight accommodations. Selection based on responses to the application as well as need.

Apply today!
Application deadline is November 1, 2021.

APPLY FOR COMPLIMENTARY REGISTRATION, HOTEL ACCOMMODATIONS AND MORE!

VISIT: https://nastt.org/no-dig-show/municipal-scholarships TODAY.

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