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JULY 2023

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ON THE COVER

Participating in the 2023 *Trenchless Technology* Editorial Roundtable are, clockwise from top, Michelle Beason, P.E.; Ashley M. Rammeloo, MMSc., P.Eng.; Tiffanie Mendez; Stephanie Nix-Thomas, P.E.; and Cindy Preuss, P.E.

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PROMOTING TECHNOLOGY IN THE UTILITY CONSTRUCTION INDUSTRY

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RECOGNIZING WOMEN IN THE TRENCHLESS INDUSTRY

By Kelly VanNatten

Be prepared to be informed as you read through the cover story, the annual *Trenchless Technology* Editorial Roudtable.

Our editor Sharon M. Bueno sat down with five powerhouse women in the trenchless industry for a candid conversation to discuss how they got to where they are today and their stories along the way. If you don't know any or all of the women on the cover, they've all made a name for themselves in our industry and their stories will inspire women and men alike. Turn to Pg. 14 to read the story.

Reading through this article reminded me of my own start in this industry back in 1996. In a male dominated industry, I definitely took note of the women engineers, contractors and public works officials we covered in the early days of my career.

Back in 1999, we featured Deborah Frost, Florida Road Boring, and Barbara Kniff, KLK Construction, who both successfully took over their family utility construction businesses after suffering major tragedies in their lives. Another standout in my mind - Atlanta Mayor Shirley Franklin, a recipient of the John F. Kennedy Profile in Courage Award for her efforts in solving the city's financial crisis, including addressing long time problems with the city's sewer and water systems. Joanne Carroll, the first woman to serve as chair of NASTT, has been an influential woman in the trenchless industry for more than 30 years.

Trenchless Innovations

There is no shortage of innovative companies in this industry, and this issue highlights those companies and their innovative solutions to underground infrastructure rehab and new installation. Be sure to check out our Trenchless Technology Game Changers section (Pg. 44) for a look at some of the breakthrough innovations covering all facets of the underground construction industry — solutions that are pushing the industry to new heights, saving system owners money, revolutionizing processes, setting project records and having a positive impact on underground infrastructure project stakeholders.

What are YOU doing on World Trenchless Day?

WORLD TRENCHLESS DAY
September 28, 2023

World Trenchless Day is a day for the entire industry to rally together and share the world of trenchless to those who have not yet realized the positive impact that trenchless methods have on their communities. Since trenchless projects are mostly invisible to the general population, this is a bit of a challenge. I think the winner of last year's World Trenchless Day video competition illustrated it quite well. If you haven't seen the video, check it out here: *https://youtu.be/g7dW75FGSkk*

Encourage your company to participate this year. How, you ask? Host a networking event or site visit, write an op-ed to your local newspaper, visit a high school or university and engage the next generation, or submit a video to *Trenchless Technology's* World Trenchless Day video tribute (email me for details).

As always, the *Trenchless Technology* staff is here to serve you, our readers. Please, feel free to reach out to me at *kvannatten@benjaminmedia.com* or 234-380-3030 if you have any suggestions or comments.

Interested in contributing editorial? Contact Sharon Bueno, editor at *sbueno@benjaminmedia.com*.

Until next month!

Kelly VanNatten
Publisher,
Trenchless Technology

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Trenchless Pioneers

By Sharon M. Bueno

Trenchless Pioneers: Eric Wood

Trenchless Pioneers is a special monthly series sharing with readers the trailblazers who grew and expanded the trenchless industry.

The rehabilitation of an egg-shaped sewer was successfully completed in the London Borough of Hackney in the United Kingdom. Those who were involved with this seemingly inconsequential project in 1971 had no idea this would be the catalyst that changed the way pipes are rehabilitated or that it would spawn countless other trenchless applications, creating a multi-billion-dollar global industry.

At the time, future Insituform founder Eric Wood was an agricultural engineer, working for a company that supplied equipment to the mushroom-growing industry. One of his customers was having an issue with an air duct leaking condensate onto the mushroom beds, attributed to a leaky pipe. It was through this experience that Eric later developed the cured-in-place pipe (CIPP) solution as a method of repair for pipes in need of rehabilitation.

Wood came up with the CIPP solution to address the problem and the rest, as they say, is history. Insituform Technologies (now Aegion Corp.), was founded by Wood in the United Kingdom. Now headquartered in St. Louis, Missouri, it has churned into a global powerhouse in the trenchless market and the CIPP process has evolved into the most popular and cost-effective method to rehabilitate underground pipes — a process now used all over the globe.

Tragically, Wood was killed in a plane crash in January 1994 at the age of 59 — just as the age of the CIPP process was opening and expanding to competitors — but he was still able to see and enjoy the success of what he created.

The first CIPP installation was a far cry from the technology, setup and speed that are used today. Wood impregnated a felt tube with polyester resin, wrapped it in a plastic sheet, dragged it 230 ft into the 46-in. by 24-in. diameter egg-shape, brick sewer and inflated it with air. Then left it to cure ambiently — the pipe was fixed.

Always the innovator, Wood recognized a great business opportunity and seized it. At the time, the only other means being used to rehab underground pipes — besides replacement — was sliplining and grouting. Wood applied for the CIPP process patent in 1970 and it was granted 1971. He came up with the name Insituform using the Latin insitu — meaning in place — and form. Straight to the point: Insituform.

"Eric was always thinking, probably at a genius level," remembers longtime Insituform colleague and good friend Lynn Osborn. "He irritated some people because of his constant meddling but that was just his nature and how he developed some of his best ideas." Osborn first met Eric in 1984 and they worked closely together for more than 10 years, traveling to tradeshows and jobsites, as well as working at the R&D facility in Memphis.

With that first project in 1971 spurred other rehabilitation processes and appurtenances necessary for pipeline rehabilitation, such as robotic cutters to open service connections in small diameter sewers and enhanced CCTV technology. Other rehab processes and solutions that grew from the industry started by CIPP include pipe bursting, plastic sheet products, spiral wound, spray-on products, pressure pipe solutions, lateral and manhole rehab, GRP panels and more.

"All of this may have eventually happened, but Eric accelerated it by years and possibly decades in some cases," Osborn says.

Eric was always innovating, always developing new ideas, Osborn says, noting that at the time of his death, he probably had more than 100 patents to his name. "One of his patents was on ocean wave generators for producing electricity. That concept is now coming to fruition," says Osborn, noting a large project of this nature off the coast of Oregon.

Osborn says that, to him, Eric Wood is the father of pipeline rehabilitation, but that is not how he saw himself. "Eric would probably see his legacy as simply an agricultural engineer with an inquisitive mind. As he once said, 'I have always been interested in making improvements in technology. My interest is that if I become aware of a particular technical problem, I enjoy addressing that problem and endeavoring to find a solution.'"

What would Eric think about all that has happened over the last three decades since his death? Some say he would be shocked at the growth but Osborn believes he would be thrilled with the innovations that have occurred. "Sometimes he would sit back and smile. He would say things like, 'We had no idea a market like this would develop, but there is so much more potential,' Osborn says. "Then, he would start talking about his next idea."

Sharon M. Bueno is editor of *Trenchless Technology*.

AWWA'S 2023 STATE OF THE WATER INDUSTRY

Reports Sector Optimism on the Rise

Despite climate change-related challenges, aging infrastructure, threats to water supply, and other obstacles, water sector optimism and preparedness is on the rise, according to the newly published AWWA 2023 State of the Water Industry report.

AWWA's 2023 report provides insight into top issues facing the water sector such as aging infrastructure, how utilities are addressing technology needs, which kinds of capital improvement projects are most prevalent, how utilities are financing projects and more.

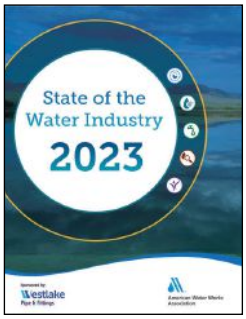
Read the executive summary for a snapshot or explore the full report to view additional material, including analysis, charts, graphs and a full ranking of the top 20 issues facing the water sector in 2023. Download for free at: *awwa.org/Professional-Development/Utility-Managers/State-of-the-Water-Industry#SOTWI_Report*

"AWWA members always amaze me," said AWWA CEO David LaFrance. "It seems like the harder the challenges get, the more confident and optimistic our members become. It's clear there are some significant hurdles in front of us — from infrastructure replacement to resource challenges to new contaminants to cybersecurity concerns — but water professionals never blink, they simply find ways to solve the problems in front.

This year's survey showed:

- Optimism is on the rise among water professionals.
- Aging infrastructure and long-term water supply are the top challenges.
- Utilities are prioritizing emergency preparedness.
- Public understanding of the value of water resources is a rising issue.
- Most utilities offer affordability programs to assist lower income households.
- Utilities are developing organizational diversity programs and training.
- PFAS and point source pollution are the top compliance challenges.

Since 2004, AWWA has published the annual State of the Water Industry report based on survey results to help water utilities, service providers, regulators and researchers identify and prepare for challenges, opportunities and trends impacting the water community. This year's report, which was sponsored by Westlake Pipe & Fittings, marks the 20th edition of the survey.



Long-term drinking water supply availability, financing capital improvements and watershed/source water protection are among the top-ranked issues facing the water sector in 2023. However, as utilities work towards more resilient, sustainable systems and operations, utility personnel are feeling more prepared about their ability to meet long-term water supply needs (54.7 percent are either very prepared or fully prepared and 29.5 percent are moderately prepared).

Utilities also signaled that they are prepared for both standard and climate related risks, with 88 percent of respondents indicating they have implemented or are in the process of implementing emergency response plans and 60 percent have implemented or are considering implementing a climate action plan.

This year's report captured feedback from 4,123 North American water professionals who were surveyed between October and November 2022, the highest response rate in the history of the survey.

APCA CELEBRATES PAST,

Plans for Future at 2023 Convention

Nearly 330 American Pipeline Contractors Association members traveled to the Bahamas in March for the 52nd annual APCA Convention, which boasted record attendance, a powerful education program, a new slate of association leaders, the launch of the new APCA Hall of Fame, the first-ever APCA Auction, and plenty of good times.

APCA members welcomed new president Roy Weaver, of Weaver LLC, who said that he is proud of the opportunity they have given him and looks forward to working with them, the board, and the staff to promote and protect merit-shop pipeline construction.

"APCA members don't back off, back away, or back down when things get tough," he said. "We keep going to work every day because we know what we do

makes a difference for our country."

Other new officers are 1st vice president Kevin LaBauve, WHC Energy Services; 2nd vice president Nick Bruno, Bi-Con Services; and treasurer Chris Jones, HardRock Directional Drilling, and new board members are Shannon Driver, Holloman Corp., and Adam Nitsche, Pumpco Inc.

APCA inducted the first three people into its Hall of Fame, recognizing their contributions to the association and the merit-shop pipeline construction industry: Jimmy Montgomery, of Montgomery Trucking Co.; David Dacusm of Troy Construction; and Shell Sanfordm of Sunbelt Equipment Marketing Inc. APCA also presented outgoing President Taylor Dacus, of Troy Construction, with the 2023 APCA Distinguished Service Award and honored outgoing Associate President Jason Hunt, of Montgomery Trucking.

APCA inducted the first three people into the association's Hall of Fame (from left): Jimmy Montgomery of Montgomery Trucking Co., David Dacus of Troy Construction, and Shell Sanford of Sunbelt Equipment Marketing, Inc.

Educational programming kicked off with keynoter Ross Bernstein, who spun fascinating stories about champion athletes into wise and practical business advice. Day two featured a government relations panel with Sue Forrester, American Gas Association, and Sarah Magruder Lyle, Common Ground Alliance, and a presentation by Susan Waller, Natural Allies for a Clean Energy Future, explaining how the group's strategy to promote natural gas is gaining traction with groups that are not typically part of our base. "We are really making a difference right now," she said.

Industry learning continued on day three with the Annual Associates Exhibit & Breakfast and a session on Carbon Capture Pipelines, moderated by Mark Bridgers, Continuum Capital, and with speakers from ExxonMobil and Navigator CO2 Ventures. On the convention's final day, members learned about recent developments in labor law from Greg Guidry, Ogletree Deakins.

Outgoing President Taylor Dacus closed the convention with a passionate state-of-the-pipeline industry speech, recognizing the APCA leaders who

APCA contractor members crowd into the Annual Associates Exhibit & Breakfast to discuss jobsite challenges and learn about the industry's latest products and services.

preceded him and taught him so much and thanking APCA members for entrusting him to lead the association and for their generosity to the pipeline industry.

APCA members meet next at the 2023 Mid-Year Meeting, Oct. 1-4 at the Westin Savannah Harbor, Savannah, Georgia.

SHAWN LOWMAN
Joins Tulsa Rig Iron

Shawn Lowman has joined Tulsa Rig Iron as director of sales. In his new role he will lead the company's sales efforts of new and existing products.

"Shawn's true love has always been in manufacturing, and we are pleased to have him join the Tulsa Rig Iron family," says Terry Flynn, vice president of sales and marketing.

Lowman has spent more than 30 years in sales, marketing and operations and the last 16 years in the oil and gas industry. Over the years he has gathered invaluable experience in the various segments of the industry from manufacturing and product development to working directly with contractors

Tulsa Rig Iron is the leading manufacturer of mud mixing and recycling systems, mud pumps, and hydrostatic test pump packages serving horizontal directional drilling and water well industries. Partnering with contractors involved in pipeline, telecommunications, and utility projects, Tulsa Rig Iron offers complete solutions for any size HDD project.

VERMEER CELEBRATES

the Opening of New Global Parts Distribution Center

Vermeer announces the opening of a 312,000-sq-ft state-of-the-art Global Parts Distribution Center to support the important work customers and dealers are performing around the world.

Vermeer team members will package and ship parts worldwide from the facility, located on the grounds of the corporate headquarters. The Global Parts Distribution Center builds on a legacy of customer support, located at the end of the old runway where company founder Gary Vermeer once delivered parts to Vermeer customers by plane.

"Vermeer is focused on optimizing this facility so we can most efficiently deliver the right part at the right time to our customers. This facility allows customer support, engineering, procurement and logistics to be co-located. They work in conjunction with our operational team members to make sure we fulfill customer and dealer expectations daily," said Tony Briggs, vice president of the Vermeer Lifecycle product group.

The location of the Global Parts Distribution Center leverages the manufacturing capabilities of the Vermeer mile, where most Vermeer products are assembled.

"Almost one-third of the warehouse is filled with parts made by different manufacturing plants on the Vermeer mile. It is very convenient for us to be located near the manufacturing facilities that supply those parts. Ultimately, we bundle the Vermeer-manufactured parts with other parts and ship the orders around the world to take care of our customers," said Briggs.

Three times more space than the previous building, the new Global Parts Distribution Center includes 23 dock doors, a warehouse management system and improved warehouse technology. This investment will help drive efficiency by centralizing parts storage.

"With people at the center of everything we do, this new facility helps our team members equip dealers and support customers and that ultimately makes a real impact on their ability to get important work done," said Jason Andringa, Vermeer president and CEO.

Jason Andringa cuts the ribbon to celebrate the opening of its new state-of-the art Global Parts Distribution Center.

The Global Parts Distribution Center is the second facility Vermeer has opened in 2023. Earlier this year, the company expanded its parts manufacturing footprint in Des Moines, Iowa. That facility manufactures horizontal directional drill tooling and utility tractor attachments.

As the number of products and markets Vermeer supports expands, the company continues to invest in its aftermarket efforts to meet the needs of a global economy.

REGISTRATION ONGOING

for Pipelines 2023 Pre-conference Workshops

The Utility Engineering and Surveying Institute (UESI) of the American Society of Civil Engineers (ASCE) Pipelines 2023 Conference is set for Aug. 12-16 in San Antonio, Texas.

In addition to the technical sessions and exhibit hall, UESI has a slate of pre-conference workshops planned that take place Aug. 12 and 13. All events take place at the San Antonio Marriott Rivercenter.

The Pipelines Conference is the premier industry event for utility and pipeline owners, design and consulting

engineers, contractors, manufacturers, suppliers, students, educators, researchers, and pipeline professionals. The conference will also include surveying as it relates to pipeline and utility projects.

Registration for the conference is ongoing and those interested in taking part in the pre-conference workshops must be registered for the conference (either full or daily).

Workshops scheduled for Aug. 12 are:

- Innovation in Large-Diameter Pipeline Management (8 a.m. to noon)
- Field Investigation Techniques & Interpretation for the ASCE-38 Standard (8 a.m. to noon)
- Large Equipment Owners Forum (1-5 p.m.)
- Force Main Rehabilitation (1-5 p.m.)

Workshops scheduled for Aug. 13 are:

- 50 Years of Success - Steel Pipe Review of Standards and Design (8 a.m. to noon)
- Direct Steerable Pipe Thrusting Manual of Practice (8 a.m. to noon)
- A Comprehensive Look at Municipal Installations of PVC and HDPE (1-5 p.m.)
- Manhole Rehabilitation and Inspection - 3rd Edition of Manual of Practice 92 (1-5 p.m.)

To find out more detailed information about these workshops visit *pipelinesconference.org/program/workshops*.

Pipeline Research Symposium

From 1-5 p.m. on Sunday, Aug. 13, Dr. Mo Najafi, P.E., F. ASCE, CUIRE Director and Associate Professor at the University of Texas at Arlington, will lead a Pipeline Research Symposium.

This symposium will include presentations by select speakers on emerging pipeline-related technologies. The attendees will be divided into interactive discussion groups to develop strategies to assist emerging technologies become accepted in the marketplace. Each group will address two technologies and include facilitators, a report leader, and a recorder to capture information.

To find out more about the symposium, visit *pipelinesconference.org/program/research-symposium*.

To take part in any of the pre-conference events, attendees must be registered for the conference. To register for the Pipelines 2023 Conference, visit *pipelinesconference.org/registration*. The deadline for advanced registration ends July 26.

2023 EDITORIAL ROUNDTABLE: WOMEN IN TRENCHLESS

The sight of having women leading trenchless projects is no longer the exception. Our panel discusses the impact women are having in today's trenchless industry.

By Sharon M. Bueno

For the 2023 Editorial Roundtable, *Trenchless Technology* delved deep into the topic of Women in Trenchless — gleaning perspectives from just a few of industry's most respected and leading women in the field of trenchless. Our panel comes from all walks of trenchless life and each with a different journey to share — engineering, contractors, manufacturers/suppliers and public works — offering keen understanding into the growth of women in the long male-dominated construction industry.

The 2023 Editorial Roundtable took place during the NASTT 2023 No-Dig Show in Portland, Oregon. Our panel consisted of:

MICHELLE BEASON, P.E.
Regional Manager National Plant Services, a Carylon Co.

The Roundtable discussion was frank, direct and their assessments of women in today's trenchless industry are powerful and empowering.

Trenchless Technology **editor Sharon M. Bueno led the conversation that covered a multitude of topics including the growth of women in the industry, as well as their experiences of sexism from "old-school" construction colleagues and what women bring to the trenchless table vs. male counterparts.**

Talk about what you do and how you were introduced to trenchless technology.

Michelle Beason: I've been in the wastewater/water business for 30 years. I started as an engineering consultant where we took on a lot of new construction projects. Then I worked for a utility district where I was on the planning and construction phase of new and rehabilitation projects. I really got involved in trenchless in 2010, and even more so since I joined National Plant Services in 2014 when I got more involved with trenchless repair services — point repairs, injection grouting, spray mortar lining; repairs that can trenchlessly extend the life of our assets at the lowest possible price.

Tiffanie Mendez: I work for Sunbelt Rentals and I'm the national sales director for the pump solutions business unit. I started out in the rental business very early in my career. I started out washing equipment in the yard. One day my manager came to

TIFFANIE MENDEZ
National Sales Director
Sunbelt Rentals Pump Solutions

STEPHANIE NIX-THOMAS, P.E.
Owner
Claude H. Nix Construction/Jasco Inc.

CINDY PREUSS, P.E.
Water Conveyance Discipline Leader
Water Services Group
CDM Smith

ASHLEY M. RAMMELOO, MMSC., P.ENG.
Director Water, Wastewater, and Stormwater Environment & Infrastructure the City of London

me and asked if I would like to try working at the counter. I just kept raising my hand when they would have opportunities and they kept giving me more stuff to do. At this rental business, they specialized in pump, pipe and filtration. So, I got to learn the business from the ground up. While doing that, I was going to school at night and working on my business degree. I was also learning a lot of cool engineering and design principles at this company. I had the opportunity to work with some really cool engineers and to do Cal-Poly's ITRC School for three summers from 1999-2001. That's where I learned about pipeline hydraulics and pumping. From there, the more opportunities that came up to sell bypass pumping, the more involved I got. It works like that in the rental business. You show up and do stuff and people keep giving you more to do, promoting you. I kept showing up and saying I'll re-locate, I'll go there and I'll do that — and here I am today.

Cindy Preuss: My current role at CDM Smith is water conveyance discipline leader. I am the internal and external technical resource for my company and clients, specifically in the area of trenchless technologies. I got into trenchless because of my second pipeline project ever as an engineer. The project included sliplining, several horiozntal directional drill (HDD) installations, cured-in-place pipe (CIPP) and auger bore and jack. I was greener than green than green, but doing my best to navigate through it all. I would love to give Vern Phillips of Harris & Associates some kudos because I remember him coming into my office during that project and asking if I was available to go to the upcoming No-Dig conference. I asked, "What's that?" Little did I know, that first No-Dig conference not only helped me with every trenchless aspect of my project design, but it blew my mind. I had need in both rehab and new installation areas and I didn't even know those were the two trenchless categories — it was really tough to decide what track to go to. Vern had said he wanted me to become the trenchless expert at Harris & Associates, and all it took was that first conference for that prospect to be exactly what I wanted as well. I walked away with a thirst and curiosity of all things trenchless that still inspires me today.

Ashley Rammeloo: I am the director of Water, Wastewater and Stormwater for the City of London (Ontario). I oversee a nearly 300-member staff in the engineering and operations of our sanitary and storm infrastructure, as well as wastewater treatment and water distribution. I came up through the sewer side of things. I got into trenchless technology in 2005 as an engineer-in-training, assigned to the trunk sewer inspection program. It was only a few years old at that point. That led to me being the project manager on the City's first trunk sewer CIPP project and it grew from there. From that, I was encouraged to write a paper and I presented it at different conferences, which led to No-Dig. That grew into me doing a larger trunk sewer lining program, as well as pilot programs to try some of the other technologies I was seeing at the shows. Currently, I sit on the NASTT Great Lakes, St. Lawrence & Atlantic Chapter (GLSLA) board.

Stephanie Nix-Thomas: I am the president of Claude Nix Construction, based out of Ogden, Utah. We are a trenchless contractor in the Intermountain West. My background is in civil and environmental engineering. I spent a number of years in consulting engineering, then worked for a regulatory agency in Utah. I joined the family business in 2000 and in 2002, my brother and I purchased the business from our parents. The company owned a Vermeer hammer from 1997 so they had done some trenchless technology before I got there. But in 2004, we did the first pilot-tube microtunnel project in Utah. In 2007, we paired pipe ramming with the GBM and we won an award at from NASTT for being innovative. It's been our core business since 2004.

How has the number of women grown during your tenures in the construction/trenchless industry, especially in leadership positions?

SNT: I would first say that a woman pioneer and leader in our business was June Jackson. And I don't know if anyone remembers June Jackson but she was a salesperson for Vermeer. She sold us that 12-in. hammer that we bought in 1997 and showed us how to do the first ram that we ever did. I think that a lot of the leadership since then has been in the engineering field, which I'm happy to see. I'd like to see more of it in the equipment, supplier and construction side of things. I think it just takes pioneering women who don't back down and have that 'Yes, I can do it' mentality. I have seen it evolve. I think discussions like this help because then more women can see women in these roles and that's how it makes it more comfortable for everybody: We're here.

AR: It was always really interesting for me coming to No-Dig in the earlier days when there were fewer women but so many of them were taking on leadership positions with the national board and the chapters. It's been nice over the last number of years to see the number of women you see at this conference increase, and that leadership has really continued. We have a really great legacy in trenchless and certainly with NASTT and at the No-Dig show. At the City, five years ago, we didn't have female staff that had their entire chain of command made up of women, and we do now. We actually have meetings now where the entire room is women and that didn't happen five or six years ago. It's really nice to see.

CP: I remember when I first came to No-Dig in 2004, Joanne Carroll was the only woman in leadership at NASTT. You look at it now, and how many women are on the board? Six. That's a pretty good increase over 19 years. Otherwise, I honestly haven't seen a big imbalance in women in the industry over the years. Except for construction, when it comes to engineering I've always seen a lot of women… Now whether they're actually acknowledged or accepted by certain clients (older, male clients), that can be a whole other story.

TM: So, in 1997 when I got to the rental industry, there was one female branch manager, Leslie Garner, and she was a pioneer. When I became a manager, it was pretty much her and me. There were women in the business but none of them were in leadership positions except for Leslie. I was the second female at the company to be promoted to a location manager, which meant you got to have your own crews, your own equipment and bid your own projects. That journey from 1997 until now, I've seen a tremendous evolution in the rental business where the industry has become more and more attractive to females. To the point now where, it's certainly not 50-50, but I will say in terms of leaders, managers and sales professionals, the highest performers, it's a 50-50 split between men and women, which is a lot different over the last 25 years. In terms of trenchless, I would come to No-Dig as an exhibitor and just brand new in my sales career, and I would see Kim Staheli, and say, "Man, I would love to talk to her." When I joined Sunbelt Rentals, they were extremely supportive of the trade association and encouraged us to be involved as we could, and that opportunity let me be at the shows and that's where I was able to serve on the program com-

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mittee. At my first program committee, who was the most energetic chair? Cindy Preuss. My point is that I'm sitting here at a table with all of you and it's all made possible because of this association and this network and fellowship we get to do. Especially for trenchless but transcending other areas of the construction industry. These kinds of opportunities are super valuable. I hope that out of this content that will be published, that more companies will have more visibility into why the investment matters and how they can meet their diversity goals in a sustainable and organic way just by providing opportunity for more people to feel like they belong.

MB: When I went to Purdue University and graduated there was maybe 3 to 5 percent women in my classes, the rest were all men. I volunteer to do lunch-and-learns at colleges and I see an increase from those early days, maybe 25 to 30 percent women. So, in terms of people entering the field, there's a lot more than when I went to college. I have specialized in construction for 18 years. As Cindy mentioned, there's very few women in the construction field. Most women in the industry are engineers, or work for municipalities. I rarely ever see contractor-owners, like Stephanie, active in the industry and that's unfortunate because I think women make very good construction managers and can lead and direct crews. We are good with planning and forward thinking. I think a lot of women are intimidated to get into construction because it's mostly men, it's field work, and it can be dirty. I am very hands on. A lot of people see my posts on LinkedIn… I'm in the pipe and help out the crews. I have earned the crews' respect. A lot of women can do that. Maybe they are not as hands on as me, but if you know your stuff, there won't be many problems. Sometimes you might get a look like, "Oh this person, what do they have to tell us?" but then you start talking, and they all realize you are an expert and can contribute. There's never been any disrespect shown toward me. I've even had people compliment and tell me, "Wow, you really know your stuff." Sometimes, they're so surprised, that they actually say it out loud. I wish more women would feel comfortable to enter the construction field but you need the right personality, too. You can't be intimidated, you'd need to get over that part. You have to learn to feel confident to be in a room full of men and lead them.

What are the challenges that women face working in construction/trenchless?

MB: I think the biggest challenge women face is the "challenge, period." Whenever you get introduced to a new group of people, they don't know who you are. They are thinking: Who is she? Does she have any experience? That is the scariest thing you need to ever overcome: that first interaction. How you carry yourself. How you have the work organized. If you know the product or projects you will be working on and have a good plan, everything else will flow nicely. In construction, there are people who have been doing the work for a long time, and don't want to be told what to do. But if you come into a situation with the right approach, are prepared, and you know your stuff, you won't have many problems. So that is the biggest challenge: navigating that initial interaction and planning phase when meeting a new group of core people — whether it be a contractor or city personnel — and being prepared. Confidence is my No. 1 piece of advice to give new, and seasoned, people in the industry.

TM: I would say where the challenge lies for us and from what I experienced is if, as a female, are in a location where you are not supported by your leadership. My advice would be if you are not supported by your leadership, if they don't see your value, you must move on to somewhere else — because you will fit and be amazing. Don't stay where your talents aren't appreciated. If you are supported by your leadership, and, to Michelle's point, if you come prepared and you know what you are talking about, then you can succeed. For a lot of us, you feel what's called "imposter's syndrome." You show up and you think: Why am I here? How can I possibly be good enough? Everybody goes through that and it's helpful for a woman just getting into the construction business to understand that everybody feels that way and it's ok. If you show up prepared, you do belong and can do this. I've been very fortunate to be surrounded by a talented group of mostly men, but women, as well, to have advocates in the business.

CP: I would say there are two main challenges. One is confidence, and the other is knowing what you don't know and being ok with that. Being honest about that lends itself to acceptance and personal growth. When I go out to a construction site or am interacting with a contractor, I understand they are the ones out there actually constructing the work I've designed — I can learn a lot from them. Through my interest in their means and methods and asking questions based on my understanding of the project, I start seeing the construction workers come around a little bit, like, "So, okay, she knows what she's talking about on her end of it and she's curious how we do it." In this way, the interaction becomes more of a collaborative dialog and not a know-it-all dialog (for either party). This can help diffuse any stigmas that otherwise may be had, while allowing me a great opportunity to learn.

AR: Going back to what Michelle was saying, it's a great benefit to be very deliberate in establishing your presence with them and building those relationships. If you do that, you can really minimize some of those challenges. I honestly think the biggest challenge is the perception of what it's going to be like. People now are more accepting and those who aren't, know that they're maybe not on the right path. There's always going to be a challenge with somebody new coming into a situation… showing that you do have relevant knowledge, that you do have some authority. You do that and you know your stuff, you're prepared, you're collaborative, and you appreciate them, then you get the same in return.

SNT: Seconding a lot of what's been said. The notes that I took are that it's your personal mindset and just having that confidence. If you are interested in it and you are good at what you are doing, don't let anything detract or distract. Be confident in what you are doing and continue on.

Sexism in construction isn't a new topic. In your experience, how have you handled sexism on the job? How much of an issue was it and currently is?

SNT: When I graduated in 1984 and went out on interviews to work for a consulting engineering firm, I interviewed with someone who asked me if I was planning to have children. And at 25 years old, I said yes. He then told me that he couldn't hire me because that would be a distraction in my career. My Dad teases me about being stubborn and bullheaded, and that interview solidified my resolve. I just knew I could do it. So, I don't let sexism bother me. I'm going to do what I'm going to do. If there's a

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AR: I graduated a little bit later than Stephanie so I've been fortunate to not have to deal with being in an interview where they are going to ask you do you plan to have children. That was already, absolutely not allowed to be asked by the time I was entering the workforce. But that doesn't mean you don't encounter it in those subtle ways and through microaggressions — that's where you see it. Occasionally, you get someone who avoids dealing with you, goes around you to someone else. Sometimes you go into a meeting and it's assumed that you're there to take notes. Not that there's anything wrong with being the administrative assistant but it's not the only job we hold. There was a time I went to a *Trenchless Technology* Roadshow and the night before I was out with some colleagues. I was sitting between two male friends from the trenchless industry and a few others who I didn't know. The next day when I went to the tradeshow, one of the men from the night before who I didn't know said, "Oh, last night, I was trying to figure out who you were married to." Well, I was the chair of the host organization. I wasn't married to either one of them. My husband was at home looking after our child. You get some of the sexism but it has evolved. It isn't the same roadblock that it used to be. It's around and it's annoying but I don't feel my career has ultimately been limited by it. I saw remnants of those attitudes, early in my career but those folks have since retired and moved on. The next generation is just not that way. It's more inclusive.

CP: It was early on in my career where I had the most struggles. The more seasoned individuals in the industry held fiercely to gender roles. So, this was the early 2000s and I was a project manager and had a client meeting. I went with my project engineer, who was male. We sat down with the client, who was male, and he would not address me. Would not talk to me. Would not look at me — even though I'm the one who handed out the agenda and was on record as the project manager. I would say something like, "Here's where we are, these are the 50 percent plans and here are some questions." I would then ask a specific question and he would turn to the project engineer and answer it, as if the project engineer asked the question. So the project engineer would look over at me, and I would then ask a follow-up question back to the client. It was just this ridiculous circle. When we walked out, the project engineer was astonished and asked me if that happens all the time? I said, "Not really, but that was the first time it was that much 'in your face." Honestly though, that was when sexism started to transition in the industry, and that client was retirement age. I've seen that completely shift over the years. I don't get that anymore.

TM: So, certainly when I started my career it was the age of the screaming superintendent, you had to 'kick the dirt and spit' in the field to get seen and heard. If customers came to our location to talk about pumps, they often would immediately turn to whomever was my male counterpart and ask them a question about total dynamic head or some such thing and that person would turn to me and wait for me to answer and we would explain the system to the client. I will say that for some of those gentlemen of a certain age, who threw their hardhats and screamed at everybody, they also, once they understood your value and that you can help them with cost control and you can add value to their project, many times those gentlemen became your biggest advocates. You see this evolution from "I can't talk to her" to "I can only work with Tiffanie because she's the only one who understands my needs and can solve my problem." I saw that evolution start to happen in the early 2000s and then as it has continued, many of those gentlemen are no longer in the workforce. The persons who have come into the industry have a much better understanding about how to conduct themselves professionally. It's not about being politically correct, it's about a culture of inclusion that allows people to experience a sense of belonging and bring their authentic selves to the workplace, which has a tangible business reason to do it in addition to just being the right thing. That's where we are getting to. I will say that in the rare instances where there has been sexual banter or somebody being wildly inappropriate in the workplace, whether it's been a client or, very infrequently, a team member, there was always a male advocate there to step in a shut it down. I've been fortunate to be surrounded by some husbands, fathers and advocates who say, "I've got daughters of my own and I know what they're going through, I'm not going to let this go on and let this happen on my watch." As many of those challenged persons as there were in the industry even back in the late 1990s and early 2000s, there were an equal or if not greater number of gentlemen who conducted themselves as gentlemen and advocates for women. I'm pleased to see that not only just for females but also for persons of color, veterans, persons with disabilities, neuro-diversity and the LGBTQ community.

MB: Echo everything already said by the group. There have been instances where I'm giving a presentation, but my male boss happens to be in the room and at the end of presentation, the people are addressing questions to him and not me. It happens less as time goes on. As others have said, as people retire, the old guard is leaving and new stewards are coming in. Plus, when people get to know who you are, that won't happen any longer. I will share this story. There are some individuals who are not used to working with women or they are just confrontational in general, whether it's a man or woman. I did a presentation in 2017 on a project. It was at a CWEA regional seminar. Gave a great presentation. I explained the project and successes of it. There were about 40 people in the room and at the end, the first person to say anything was a man. He said, "Wow, that was the best presentation I ever heard a woman give!" I thought for a minute and threw the statement back at him and said, "The best presentation you ever heard a woman give?" I needed to say something back to him, as everyone was watching me with wide eyes, but I didn't want to react too strongly. The way I did it was subtle enough because he then realized how it sounded. He said, "Well, you just really seemed knowledgeable. You seemed to really know your stuff. There's not a lot of women in the industry." He went on and on. He asked what my experience was and background. I explained my background, and the situation was smoothed it over. At the end of the meeting, people came up to me and said, "I can't believe he said that, etc." I don't think he meant it to sound the way it did. That is a good lesson: Don't overact, but respond. I threw the statement back at him as a question. I protected my integrity so it didn't look as if I was bowled over by a backhanded comment, and gave him a chance to recover in the eyes of the others. My biggest advice is to take a pause. Don't let someone give you a backhanded compliment or attack you. Shut it down. It will happen at some point. Be prepared on how you are going to respond. But do respond, professionally.

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MB: In my job as a construction professional, it is a very visible position. If you are trying to advance in the industry and obtain new customers, you are visible. I post photos of myself at jobsites on LinkedIn. It really helps people know you. And there's a lot of power in that. I have had people at conferences saying, "Oh, I love your posts on Linkedin." I might post once a month but people remember and see you are active. So, you become recognizable, and you have a lot of power in that. I get asked to present at conferences and I love to teach and share information. I think there is a lot of visibility in being a woman in a male-dominated industry. Back to the organization part, women are great planners. We can really plan projects well and you get respect from your coworkers because you are efficient and organized.

TM: For me, the advantage of being a woman in construction and trenchless is advocacy. It's being able advocate for other women and to see the challenges or the opportunity being provided disproportionately and then do something about it. The more visible you can be, as Michelle said, and the more advocacy you can provide and use your influence to help not just women but other persons of diversity to advance within or industry: for tangible reasons of creativity do we want to appeal to the mosaic of the community. The reason construction has been white, male dominated for so long is because other persons, other diverse persons don't see it as a viable alternative, based on what they see. Many times, women and other diverse candidates say this isn't some place I want to be because I won't feel like I belong here. But we have an opportunity as women, mature women in the industry who have built our careers, to say, "Let me be the one to show people how it can look differently." We certainly see that reflected at this conference. We certainly see it in the industry now that our advocacy is working and we can continue to leverage that. The other thing I would add is authenticity. What's worked well for me is always being authentically me. I've never tried to be one of the boys. And that has worked to my advantage because I want to be respected as a woman. As a woman, I want to wear jewelry, I want to do all the girl things. And I can still work here but I don't need to be like my male counterparts be a teammate and an advocate and a trusted colleague.

CP: I feel like an advantage is being a woman who has seen a transformation in the time that I've been involved in the industry. I'm able to impart and share that experience with younger generations who are very, very concerned about DEI, but don't know or realize that there actually has been progress over time.

AR: I think there is a big advantage in being a woman because it does bring that diversity, which means we bring a different lens. Our different experiences allow us to see projects or how something might go in a different way. This is the whole point of bringing diversity into the workplace; you get more perspectives and you find different ways of doing things. Just by nature of not having the exact same experience in life as your colleagues means you already approach things differently. There is that advantage and you can really stand out as a contributor. The other thing is when you are in a male dominated field, as a woman, people remember you. You already stand out. We often put a great deal of pressure on ourselves to fit in, in general, in society. But this is why I always loved being in operations and in construction — there was less expectation and pressure on myself for fitting in because by very nature of being female, I already didn't. It gave me a lot of freedom to just be myself, which as Tiffanie was saying, that's where you get your best work and your best contribution, when you are in that comfort zone. If you embrace that, you can really use it to your advantage.

SNT: I just think that there is a great advantage to being in the trenchless industry right now, in general. The fact that I'm a woman in this industry is exciting and interesting because it is growing so much and it's the right way to do things. I get to participate in a time where people are paying attention to it and we can bring innovative and creative solutions to every project that we. I love being in those conversations with the whole group where we have an open conversation and people are more open and being themselves, coming up with some great ideas because it's never been done before. And I get that on a daily basis. I think that really an advantage, not just to being a woman right now but just being in the industry. It's pretty exciting.

How do you think the construction/trenchless industry can attract more female candidates going forward?

SNT: By doing things like we're doing today. By showing women and diverse groups that you can fit in, you can help build a diverse and collaborative culture. Don't discount construction because you are different than what you think the industry accepts. The more of women the better. The more ideas the better. I'm looking forward to more diversity.

AR: It's the visibility. It's always an interesting problem. We talk about this with engineering in general. It's a big topic because you have to get to women so much younger than we sometimes do. We are having more women come into engineering school but it's stagnated a little bit because it was roughly 25 percent when I went into civil engineering in 1999, and that seems to be where it is now. Although, there was a university in Canada that reached 50 percent female registration in engineering recently. There have been strides. So, there is that — having women seeing it as a viable career path. There is also showing that this is a good industry to continue in once they graduate, making sure that we have the supports there. I think a good example is policies around maternity and parental leave. In our workplace, we are seeing a lot more sharing between moms and dads. So that is helping by lessening that belief by young women of 'I can't go into this field or that because I want to have kids', etc. We're seeing much less of that attitude. It's becoming less and less of a perceived barrier.

CP: This is where I get a little bit uncomfortable because I feel like we need more people interested in engineering, and trenchless, in general. I don't think that the need is specific to women or otherwise. We need smart people to get into the field. Specific to trenchless, I am mentoring two individuals at my company who happen to be women, but I'm really just trying to get more people interested in trenchless and show them how amazing trenchless is for so many reasons. So that's a big reason why I'm making a concerted effort to mentor. I would mentor even more people but it takes a lot on top of my workload; it's a formal mentorship program, so I'm capping it at two for now.

TM: I think that every case study and success story that we can share, everything we can make public around women having success in construction and trenchless is a catalyst for more women seeing it as a viable career opportunity. I was fortunate. In 2013, I did a brief stint at an environmental remediation company. The CEO was Ferdinand Seeman. I told him, "You won't want to hire me because I'm four months preg-

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nant." He said, you said you were going to come over when we got our venture capital and we don't care if you are pregnant. We just want you. I left Sunbelt for two years to do this remediation startup. The first project we had was a solvent removal job and I was 8 1/2 months pregnant doing the preconstruction meeting. This is a story I often share with other females. I was the construction manager in charge. It was my project. In the positions that we are in now, we have the opportunity to share those stories with others and to create that environment.

MB: I like to volunteer to speak to students at universities. I just did a presentation at Cal-Poly Pomona. None of them had had any coursework in wastewater or trenchless, but they got excited about the technology we have in sewers. Most schools these days are building centric — construction of buildings, not pipelines. I started my presentation with the basics, like what is asset management. Almost every project in every industry starts from asset management: How do we maintain things so they don't fail. The students got excited about asset management. They got excited about pipes and wastewater. Therefore, getting in front of people, men and women, is a great way to attract new faces. We want them to come work for us. Social media is also a great tool I post a lot of photos and make videos of our projects. That visibility is important — they 'see' a woman with men in a pipe, all suited up. Some think it's pretty cool and important stuff and they think "I can do that because she's doing it!" The younger generation uses social media extensively. Let's use that to our advantage to attract workers to our industry.

What is it about trenchless technology that keeps excited and involved?

CP: Honestly, it is NASTT and No-Dig. That is what has kept me engaged. Especially the innovative product awards, because they showcase innovative products every year at No-Dig, where there's a nice cross-section of new installations and rehabilitation. You get to see how fast technology moves in the industry. You're better able to keep your finger on the pulse by attending, and even perhaps influence technological advances by imparting feedback to manufacturers and vendors. Also, the opportunities for networking have opened up my whole career. My career is largely about the relationships I've built and the resources available to me, much of which is through NASTT. I'm not paid by NASTT but honestly, I am who I am in my career because of that organization. I can say that wholeheartedly. NASTT really makes a difference in this industry.

AR: When I got involved, a lot of the technology was really new to London. We had done smaller projects but we were just ramping up. So, it was a way for me to get involved in something that was really innovative for the city and to be on the forefront of something special and really establish a career path. The No-Dig shows were a huge part of that as well as the trenchless roadshows. Also, the people. When I came here, the people were so welcoming. The contractors were great about teaching you about it. Everyone was so excited about what they were doing and how the technology has evolved. Now I come in and we are talking about AI inspection and how that's going to be the next big change for a lot of the work we do at the city. Just when you think you've been using all these technologies and we got a track record, something changes and now it's the next leap forward. And you just don't get that in other aspects of construction right now to the same degree or pace. It's just an exciting industry to be in.

SNT: What keeps me excited about it is that it's challenging and it's innovative. Every project allows me the opportunity to strengthen or build new relationships to help me solve problems. No Dig and NASTT, as well as my daily work allows me to work collaboratively with suppliers, engineers and other contractors and it's so much fun. I enjoy every single day. After 23 years, I still like it. Sure, there are days I would rather just go skiing in the middle of the week but I do come to work excited every day. The other part that is exciting to me is that I've got people coming up through my business who I'm mentoring to take over on the next level and I'm excited to see what they are going to do. And the solutions they are going to come with. It's never the same.

MB: I've always been a bit of a natural teacher. I like to teach and help. It's really nice that I have this whole network of cities that can call me and ask me questions and advice, and I can in return give them good tips that will save them a lot of money. I love that I'm a resource, but I have this great network that I can call on to ask questions, too. And that gets me excited about new services and cool projects. It's rewarding to watch an idea or project take shape and have an impact.

TM: Two things keep me involved and motivated in trenchless. First, it's the people. The people you get to be with, who you get to meet and work with every day — teammates, clients, suppliers, vendors. Everybody. It's an amazing group of grounded professionals. It's amazing to have this network. I echo what Cindy said about NASTT and the opportunity to gather and share. It's been a huge boost for me and my career. If I hadn't been given the opportunity and empowered by my employer, my career would not be where it is today. That kind of empowerment and support is what keeps me motivated; it's the advocacy of our company and teammates. Secondly, the technology and what we do. And the fact that all the people we work with are so excited. They are so excited about this industry. You see it in the presentations and the energy.

What advice would you give any younger woman entering construction/ trenchless?

AR: If something sparks your interest, catches your attention, give it a try. Don't worry about being the only woman in the room because 1) you get used to it and 2) it won't be that way forever. Yes, there are challenges and frustrations sometimes but the benefits more than outweigh those.

SNT: Don't second-guess yourself, just do it. And if you have any questions, just call me.

CP: Speak up. You may have questions, and you may be a little bit lost in a conversation. Speak up because nine times out of 10, someone next to you is going to say, "thank you for asking that, I had the same question." Give yourself a voice.

TM: Arrive early and just do the best you can with every single day. If you look at yourself in the mirror at night and you can say, "I did everything I could today to move business forward, tonight I'm going to sleep well knowing that, and tomorrow I'm going out there and do the most I can again, and, when I have the opportunity to do so, I'm going to be an advocate for others."

MB: The most important thing is self-confidence and the relationships that you build and maintain. Your relationships will support you and protect you...they'll fight for you and you will for them.

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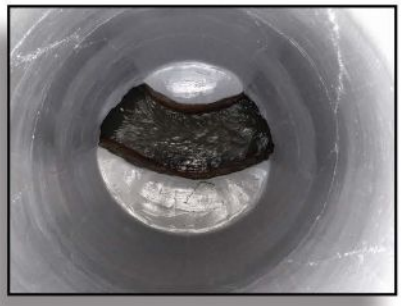

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BYPASSING LARGE PIPELINES WITH PNEUMATIC PIPE PLUGS: WHAT YOU NEED TO KNOW

By Pete Rogers

Pipe plugs are designed to perform three essential functions:

1. Blocking a pipeline
2. Conducting an air test in a pipeline
3. Bypassing effluent in an active pipeline.

Blocking a pipeline becomes necessary during new installation or maintenance when either effluent needs to be temporarily stopped or when a new pipe is being air tested for leaks.

Air testing a pipeline is necessary when testing a new installation for leaks before placing it in service or when trying to locate a leak in an existing line.

Bypassing is necessary when the flow of effluent in a pipeline needs to be redirected, most commonly when maintenance or repair is required for a longer period of time when the flow cannot be stopped.

This article concerns sewage bypass, selecting and using bypass plugs, and plug safety guidelines. A bypass plug has a tube or hose open at both ends of the plug, which runs entirely through the plug.

Bypass pipe plugs used in waterworks applications are pneumatic plugs. Pneumatic pipe plugs are used

for blocking, bypassing or air testing. Mainly used when working with industrial underground waterworks systems, they can fit into pipes up to 120 in. in diameter. They can also be used in smaller plumbing applications to test a complete system for leaks.

A pneumatic plug is a rubber ball that can be inflated with air, water or any inert gas (nitrogen) with a bicycle pump or large air compressor. As it fills with air, it expands against the pipe and seals in place, either stopping the flow in the pipe or redirecting it to go somewhere else. A second test ball must be put in place to check for any leaks between the two to run a low-pressure air test.

Bypass/muni ball plugs are used for testing and monitoring pipe systems. Some bypass plugs are designed to handle high back pressure in applications such as water mains, force mains, and industrial lines. A Muni Ball has a bypass tube running through the plug that allows the user to bypass effluent through the tube.

Most bypass pipe plugs come with adapter caps threaded onto the bypass on the front of the plug. Those with caps can also be used for blocking and with the cap removed, they can be used for bypassing. And, with the cap adapted with air fittings, it can be used to perform an air test. There is a broad size range of bypass plugs on the market from ¾ to 96 in. in diameter, with bypass tubes ranging from ½ in. to 24 in.

Types of Bypassing

Certain bypass plugs are designed for two types of bypassing. Pump bypassing and gravity bypassing.

Pump Bypassing

Bypassing with a pump involves a municipal pipe plug being installed in a pipeline upstream from where maintenance or replacement work needs to be conducted. The plug is installed into the pipe, and a hose or pipe is attached to the bypass on the front of the plug. The hose is then connected to a pump on the intake side and another on the output side.

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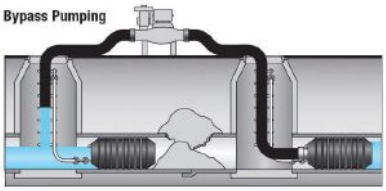
Then, effluent is pumped up and out of the manhole running downstream, and past where the work is being conducted, before it is routed back into another manhole where the effluent can continue. A blocking plug is installed on the upstream side of this manhole to prevent effluent from flowing toward the work area.

Gravity Bypassing

This type of bypassing occurs when work needs to be conducted in an active manhole, but the flow cannot be blocked. In this instance, two municipal pipe plugs are installed into both access pipes that feed into the manhole. A hose is connected between the bypasses of the two plugs so that the flow can continue while the manhole remains dry.

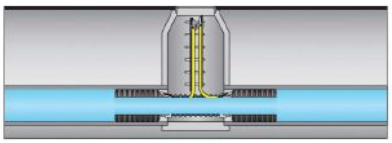


Proper Pipe Plug Selection

To select the correct municipal pipe plugs for your application, the following questions need to be answered:

- What is the inside diameter of the pipe you need to plug?
- How much volume must the bypass accommodate? This goes to the size of the bypass required. You can obtain this information from your project engineer.
- What are the back pressure requirements? In other words, how much pressure will the plug be required to hold?
- Pressure is most commonly measured by either pound per square inch (psi) when the pressure is coming from air, or
- Feet of head, if the pressure comes from liquid such as water or sewage.
- What is the access opening the plug needs to fit through to be installed? Most commonly, this would be the diameter of the manhole the plug must be passed through before it is installed. Many of municipal pipe plugs have flexible hose bypasses that allow the plug to be bent up to 45 degrees to aid in installation
- What is the temperature of the media being blocked? Cherne's Muni Balls are made of natural

Gravity Bypassing



rubber because of their flexibility, memory, and durability. However, natural rubber should not be exposed to temperatures exceeding 125 degrees Fahrenheit, as it will begin to melt.

- Are there going to be any oils, hydrocarbons, or petrochemicals in the media the plug needs to be blocked? These may harm natural rubber and cause it to degrade. Please consult with the factory if your application involves blocking substances such as these.

Important Safety Considerations

Special care needs to be taken before and after a Muni Ball or any pneumatic plug is placed into service:

- Inspect the rubber body of the plug for punctures, bulges, cracks, corrosion, and leaks.
- Inspect the end plates of the plug for cracks, loose fit, missing or damaged eyebolts, rusty end plates and fittings, and damaged inflation fittings.
- If any of these appear, we recommend consulting the Cherne factory.

While installing the Muni Ball:

- Make sure an extension hose with an accurate pressure gauge is used to safely inflate the plug, monitor its air pressure while in use, and deflate the plug from a safe distance.
- Always ensure the pipe the plug is being installed in is inspected and debris such as gravel or broken glass is removed.
- Avoid installing the plug over any exposed rebar.
- Ensure the plug is inflated to the exact inflation pressure prescribed by the manufacturer.

After the work is completed, eliminate any back pressure in the pipe before deflating the plug. Do not attempt to remove the plug from the pipeline until it has been completely deflated.

Remember, most damage occurs to plugs when they are either being installed or removed from the pipe. A safety instruction manual is provided with each Muni Ball when it leaves the factory. Make sure you review it and understand all precautions.

Pete Rogers is an inside sales specialist at Cherne Industries, part of the Oatey family of companies.

CRITICAL INFRASTRUCTURE:

50 MGD Bypass Needed for New Force Main Project

By Anna Anderson

A bypass was required during construction of a new force main to convey treated water from a water reclamation facility to a pollution control plant, a key milestone within the greater Bay Park Conveyance Project.

Nassau County, New York The Bay Park Conveyance Project (BPCP), the largest microtunneling project in the Western Hemisphere, is being carried out by some of the nation's most trusted construction and service companies to "Improve water quality and storm resiliency in Long Island's Western Bays by upgrading existing wastewater management infrastructure... On March 14, sliplining began, repurposing more than seven miles of an abandoned aqueduct beneath Sunrise Highway between western Rockville Centre and western Wantagh in Nassau County. By repurposing this existing structure, the new pipeline will be constructed faster, at a substantially reduced cost, and with less disruption for area residents," according to a New York State Department of Environmental Conservation press release.

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Rain for Rent was brought on board during a key milestone moment in this multi-year project to provide bypass system design and necessary pumping equipment. The bypass system would be utilized for the phase wherein construction of a two-mile effluent force main conduit was required to convey treated water from the South Shore (previously known as Bay Park) Water Reclamation Facility (WRF) to the rehabilitated aqueduct under the Sunset Highway, and ultimately to the Cedar Creek Water Pollution Control Plant's (WPCP) outfall pipe.

Rain for Rent's local branch team from Keyport, New Jersey, developed the design, delivered the equipment, and provided installation services (via training provided to the contractor's team) for the 50 mgd bypass for Bay Park Water Reclamation Facility Effluent Channel.

The bypass system, engineered to fit into a minimal footprint, was comprised of five 18-in. DV400 pumps, four primary and one standby, each outfitted with pressure/level transducer controls to operate automatically.

The transducers were set to automatically start and stop the pumps at a predetermined level — as the flow would rise the transducer ramped the pump speed up and down to mimic flow. The transducers were set up with "stairstep" methodology to allow each pump to start and ramp up to full speed before the next in line came on — a process repeated as necessary until all the primary pumps achieved full speed, if needed. Once the flow receded, the

process would commence in reverse.

The suction piping consisted of individual 20-in. HDPE SDR17 suction tubes, approximately 30 ft at their greatest length, inserted at a minimum of 4.4 ft of submergence (to prevent a vortex) into the effluent inlet channel behind the temporary bulkhead.

The discharge (18-in. HDPE SDR17) from each 18-in. pump flowed through isolating 18-in. knife valves to regulate head pressure on the pumps and prevent cavitation, into a common manifold which consisted of five 36-in. x 18-in. tapping sleeves placed on the 36-in. HDPE discharge pipe. Exiting from the HDPE manifold, a single 175-ft run of 36-in. HDPE SDR17 discharge line conveyed the flow to the top of the effluent pump station tower. At the discharge point, the pipe discharge extended deep into the tower to prevent splashing and odor.

Due to the requirement that this project be operated by the contractor's team, Rain for Rent provided instruction and training, and a Rain for Rent supervisor remained stationed on-site for the entire 20-day installation period to ensure any questions could be answered in person without delay. Additionally, Rain for Rent provided an on-site supervisor for pump watch to ensure the proper assembly and disassembly of the system's suction stingers.

The daily stinger break down was necessary due to the plant's requirements that the bypass system only operate at full flow; and, with the contractors working a strict 5 am to 12 pm shift each day, the temporary bypass system suction stingers had to be disassembled at the pit at the end of each shift to allow for the existing permanent system to take over – an engineering element Rain for Rent incorporated into the system's design.

The customer was thoroughly pleased with the design, services, system and equipment performance provided by Rain for Rent; and their feelings of satisfaction and trust were reinforced by Rain for Rent's demonstration of pride in partnership when training and supporting the contractor's operations team.

An ongoing job, the project, according to the press release, will ultimately "Reduce nitrogen pollution in the Western Bays by redirecting treated water from the South Shore WRF to the Cedar Creek WPCP. From Cedar Creek, the treated water will be discharged approximately three miles offshore in the Atlantic Ocean via an ocean outfall pipe that diffuses the water and disperses it. A new pump station will be constructed at the South Shore WRF.

Project work began in March 2021 and is expected to be completed in 2024."

Anna Anderson is corporate communications manager at Rain for Rent.

NAVIGATING CHALLENGES AND BUILDING BRIDGES

Pre-Design Preparation Critical to Bypass Success

By Ladd Gould

During fall 2019, a major city in the Southeast was in the process of planning and designing a substantial sewer rehabilitation project. The objective was to rehabilitate 2,700 ft of 78-in. sewer pipe using the cured-in-place method.

This project presented several formidable challenges in terms of access. The project site had the potential for flooding, and the sewer easement itself posed additional difficulties as it passed beneath a busy four-lane NCDOT parkway, traversed a bustling mall parking lot, crossed a two-lane road, and continued along a newly paved walking trail within an active greenway.

During the design phase of many sewer rehabilitation projects, the focus tends to be primarily on the access areas directly impacted by the scope of the rehabilitation. However, for the rehabilitation to take place there is a high probability the diversion of the sewer will impact the community outside of the rehab scope. Therefore, it is critical to pull back and consider the broader picture. Every community strives to avoid congested roads, blocked driveways, detours, inaccessible businesses, or closed parks.

Recognizing the potential challenges for this project, the City and design engineers took a proactive approach by involving experts early in the design process to set realistic expectations for executing the temporary diversion. This foresight allowed the project team to identify access issues in advance and create a comprehensive plan for the bid documents. The plan detailed key access areas, methods for crossing major roads, and right-of-entry strategies to minimize the impact on the community and local businesses.

Scoping the Project

The primary goal was simply to divert the flow for the cured-in-place lining process. The suction structures chosen to bypass the flow were positioned near a creek prone to flooding. The bypass piping route required the pipes to ascend an embankment, cross the four-lane DOT parkway, navigate the mall parking lot, cross the two-lane road, and finally traverse the greenway to reach the downstream manholes near the treatment plant. The bypass pumps had to generate enough pressure to convey 57 million gallons per day through 4,600 lf of piping. In addition, a pressurized 36-in. force main tied into the 78-in. line, necessitating another separate bypass design. Lastly, given the sewer line's proximity to the creek banks, flood mitigation measures were crucial to protect the pumping system and prevent inflow into the sewer line during extreme weather events.

Detailing the Challenges

The primary project challenge was the route for the bypass piping — across a state DOT controlled major parkway. The project team considered — and rejected — several options for the bypass discharge pipe to cross the parkway. A typical solution is trenching — a shallow road cut for the bypass pipes with a road plate over the cut. Given the mild temperatures in the southeast, pipes rarely freeze, therefore water lines are placed without much cover. In this case, the existing utilities were simply too shallow to allow adequate depth to place the 24-in. bypass discharge piping.

Another possibility called for a jack-and-bore process to install large steel casing for the bypass pipes to go beneath the existing utilities. Since the alignment of the bore was in the same right of way as the existing 78-in. sewer, it was noted the 78-in. sewer was tunneled out of solid rock. This increased the chances of jack and bore failure if rock was encountered, thereby driving up cost for the owner. Additionally, the placement of the bore pit in the parking lot would have negatively impacted the mall.

The road crossings were not the only challenge. The City required the suction points and all bypass pumps to be protected from flood waters of the creek to an elevation that was higher than the 100-year flood plain in case of hurricanes or tropical storms while still providing access to the pump watch personnel for fueling, operations and maintenance.

The City, engineers and Sunbelt Rent-

als discussed and resolved the challenges even before the project went to bid. This way, the specifications would provide clarity to the contractors bidding on the project by including all the required elements for the access and the bypass.

Bridging the Route

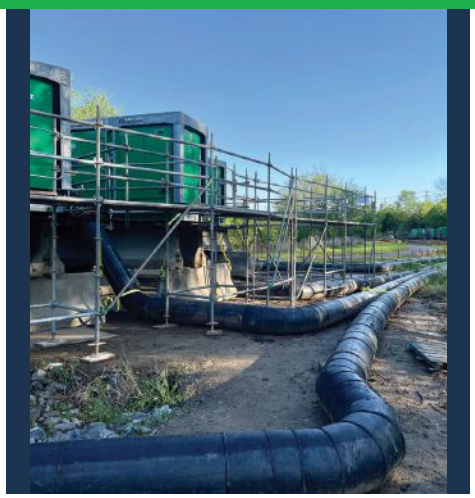
A previous siphon sewer rehab project in Montgomery, Alabama, inspired the solution for crossing the North Carolina DOT roadway. The Montgomery project required the use of bridges to cross multiple waterways for the bypass pipes. They were efficient and relatively easy to deploy. This led the team to the initial design for a temporary aerial truss bridge on towers to support the 90,000 lbs of the three 24-in. HDPE pipes, while still providing the vehicle clearance required by the DOT.

The pipe traveled up and over the parkway on a 135-ft aerial bridge which provided close to 20 ft of vehicle clearance. The piping then traveled through the mall on right-of-way easement, which required water-filled barriers to protect the above ground pipe, along with several trenches and temporary road plates to bury the pipe for unimpeded vehicle access to the mall. The team opted to build another 100-ft aerial bridge to avoid another difficult road cut to which allowed the three discharge pipes to cross a two-lane road. After that, the pipe ran down the east side of the greenway on its way to the discharge manhole. Extensive composite matting was utilized to protect the newly paved greenway from pipes and equipment, including heavy trucks and resin tankers.

At the discharge point, the three 24-in. pipes converged into a 36-in. common discharge manifold, and a 36-in. HDPE elbow facilitated the transition into the downstream manhole. This reduced the need for additional modifications to the discharge manhole besides a cone pull.

Flooding Protection and Remote Monitoring

To keep the pumps above the creek



floodplain, Sunbelt Rentals used steel road plates and concrete jersey barriers to elevate the pumps 6 ft above grade. To protect the suction location, the existing lid of the downstream suction vault was removed, and a 6-ft wall of steel sheeting and a waterproof membrane was installed to prevent potential flood waters from infiltrating the sewer.

Additionally, another challenge of elevating the pumps 6 ft above grade was the need for safe access. Accessing pumps with ladders was not an efficient option. As a solution, Sunbelt Scaffolding Services constructed scaffolding around both elevated suction locations which allowed for safe access for the Pump Watch Technicians to operate, fuel and maintain the pumping system.

From the suction point, all pumps conveyed flow using a common manifold and discharged through three 24-in. SDR26 HDPE lines. Flow meters were installed on each of the main 24-in. discharge lines and several pumps were connected to Sunbelt Rentals PumpSentri. The pumps' performance and the system flow were continuously monitored using PumpSentri technology, providing real-time data through a remote dashboard to which all the project stakeholders had access.

Force Main Challenge

Managing the 36-in. force main posed another challenge. Initially, the plan involved routing the force main through the three 24-in. discharge lines. However, due to increased friction and head loss from the bridges, it was determined that the existing pump station might struggle to overcome the additional pressure. Fortunately, a pig launch retrieval station with a valve near the force main discharge offered a solution. Sunbelt Rentals used a single 24-in. HDPE pipe to redirect the force main to a manhole downstream of the first suction location, allowing the flow to be conveyed back upstream to the two bypass suction structures.

Valuing Foresight

The project required 13,200 lf of 24-in. HDPE pipe, and 10 high-volume 12-in., 325-hp primary pumps, with eight serving as primary and two on standby to achieve the design flow of 57 MGD. To ensure effective operation, two technicians were on-site to perform Pump Watch maintenance and refueling of the diesel pumps.

Throughout the project's duration, the temporary bypass system operated flawlessly. While under full bypass, the city personnel observed degradation in the downstream suction structure and decided to repair it while the bypass system was still in place. Once the rehabilitation of the 78-in. sewer was completed, the pumps at the downstream manhole were removed. The 36-in. force main was reinstated, and the upstream bypass system facilitated the diversion needed to complete the manhole repairs. This approach resulted in significant cost savings for the city, utilizing the existing partial bypass system and the already operational discharge pipe.

The successful delivery of this complex project was made possible through the diligent planning and ingenuity of the design team, coupled with the speed and efficiency of the prime contractor. By involving temporary diversion experts early in the process, the project's bypass challenges were addressed proactively, resulting in reduced risk, cost and impact on the community.

Ladd Gould is national strategic customer manager at Sunbelt Rentals Inc.

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SAN DIEGO WATER AGENCY UPGRADES AGING AQUEDUCT

Critical Water Supply Tunnel Sliplining a Success Thanks to Careful Planning, Collaboration

By Bijan Khamanian

Through a design-build alternative delivery method, San Diego County Water Authority undertook the rehabilitation of its First Aqueduct Treated Water Tunnels located in Escondido, California.

The timely rehabilitation of the First Aqueduct is part of the Water Authority's proactive asset management program. An essential element of providing safe and reliable water supplies is assessing the agency's 310 miles of large-diameter pipeline and making the upgrades necessary to continue serving the region. That work, funded through water bills paid by residents and businesses across the county, sustains the region's $245 billion economy and quality of life.

"The First Aqueduct delivered imported water to our region for the first time more than 70 years ago, and it remains critical to water supply reliability for our region to this day," said Gary Croucher, chair of the Water Authority's Board of Directors. "Coordination across Water Authority departments and collaboration with our member agencies allowed us to complete this extraordinarily complex project and ensure these pipelines operate for generations to come."

Through a lengthy statement of qualifications and approval process, the agency awarded the project to Michels Trenchless Inc. and Stantec. The initial design package identified several methods for relining these tunnels. Welded in place steel plates, sliplining with FRP, cured in place pipe and spray on liners.

Phase One — Sliplining

The Michels/Stantec design-build team quickly eliminated all but the sliplining option for Phase One. Some of the project requirements do not allow for slow-moving construction methods. Welding,

coating, contract grouting, etc. take too long and would result in a 3 to 4 year process (shutdowns limited to three per winter).

The goal was to try to complete the tunnel rehabilitation work from December to March and demobilize entirely from the site by the end of April.

shoe concrete tunnel. The 70-year-old structure was relined using 63-in. (1,600 mm) ID fiberglass reinforced polymer mortar (FRPM) Hobas pipe. The tunnel was more than 385 ft (117 m) deep under the peak elevation, resulting in an estimated 155 psi (10.5 bar) external hydrostatic head. The design allowed for zero infiltration for the entire run to

completion of additional work outside of the tunnels while the aqueduct was in operation. The work also included a seismic retrofit of the Oak Hills downstream bifurcation structure, where the flow from the 63-in. pipe was split to twin 42-in. siphons downstream of the tunnel.

As one of the longest-pushed slipline projects in a dry host pipe, and to reduce

Project requirements:

1. Non-tunnel work could be completed between flow shutdowns, as the tunnel could not be taken out of service during construction.
2. A maximum of three, 10-day, shutdown periods (24/7) during the winter season of dry time is allowable in the tunnel.
3. Construction was only allowed in winter when the water usage was less than in summer, enabling conveyance systems to go offline.
4. The pipe was installed by jacking a full pipe string from the access pit in a single drive.
5. 100 psi internal Pressure Rated Pipe
6. 160 psi external pressure rating
7. Standalone structural system
8. NSF61 potable water rating
9. Placement of special temporary diversion pressure fittings between the shutdowns to enable the flow to be put back into the downstream aqueduct.

The Oat Hills portion of the project consisted of more than 3,600 lf (1,120 m) of existing 72-in. (1,830 mm) ID horse-

maintain the highest purity of the precious drinking water source.

To add to the strict shutdown schedule, several 2023 winter atmospheric rivers hit during the project's construction at Oat Hills. The excessive precipitation induced further stress on the construction schedule.

Selecting the Right Pipe

The Michels/Stantec team elected to use Hobas FRPM pipe. The pipe demonstrated a 100-plus-year design life per ASTM D3681 long-term strain corrosion test procedure for fiberglass reinforced polymer mortar pipes. FRPM pipes offer a multigenerational solution, a low carbon footprint and a sustainable option compared with pipes that require replacement or renewal every 30 to 50 years.

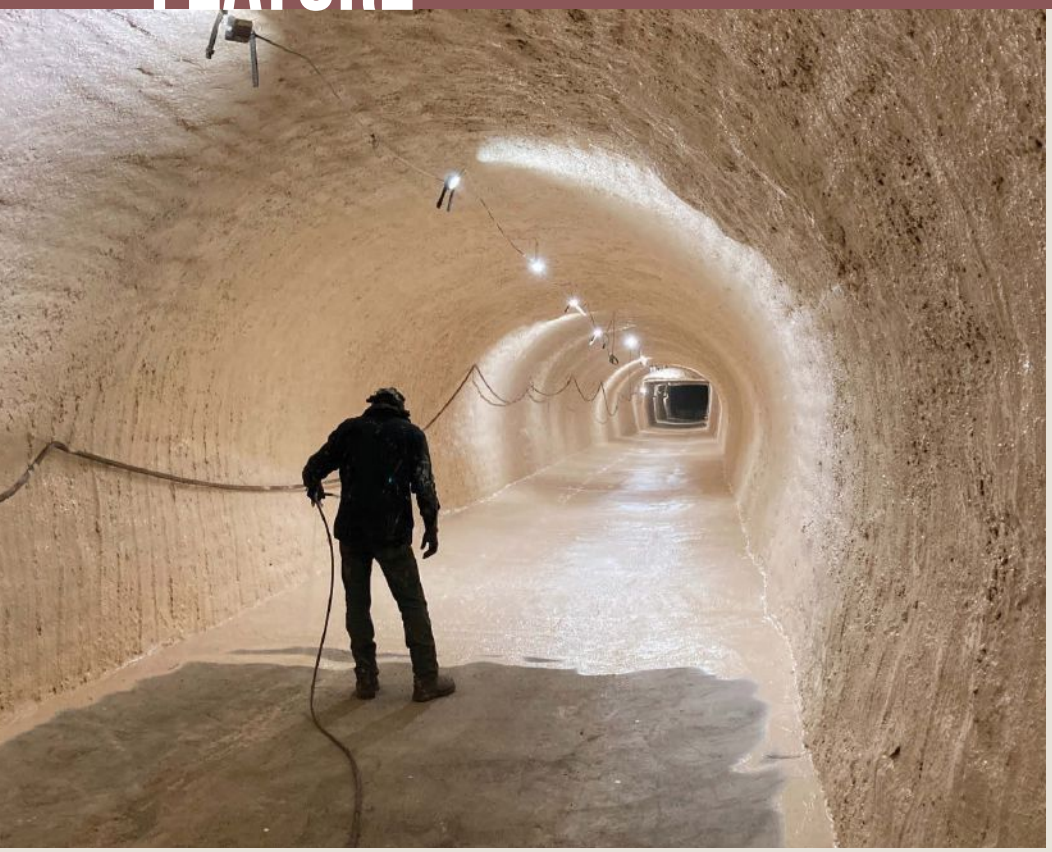
To ensure the rapid installation of the pipe inside the host tunnel, the Michels team picked 20-ft (6 m) joints for the task and completed the slipline portion of the project in just over three months from December 2022 to March 2023 in a single winter season. The project completion date of June 30, 2023, allowed for

the anticipated higher-than-normal jacking loads, the original Michels design used wheeled casing spacers for the entire run. After further study, it was determined that based on Hobas' high jacking capacity, much simpler spacers with polypropylene shoes would also work and this revision was made to the design.

The team used an Akkerman SL100 sliplining frame and power system to expedite the installation and increase the number of pipes placed daily. During the second shutdown, with the machine and spacers in place, the lining process took 55 hours to complete, with just under 3,600 lf placed in the system, and completion of the first lift of the annular grout install—the balance of the grout installed during shutdown three.

The project was a complete success, thanks to careful planning by the contractor, consultant and all suppliers and subcontractors in conjunction and cooperation with the Water Authority to make this a showcase for similar projects in the future.

Bijan Khamanian is the division manager North and Canada for Hobas Pipe USA Inc.



REHABBING PITTSBURGH'S M29 OUTFALL

Challenging Project on the Shores of the Monongahela River

By Mallory Griffin

Site conditions often determine the feasibility of trenchless vs. open cut repair. One recent project along the shores of the Monongahela River in Pittsburgh, Pennsylvania really bring this to light.

The roots of this project can be traced to 2016 when the Allegheny County Sanitary Authority (ALCOSAN) inspected the M29 combined sewer outfall and found the brick structure to be in severe disrepair. A solution had to be found before a catastrophic event occurred that would damage not only the sewer itself, but the railroad tracks and state highway above.

Sewer History

The M29 outfall was initially built to culvert a stream and provide land for a steel plant operation along the Monongahela River in the 1800s. The original culvert was a 10-ft by 14-ft rectangular brick structure, more than 30 ft deep and 120 ft long. It was extended another 330 ft in 1892 with a 15-ft brick arch structure for a total length of 450 ft to the current riverbank location.

Over the years on the steel plant site, a state highway and local railroad were constructed on top of the M29 structure, preventing access from above to the 30-ft-deep culvert. Today, the M29 outfall serves as the second largest CSO in the City of Pittsburgh and it is a significant part of the Pittsburgh Water and Sewer Authority (PWSA) and the downstream ALCOSAN combined sewer interceptor network. As such the project is jointly owned by PWSA and ALCOSAN.

Designing a Repair

The engineering team evaluated several replacement, repair and trenchless rehabilitation options for the culvert. The designers selected to competitively bid geopolymer structural lining or shotcrete lining with steel reinforcement due to the size and accessibility of the structure. Given the sheer size and location of the outfall pipeline, trenchless rehabilitation would not be a standard application for design or construction. The M29 outfall application required careful planning and design.

Access to the CSO culvert had two options; from either the river outfall via barges or secondary access to the structure was 450 ft upstream in the diversion chamber through a single manhole opening 30 ft below an active state highway travel lane. Additionally, the existing invert of the culvert sat 3 ft below the normal pool of the Monongahela River. This required the installation of a large sheet metal cofferdam with a continuous, 24/7 pumping operation to dewater the structure.

Most of the equipment and materials used for the culvert rehabilitation were to be brought in through the outfall, with limited need to use the single manhole in the PennDOT roadway. Rehabilitation of a single pipeline is typically completed within 2 to 3 days of work under dry weather conditions. The M29 CSO presented a challenge based on the duration of the rehabilitation given the structure's size and frequency of wet weather days in Pittsburgh.

Construction sequencing for starting/stopping work was developed around the anticipated weather each workday, with an estimated 12-minute window to clear the site of all workers and equipment in the event of unforeseen rain. Additionally, the contractor had to work within time restrictions of the highway and operational railroad above.

In addition to the trenchless rehabilitation of the CSO structure, a new cast-in-place concrete river end wall with a 15-ft metal flap gate, and modifications to the upstream concrete diversion weir were designed to improve hydraulics within the upstream system.

Unusual for a project like this, a physical scale model of the culvert and outfall and a computational hydraulic model were built to simulate the sewer system interaction with the Monongahela River during various wet weather events and river stages. The models were used to understand the dynamics of the outfall volume during storm events to activate the flap gate and the river intrusion into the sewer system, as well as sediment transport from the river into the outfall.

The final construction scope included: filling major voids in the brick walls from inside the structure; lining the brick culvert walls with shotcrete; reforming and establishing a new concrete invert; applying an epoxy corrosion inhibitor on all surfaces; and replacement of the existing stone endwall with a new cast-in-place concrete endwall with a flap gate. The design incorporated Cooper E-80 railroad loading calculations for the new endwall and shoring and the shotcrete lining system 30 ft below the tracks to ensure it met the lifetime design requirements.

The Art of Sewer Rehab Preparation

In the summer of 2021 work began with dewatering and a pre-construction inspection, revealing the structure to be in much worse condition than anticipated. Significant voids in the culvert crown and walls were discovered, requiring urgent contractor attention to alleviate a potentially catastrophic failure. Voids were filled with rebar reinforcement and the same shotcrete materials that would be used for the culvert lining.

Before installing the lining, the contractor removed more than 400 tons of sediment, gravel and brick from the CSO with a mini excavator. Removing the sediment and installing the metal flap gate will also lessen the operational maintenance and cleaning costs within the downstream ALCOSAN combined sewer system and alleviate hydraulic bottlenecks and flooding upstream.

Construction Success

The trenchless construction activities required continuous air monitoring within the CSO and continuous weather monitoring for the occasional summer pop-up thunderstorm. Since the facility is a combined sewer overflow that serves a large portion of Pittsburgh and is along the Monongahela River, all construction was planned to occur during dry weather operations. During wet weather events, flow in the outfall reaches the crown of the culvert, and the rising river levels overtop the cofferdam. Safety and scheduling for all construction activities were constantly considered during the project's design and implementation.

Additionally, traffic detours and flagging were in place to allow secondary access within the PennDOT roadway. The existing railroad at the top of the riverbank transported loads of steel across the culvert on weekday nights. Contractor site access to the riverbank was coordinated each shift to allow crossing the tracks to unload materials. Coordination of the access constraints led to a very detailed construction sequence to facilitate the construction of the shotcrete lining of the culvert.

Construction was completed in the Spring of 2022. Inclusive of weather delays, construction was substantially complete in six months, except for the fabrication and installation of the metal flap gate.

Mallory Griffin, P.E., is a consulting engineer in Pittsburgh.

Styrene Barrier Products:

A CIPP SOLUTION TO ADDRESS STYRENE EMISSIONS

By Samit Sadavarte

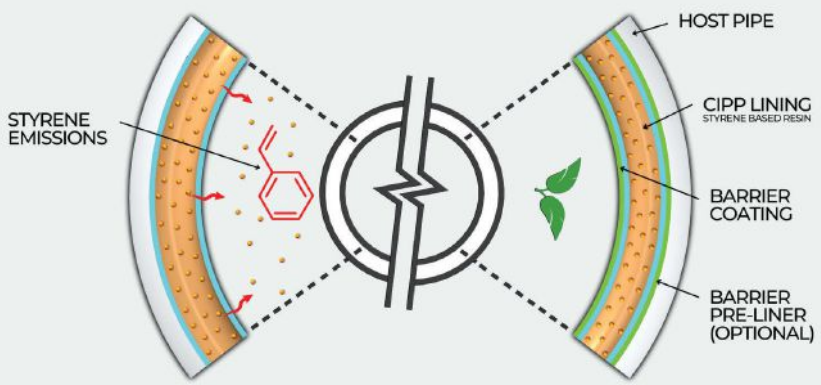
Cured-in-place pipe (CIPP) products have grown in usage over the years as an increasingly popular solution for repairing pipes without requiring extensive excavation. Funding from the 2021 Bipartisan Infrastructure Law, which provides about $50 billion for water and sewer projects, has facilitated many municipalities planning CIPP projects to prioritize the upgrade and repair of existing infrastructure in a cost-effective and timely manner. However, the most common and inexpensive CIPP applications are made with liners that are infused with resins containing styrene.

The Need for Caution with Styrene

Styrene is a colorless liquid contained in resins, commonly used in the curing process for CIPP materials. Styrene is activated during the curing process to harden the liner and emits vapors as a byproduct. According to the Centers for Disease Control and Prevention (CDC), breathing high levels of styrene can cause a variety of negative health effects including changes in color vision, tiredness, feeling drunk, slowed reaction time, concentration problems, or balance problems. These emissions become especially troublesome when working on pipe relining projects near occupied structures like residences, businesses and schools. The risk is heightened for projects near buildings with dry or damaged p-traps or older buildings without p-traps at all. Sewer projects near older buildings and neighborhoods are good opportunities for considering styrene barrier products because lateral pipes connecting homes to the broader sewer network can carry fugitive emissions from nearby sewer projects.

What CIPP Professionals Need to Know

Styrene barrier products are one innovative solution for minimizing



exposure to styrene. As a director of business development for new markets at The Haartz Corp., I've worked alongside countless professionals to supply hundreds of thousands of feet of CIPP liner material nationwide. One aspect that stands out regarding styrene is that many professionals I've interacted with do not understand where emissions come from and how much a styrene barrier product reduces them.

Styrene fumes are not solely let off during the curing process. According to a study from the CDC's National Institute for Occupational Safety & Health (NIOSH), styrene emissions also occur during the wet-out and storage stage – when a tube is saturated with the styrene-containing resin prior to installation in the host pipe. Fumes can also be released from the refrigeration truck transporting the products and the cutting points when the liner is connected back to lateral connections after curing is completed.

How It Works

Nearly all CIPP products consist of a nonwoven substrate with an extrusion coating laminated to the textile. As the coated fabric is shaped into a sock and then wet-out, standard CIPP coating allows styrene to permeate through the coating, causing fumes throughout the process and on the jobsite.

Styrene barrier products include a coating within the extrusion layer with properties that considerably reduces the amount of styrene monomer chemical compound from migrating through the coating. Sometimes a pre-liner is also incorporated to further control emissions.

The Haartz Corp. recently participated in an industry study measuring the efficiency of styrene barrier products. The tests compared styrene emission levels for standard products against those incorporating a barrier coating. Measurements were taken during the opening of the refrigerator truck – a point in the process with high styrene emission levels.

When opening a refrigerated truck containing liners impregnated with styrenic resin, values usually measure between 200 to 300 ppm. The test found that when utilizing a styrene barrier coating, styrene emission measurements fell to 0.27 ppm – more than 99.8 percent less than standard CIPP products.

Important Factors to Consider

Most styrene barrier products can be cured using steam, hot water or UV. A reliable barrier should have a strong bond to the nonwoven layer and excellent chemical resistance properties. These factors reduce the risk of delamination and guarantee that the barrier will withstand exposure to harsh chemicals and corrosive materials as part of the wet-out process before installation and high-pressure jetting/flushing as the pipe is cleaned during its service life. The time it takes to cure the material is also crucial to consider since a shorter curing time improves efficiency and reduces project turnaround time.

Regardless of the type of project, it's important to consider whether the styrene barrier coated nonwoven will be flexible enough to dimple at a lateral connection point. A styrene barrier product that does will accelerate and simplify the lateral reinstatement process, reducing potential tears and damage to the newly in-place liner.

The Take-Away

As CIPP projects for pipe repair continue to gain popularity, it's crucial that professionals explain the pros and cons of various CIPP solutions to their customers, including potential health risks associated with curing styrene resins. Styrene barrier products are one of the emerging solutions to address these concerns. When selecting a styrene barrier product, it's important to understand its quality of performance in the field – they should have similar qualities throughout the process from wet-out to inversion and curing.

Having a trusted supplier with decades of experience and a strong track record for quality and performance is key. Suppliers who serve as partners won't treat you like a transaction. They should take the time to understand your needs and even work with you to develop a custom solution to meet the unique challenges of your project.

Samit Sadavarte is the director of business development (new markets) at The Haartz Corp.

TRENCHLESS TECHNOLOGY GAME CHANGERS

INNOVATIVE COMPANIES THAT HAVE SPURRED THE GROWTH OF THE INDUSTRY

INTRODUCING APPLIED FELT'S® ENVIROCURE® - THE ANSWER TO CIPP STYRENE EMISSIONS.

Through extensive research and development, Applied Felts® has developed a solution to the perceived concern about the safety of styrene emissions in the Cured-in-Place Pipe process. EnviroCure® is a heat-cured, STYRENE IMPERMEABLE polymer coated, multi-layer felt liner, that vastly reduces if not eliminates styrene emissions and odor on the jobsite before, during and after installations - taking away the significant cost and unpredictability of styrene-free resin systems.

An independent study conducted by IUPUI, Oct. 2021, concluded, EnviroCure reduces on-site styrene emissions to less than 1 part per million. Jobsite reports no detectable odors in refer trucks when doors are opened, or in steam flumes or manholes.

APPLICATION

EnviroCure provides a safer and less expensive option vs. more costly styrene-free resin for all mainline CIPP installations that typically use styrenated resin systems, providing the solution to jobsite styrene emissions as opposed to relying on a resin system to accomplish the objective.

Over 50 Years of Installation Success

Applied Felts' proven, decades-long history of extending the life of sewer and water pipes using our rigorously-tested, 100% in-house, vertically- integrated manufacturing processes has allowed Applied Felts CIPP felt and hybrid liners to lead the way in the trenchless pipeline rehabilitation market since our close involvement with the invention of CIPP liners in the 1970's.

And, making your job even easier, streamline your next job with **pre-impregnated liners** from anywhere in North America with **our 5 strategically-located regional wet–out facilities at FerraTex Solutions.**

Applied Felts: 276.656.1904; Applied-Felts.com Ferratex Solutions: (844) 433-7728; Ferratex.com

RELINE DONE RIGHT™

CONTECH® ENGINEERED SOLUTIONS

Contech has been providing fully structural rehabilitation and relining solutions using steel and aluminum tunnel liner plate and structural plate, steel reinforced polyethylene pipe, PVC liner pipe and many others for over 75 years – recently adding in situ manufactured spiral wound steel reinforced HDPE materials. Knowing pipe assessment, structural design & hydraulic analysis is what we do. The result is the right solution for your project needs - done right, on time and under budget. www.conteches.com/reline

As our infrastructure ages, the roadway, water management and sewer control systems are deteriorating and losing integrity. Maintaining these critical structures is a major challenge. Today, perhaps more than ever, keeping our infrastructure safe and workable with limited financial resources requires innovative solutions. Replacement can be costly and time-consuming. Contech makes it easy. We make it our business to know the ideal solution for you - inside and out.

Rehabilitating or relining a drainage or sanitary pipeline or structure requires a site-specific analysis. There is no one-size-fits-all approach. Every reline project needs to be examined closely by qualified professionals.

From an engineering perspective, the design approach must consider the usual design parameters and must carefully evaluate the current condition of the pipe or structure and the supporting fill that surrounds it. The primary areas where an engineer should be concerned are:

- Geometric shape and condition of existing pipeline or structure (and access structure)
- Hydraulic requirements and limitations
- Optimum shape, size and materials
- Constructability
- Design service life
- Structural analysis and design
- Specification goals

Are you considering a reline solution to address an aging culvert or storm sewer system? Please reach out to your local Contech representative for additional assistance. For more information, visit www.ContechES.com or telephone 800-338-1122.

SPONSORED CONTENT

GORMAN-RUPP PUMPS - THE PUMP PEOPLE

Gorman-Rupp has been revolutionizing the pumping industry since 1933. Many of the innovations introduced by Gorman-Rupp over the past 90 years have become industry standards.

We continue to update our machinery, processes, research and development and engineering to ensure that our pumps and systems are among the most reliable and efficient on the market. With nearly one million square feet under roof, our facilities house some of the most modern manufacturing, testing and warehousing facilities in the world. Our experienced engineers take advantage of the latest technologies and innovations to custom-design, manufacture and assemble our products.

With over one million Gorman-Rupp pumps installed to date, we have the knowledge and experience understand your specific application. We provide solids- and clean-fluid handling pumping solutions for municipalities, industrial plants, construction and rental businesses, refineries and petroleum plants, mining sites, agricultural operations and a variety of original equipment manufacturers.

One of our most successful and innovative lines of pumps has been our self-priming models. Gorman-Rupp also manufactures complete lines of submersible, priming-assisted (dry-prime), standard centrifugal, horizontal end suction centrifugal and rotary gear products built for the most aggressive pumping applications. In addition, our ReliaSource® pump packages that incorporate these products, are designed, manufactured and tested and include pumps, motors, piping and controls to ensure superior operation and easy installation.

We perform rigorous testing based on Hydraulic Institute Standards and test to customers' actual operating conditions in our one-of-a-kind testing facility guaranteeing innovative, superior-quality products that are ready to tackle your toughest jobs. To ensure you get the right equipment for your requirements, Gorman-Rupp partners with a worldwide network of distribution and provides them with the most extensive training. Gorman-Rupp distributors will work hand in hand with you to recommend, customize and specify equipment. And Gorman-Rupp is always available should you ever require any assistance.

Philosophy

Gorman-Rupp helps our customers solve pumping challenges by designing our pumps and pump stations to deliver decades of trouble-free operation and performance. When you choose Gorman-Rupp, you'll benefit from some of the lowest lifecycle costs in the industry and achieve maximum uptime and minimal service interruptions. And you'll enjoy one of the highest customer satisfaction ratings in the industry—guaranteed.

Industry Leading Support & Warranty

Gorman-Rupp stands behind the quality of our pumps to ensure they meet your requirements for the long haul. To maintain industry-leading client satisfaction well beyond product installation, we offer a variety of services to meet your needs, including:

Training

We provide in-depth training seminars for technical and service personnel in our one-of-a-kind training facility. You'll learn about our products, technologies and how to service your equipment.

Service

Because our equipment is designed for minimum maintenance and ease of service, maintenance is simple and cost-effective to perform in-house, and only minimal resources are required to keep our pumps and pump packages operating at peak performance.

Industry-Leading Warranty

Gorman-Rupp stands behind our products with some of the best warranties in the industry. Our manufacturing processes and rigorous testing standards result in a quality product you can rely on in the toughest applications.

Construction Market

We have built our reputation on the workhorses of the construction pump market: self-priming centrifugal trash pumps. These dependable, versatile performers help contractors move large volumes of water quickly. We also manufacture an extensive line of submersible and priming-assisted pumps used in sewage bypass, job sites and mines that offer maximum reliability, service life and they don't come home until the job is done.

Gorman-Rupp Pumps

600 S. Airport Rd.
Mansfield, Ohio 44903
Telephone: 419/755-1011
E-Mail: grsales@gormanrupp.com
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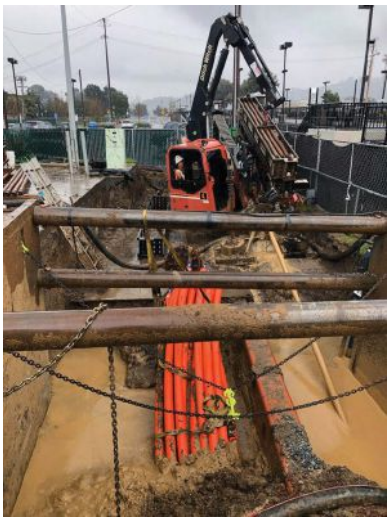
THE 27-WAY MULTI-DUCT CHALLENGE



On a rainy week in San Mateo, California, LT Directional was up against some mighty odds. Not only was mother nature on their tails with some major rains threatening the productivity of the job, but they also were in a metropolitan area that put them up against public transportation railway on the surface, as well as the risk and hazards that come with drilling next to that–but they also we battling an especially complex maze of existing underground utility under the surface.

With some major high-tech companies headquartered in neighboring streets, such as Survey Monkey, Sony Interactive, and GoPro, they had a lot to lose if they inadvertently hit some existing power or communication utility lines. The safety of the crew was paramount from minute one as we arrived on the scene at 6 am, ready for the safety briefing. The job was to install 27 2-inch pipes over a few hundred feet that paralleled the San Mateo rail. This meant that there were a few different factors to take into consideration for the job.

Bore Hole Size

First, LT directional would need to widen the hole enough to provide enough clearance for a 27-way puller. This meant that the final hole size would need to be at least 32 inches in diameter. With 27 2-inch pipes, the hole would need to be large enough that there is clearance for the pipes to pull freely without creating a suction that often accompanies the deadly combination of too little clearance in a whole with not the right mud recipe. When you create a hole that large in the shale, clay, and sand composite mixture that you often find in Northern California, suddenly, the wall pack becomes a concern as well… which leads to the next factor.

Hole Stability

With a 32" hole, there is a lot of room for gravity to take over, and the hole collapse in on itself or deforms. They opted for the Deluxe Barrel, or "pig," from Melfred Borzall with added hardfacing, mudflow ports, and cutter teeth options.

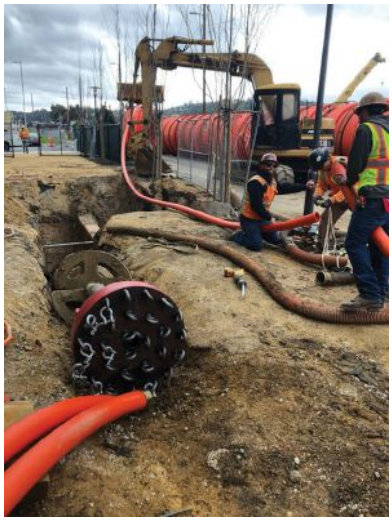
HDD Tooling

LT Directional knew they needed tooling custom-fit to this large bore tooling that was not quite Maxi but larger than typical jobs. The tools they decided to include in their arsenal were a 32" Deluxe Barrel & Tornado Reamer combo for mixing and pumping action that simultaneously provided wall-pack stability. Running a JT100, this crew encountered rocky conditions but ample amounts of sandy conditions that risk collapsing the hole. The Tornado's large paddle cutter blades provide the mixing action needed to keep the risk low for balling up. The barrel stabilizer also kept fluid flowing with its built-in fluid ports.

They trailed that with a swivel and custom-manufactured multi-duct puller from the Melfred Borzall engineering team. The multi-duct puller had 27 eyes that connected to 27 DCD Deluxe Duct Pullers that protected the pipe ends with a bell.

Melfred Borzall engineers had a challenge ahead of them as they had to build this from scratch and tailor it to the specs of LT Directional's job. After sharing designs, collaborating, and finalizing the puller, it was tested and delivered on-site by their Northern California HDD specialist.

This was a great example of careful planning, proper preparation and investment in the right areas to ensure a successful job…even when mother nature isn't cooperating with the job.



SPONSORED CONTENT

LEAK REPAIR TECHNOLOGY FOR BRIDGE PIPELINES

Starline® Cured-in-place-lining with carbon fiber SRS is an ideal solution to repair gas leaks within bridge pipelines.

PPM PROGRESSIVE PIPELINE MANAGEMENT
THE INFRASTRUCTURE RENEWAL SPECIALISTS

Pipeline running underneath a bridge.

As bridges age, so do the pipelines that run alongside or underneath the bridge. Of the 614,387 suspension bridges in the U.S, forty two percent are 50 years or older. In the Northeast, gas pipelines and bridges are typically 75 - 100 years old. Pipelines that run under, alongside, or through the bridge's abutment walls are particularly vulnerable to corrosion and gas leaks.

THE PROBLEM WITH PIPELINES ON BRIDGE CROSSINGS

Most bridge or overpass crossings place the pipeline through the concrete abutment wall of the structure, either with a protective sleeve, or in some cases without a sleeve. The pipeline is often resting on top of the structure completely exposed except for where it re-enters the road or offsets into the abutment walls. Pipelines exposed to wind, salt and extreme temperatures have accelerated corrosion. When the pipeline is weakened at the concrete abutment wall juncture, there frequently is a gas leak.

Repairing excessive corrosion and leaks in the pipeline where it enters the abutment wall of the bridge would normally require the pipe to be removed. Removing pipe in an abutment wall affects the structure of the bridge and requires drilling through the foundation of the abutment wall. Local municipalities and owners of the bridge typically will not allow drilling in the bridge abutment nor will they permit replacement of the pipeline, especially where it enters and exits the abutment wall of the bridge structure.

SOLUTION: REPAIR THE PIPELINE WITHOUT DISTURBING THE BRIDGE

Installing a Carbon Fiber Structural Reinforcement Sleeve (SRS) into the gas pipeline directly at the bridge abutment wall is proven to prevent the need for removal or excavation. The carbon fiber SRS reinforces the corroded pipe with a carbon fiber sleeve without disturbing the pipe. Its structural integrity is ideal for situations where the integrity of the host pipe potentially has been compromised by corrosion and also when a gap in the pipe needs to be bridged.

Progressive Pipeline Management's (PPM) SRS sleeves are made of a high strength carbon fiber laminate composite material and glass outer coating to prevent corrosion. The carbon fiber material bonds to the interior of the pipeline, essentially becoming the host pipe for a cured-in-place-liner (CIPL) installation. The SRS has been tested at pressures to 250 PSI and approved by the Gas Technology Institute for its strength, durability and compatibility with PPM's Starline® CIPL product. The SRS significantly reduces costs and time by preventing future corrosion and eliminating the need for excavations.

During a 12-inch rehabilitation project in East Orange NJ, the pipeline went directly through the bridge's concrete abutment wall. The crew successfully installed the SRS in the abutment wall, with temporary PVC piping between the 12-inch wrought iron gas main and the abutment wall.

PPM is the exclusive licensee in North America for the Starline® Cured-in-place-lining with over twenty-one years of specialized expertise associated with gas pipeline rehabilitation, PIPES ACT compliance and trenchless technology.

PPM crew is installing SRS sleeve and PVC pipe between abutment wall and gas main

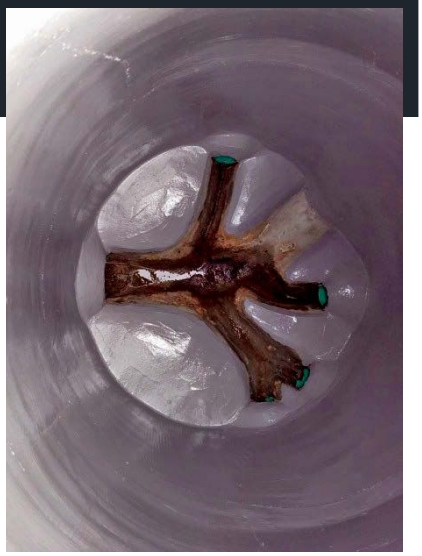
Mario Carbone, COO Progressive Pipeline Management

Mario Carbone spent thirty-two years in design, maintenance and construction with Brooklyn Union Gas/KeySpan Energy and ten years as the senior manager for gas R&D with KeySpan Energy before joining PPM. In addition to his expertise in CIPL, engineering and field operations, Mario is versed in current regulations for corrosion and pipeline environmental procedures and holds three gas pipeline industry patents. His inventiveness to overcome challenges led PPM to win the Trenchless Technology Project of the Year multiple times.

www.progressivepipe.com
info@progressivepipe.com
855-246-6344

CURED-IN-PLACE FIBERGLASS REINFORCED EPOXY LINER (CIPM)

ProtectiveLinerSystems
Infrastructure Rehabilitation



Since 1984 Protective Liner Systems, Inc. has been providing high quality, performance proven, corrosion resistant lining systems for sewerage system manholes, wet wells, pump stations and secondary containment structures.

PLS's original product was a prefabricated fiberglass bag liner that was resin impregnated in the field and heat cured. This bag liner system had a number of disadvantages including, the lead time to prefabricate the bags, potential errors in measuring the host structure and fabricating the bag, large equipment necessary for installation, not being able to access outfall areas with the large equipment, and only being able to install the bag in circular structures. Out of these difficulties our current flagship product, PerpetuWall, was developed. PerpetuWall is a cured-in-place, fiberglass reinforced epoxy lining system that requires no pre-measuring of the structure or prefabrication of the bag. It can be installed in any size and shape of structure and can be installed in the most difficult of locations with minimal equipment. In addition to providing the basic strength and corrosion resistance of an epoxy, it also provides additional structural strength by means of the embedded fiberglass.

Thirty five years after the introduction of PerpetuWall, Protective Liner Systems, Inc., now provides a full range of rehabilitation products to meet your specific needs. Included in these products are various cements, different epoxies and also the fiberglass reinforced epoxies. All of PLS's products are manufactured to strict quality controls and with the best materials available in today's market. Regardless of the level of rehabilitation necessary in your sewerage system, Protective Liner Systems, Inc. can provide you with the appropriate solution.

To supplement Protective Liner Systems, Inc. manhole rehabilitation products, PLS became the North American Distributor for Stehr road rehabilitation products. The primary product in this line is the Stehr SKF 950 Manhole Cutter used to cut concrete and asphalt pavement around manhole covers to adjust them to grade during paving and re-paving operations.

For more information contact us at;
Phone: 770-482-5201
Fax: 770-484-1821
Email:
sales@protectivelinersystems.com
or visit us on the web at
www.protectivelinersystems.com

Protective Liner Systems, Inc. Products

PerpetuCrete BR -(PLS-506) - Fast Setting Bench Rebuild Mortar
PerpetuCrete MSC - (PLS-507) - Micro Silica Cementitious Manhole Liner
PerpetuCrete CA - (PLS-508) Calcium Aluminate Cement
PerpetuCoat M - (PLS-614) Ultra High Build Epoxy Coating
PerpetuSet - (PLS-616) - Fast Setting Epoxy Resin
PerpetuWall - (PLS-650) - Fiberglass Reinforced CIP Composite Liner
PerpetuWall CS - (PLS-655) - Fiberglass Reinforced Chimney Seal
PerpetuSealFlex - (PLS-101) - Novolac & Urethane Hybrid Chimney Seal

Distributor for Stehr SKF 950 Manhole Manhole Cutter

SPONSORED CONTENT

RADIUS: INNOVATIONS IN MANUFACTURING

In today's competitive construction industry, trenchless drilling has emerged as a groundbreaking approach for installing underground utilities with minimal disruption. This innovative method eliminates the need for extensive excavation, reducing costs, environmental impact, and project timelines. As the demand for efficient and sustainable infrastructure solutions grows, the trenchless drilling sector has witnessed remarkable advancements and innovations.

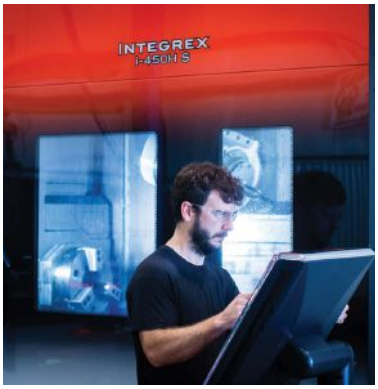
Manufacturing facilities are constantly seeking ways to optimize their operations and increase productivity. One effective approach gaining popularity is transforming traditional manufacturing facilities into lean facilities. Radius HDD, a leading manufacturing company, successfully transformed its Weatherford facility into a world-class operation by implementing lean principles. Through waste elimination, process streamlining, and a continuous improvement mindset, we achieved remarkable improvements in efficiency, quality, and customer satisfaction.

To drive the transformation, Radius embraced lean manufacturing principles. The focus was on identifying and eliminating various types of waste, including overproduction, waiting time, excess inventory, unnecessary motion, defects, and overprocessing. By applying lean tools such as value stream mapping, 5S, and standardized work, the facility underwent significant restructuring to optimize processes and reduce waste.

At the heart of the transformation was the establishment of a culture of continuous improvement. Radius instilled a mindset that encouraged all employees to seek opportunities for incremental enhancements. Regular improvement events and forums were conducted to identify and address operational bottlenecks, refine processes, and drive long-term improvements. This culture of continuous improvement created a dynamic environment where change was embraced, and innovation thrived.

Radius leveraged technology and automation to enhance productivity and quality while catering to the unique needs of its customers. Advanced manufacturing technologies and robotics were introduced to automate manual processes, reduce cycle times, and improve precision. By leveraging cutting-edge technology, we achieved greater operational efficiency, reduced the risk of errors, and improved overall productivity. Additionally, the implementation of these specialized machines and processes has significantly increased Radius' ability to manufacture custom tooling. This includes subs, reamers, and other tools that customers have devised to enhance their drilling experience in a variety of conditions. Our advanced capabilities in producing tailor-made tools have strengthened customer relationships and empowered them to overcome specific drilling challenges with greater efficiency and precision.

Throughout the transformation, we maintained a strong customer focus. By actively engaging with customers, the company gained valuable insights into their evolving needs and expectations. This customer-centric approach guided process improvements and product enhancements, ensuring that the transformed facility could deliver exceptional value and exceed customer expectations.



Much like the manufacturing industry's adoption of lean principles, the trenchless drilling sector can significantly benefit from the application of lean methodologies. By eliminating wasteful practices, optimizing processes, and fostering continuous improvement, trenchless drilling projects can achieve enhanced efficiency, reduced project timelines, improved quality control, and increased customer satisfaction.

This approach aligns perfectly with the transformative power of lean manufacturing.

The success story of Radius' transformation into a lean operation exemplifies the remarkable outcomes that can be achieved. Through the implementation of lean manufacturing principles, employee engagement, continuous improvement, technology adoption, and a customer-focused mindset, we achieved significant improvements in efficiency, quality, and production volumes. This milestone marked the establishment of Radius as a model for world-class manufacturing operations, inspiring other organizations in the industry to embark on their own lean transformation journeys.

- Steve Taylor, Operations Sr Manager at Radius HDD

RAPIDVIEW IBAK NORTH AMERICA - HISTORY & INNOVATION

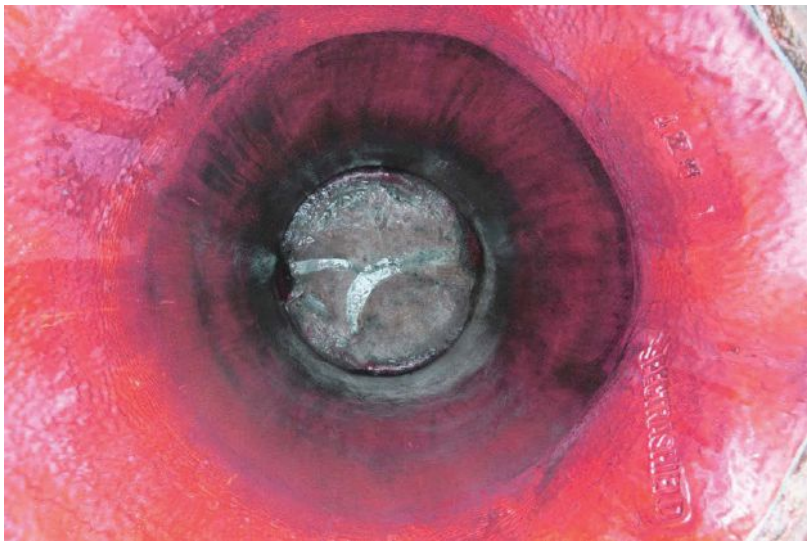
RapidView knew IBAK would be the perfect match since 1991 when they began their journey in the sewer inspection industry. Seeing many similarities between themselves, RapidView and IBAK came together in 2004 to form a partnership that has become known as the industry's premium brand. The relationship between RapidView and IBAK has helped evolve the pipeline inspection industry across North America. Many of IBAK's sewer inspection technologies have become standards over the years as the tools for pipeline inspection have evolved.

Founded in 1945, IBAK Helmut Hunger GmbH & Co. is the biggest manufacturer and supplier of pipeline inspection systems in the world today, as well as a leader of firsts and the oldest company in the industry. After many years of research and development, IBAK presented the first sewer TV inspection system in the world in 1957. From there, they've gone on to be the first to design and implement many more products. In 1993, IBAK invented the first lateral launching system for inspecting laterals from the mainline, and the first always-upright pan & tilt camera. The first pan & tilt camera for 4" and push systems was later introduced in 2000. In 2002, IBAK introduced the truly revolutionary 360° PANORAMO technology for mainline inspection, and in 2006 this technology was adapted for manhole inspections with the debut of the PANORAMO SI. In 2013, IBAK introduced the first fully integrated, completely digital HD inspection systems utilizing the benefits of the fiber optic cable as well as the first in a series of integrated rehabilitation cutters and grinders. In 2016, 3D GeoSense was released to the market allowing users to track their camera's position and map their inspections in three-dimensional space providing them with accurate data regarding pipe position and orientation. In 2018, the PANORAMO technology advanced even further with the introduction of the high resolution 4K PANORAMO mainline and manhole inspection systems.

For more than 70 years, customers all over the world have benefited from the great experience of IBAK. As technology continues to advance, IBAK continues to design and manufacture pipeline inspection systems with features that are unique in terms of function and technology. RapidView IBAK North America imports, distributes, and services the complete IBAK inspection and rehabilitation product line throughout the country out of their facility in Rochester, Indiana, and has grown into the largest pipeline inspection equipment company in North America.

RapidView IBAK North America specializes in the highest quality pipeline inspection and rehabilitation equipment in the industry, including push cameras, mainline, lateral launch, high definition, 3D mapping, 360° pipe and manhole scanners, portable systems, cutters, software, and fully converted vehicles with complete system mounts. If you are a municipality looking to improve your city with cost effective equipment, or a contractor wanting a reliable fleet of equipment that will keep your business moving, then RapidView has you covered.

EXPERIENCE YOU CAN TRUST



SpectraShield® is proud to celebrate 30 years of excellence in infrastructure rehabilitation. As innovators in the industry, SpectraShield® has earned the confidence of major municipal utility owners and multinational engineering firms, protecting thousands of structures across 4 continents.

The state-of-the-art SpectraShield® product provides layers of quality and years of protection by:

- Stopping infiltration and corrosion in manholes, wet wells, and lift stations
- Protecting wastewater infrastructure from corrosion
- Restoring wastewater structure surfaces to their original profile
- Providing an impervious barrier to water penetration

With its flexible formula, SpectraShield® restores structural integrity with a "stress skin panel" effect. This provides flexibility to accommodate common ground movement conditions such as freeze/thaw climates and traffic loading. SpectraShield® goes on fast and cures fast - a seven-foot manhole can typically be lined in less than one hour.

Additionally, SpectraShield® is easy on the budget. SpectraShield® is a cost-efficient alternative to manual repair and other liner systems and coatings currently available. Over time, SpectraShield® has proven to significantly cut down on capital costs. From manholes to wastewater treatment plants, SpectraShield® eliminates the need to fully replace the system components by rehabilitating wastewater structures so they are "like-new".

In the words of the Superintendent of Water and Wastewater Indiantown Company, Inc.

"We've had over 100 manholes coated with your product and reduced our infiltration by over 100,000 gallons per day. We have many brick manholes that we thought were in need of replacement, but your product made them like new again, which cut down on capital cost."

SpectraShield® is the originator of the industry's 10-year performance warranty. With proven results and a 100-year design life, SpectraShield® promises its customers confidence that spans decades.

"The SpectraShield system has a 10-year warranty and 100-year design life. That, and how quickly it is installed, sold me. The actual lining took two hours with minimal disruption. We returned the lines to service within minutes of the application." - Frank Renaldi

In addition to its premiere product, SpectraShield® also offers an impressive line of other infrastructure rehabilitation products:

- SpectraGrout®
- SpectraGarde®
- SpectraVu

SpectraShield® is the leading pioneer in polyurea lining systems. With 30 years in industry, that's experience you can trust.

Contact SpectraShield® today or visit spectrashield.com to find the installer nearest you.

DIGGING SAFER AND SMARTER WITH MUD DOG® VACUUM EXCAVATORS

Super Products®

There are more than 100 billion feet of underground utilities located in northern America. In the U.S. alone, a utility line is hit every six minutes causing power and utility disruption, injuries and even death. Compared to abrasive, traditional machinery, vacuum excavators offer the safer, smarter and more precise digging method. Mud Dog® Vacuum Excavators are designed to meet the challenges of compact, urban projects to large-scale excavation by offering versatility, safety and productivity on the jobsite.

Versatility

Mud Dogs come in a variety of model configurations¬ to tackle applications in various environments, including harsh conditions. The 700 offers a compact footprint for excavation in urban environments while maximizing payload and maintaining the power and precision that larger units offer. The 1200 offers consistent performance and precision for excavation during mid to large-scale projects. The 1600 is the largest vacuum excavator in the industry offering maximum payload and performance for large-scale excavation in the harshest environments; no project is too big or too tough to tackle.

Safety

The use of large, traditional machinery on a jobsite can be risky and hazardous to operators and even the surrounding community. Due to the precision and non-destructive nature of utilizing compressed air or pressurized water, vacuum excavation is the safer solution. With the Mud Dog, an operator can choose to dig with the most efficient and safest application for the job or environment at hand. Soil conditions can vary from soft topsoil to clay to limestone or rock; each of these requires a different excavation strategy: air, water, or both.

Air excavation is desired in applications where soil tends to be less compact, water is not easily available, small-scale projects or backfill is required. Additionally, when working with buried electrical lines or brittle utilities, air excavation is often preferred due to lower operating pressures and its non-conductivity. Hydro excavation is desired in applications where soil is made of dense materials or frozen. Hydro excavation also does not produce nearly as much high velocity debris as air excavation, reducing the risk of damage to utilities and injuries to operators.

Productivity

Excavating in remote areas or narrow streets and roads with traditional equipment can cause damage to the surrounding landscape and increase traffic congestion, which can be hazardous and inconvenient. When cables, utility lines or water mains need to be repaired or installed in these hard-to-reach areas, vacuum excavation provides an ideal solution. The unit can be located away from the excavation site by utilizing an extendable, 8-inch diameter boom that rotates and pivots downward.

Mud Dogs also come with features to ensure efficient workflow and productivity, including variable blower and water pump speed. These allow for increased digging effectiveness, water conservation and fuel efficiency.

Partner with Super Products

Product innovation, customer satisfaction and ensuring the safety of businesses and operators in the industry has been and will continue to be a priority for Super Products. Partner with Super Products for your next excavation project.

SPONSORED CONTENT

EPOXYTEC TECHNOLOGY COMBATS I&I TO PROTECT VALUABLE INFRASTRUCTURE

Epoxytec has successfully provided innovative lining solution technologies for the water wastewater industry for 30+ years. Tnemec Company's recent acquisition of Epoxytec has fostered the expansion of those capabilities. The companies' combined resources have facilitated R&D growth that continually improves their products' potential, focusing on combating inflow and infiltration (I&I) by providing monolithic lining protection.

I&I has forced municipalities to seek out trenchless rehabilitative solutions, particularly for the nation's aging manhole infrastructure. Epoxytec's flagship CPP product line has led the charge as one of the principal structural epoxy technologies to combat I&I. CPP lining products repair, protect, and enhance water wastewater infrastructure using trenchless applications that cause minimal disruption.

CPP liners offer a complete, fully sealed rehabilitative lining solution that satisfies I&I compliance requirements established by EPA mandates. These ultra-high build, high- strength applied structural epoxy linings can seal all aspects of infrastructure, including the bench, invert, incoming/outgoing pipes, etc. Additionally, CPP products have the unique ability to adhere, with high bond strength, and tie into a variety of construction materials, including CIPP, concrete, brick, and steel.

This CPP product line has revolutionized the industry since it was first installed in Miami Dade County Water and Sewer in the early 90s. Since then, these products have continued to evolve. In addition to the original CPP Trowel-Liner, available for trowel-applications, CPP is also available in spray-applied versions including CPP Sprayliner MH, specifically formulated to rehabilitate and line sanitary sewer collection systems, this product offers high moisture tolerance, H2S resistance and sealed I&I barrier protection. CPP Sprayliner 61 is designed to line drinking water storage tanks, water pipelines, and other structures in contact with potable water.

Epoxytec continues to provide dependable lining solutions, innovative and expanding products to meet the ever-evolving needs of aging infrastructure.

DON'T LET RAILROADS, REBAR, OR RIVERS STOP YOU, UMAG HAS A SOLUTION.

Whether you are drilling under rails or concrete with wire mesh and rebar, the Echo 50XF can handle it all. When switched into the sub-kHz frequencies the 50XF powers through passive interference and provides the locator with some of the most accurate results on the market.

Need a little more range for highway and river crossings? No problem, kick the transmitter up into the high-power mode, with frequencies ranging up to 41kHz. The Echo 50XF features 16 frequencies and two power modes making it one of the most versatile, standard-size transmitters on the market. When paired with the Mag 9 or Mag 5s you'll have a winning combination that will unlock endless job opportunities for you and your crew! This will be your go-to transmitter for almost any job.

- High and Lower Power Modes
- 16 Frequencies, .325kHz – 41kHz
- Depth & Data Range of 164ft in High Power and 131ft in Low Power.
- 15" long x 1.25" diameter

Check out Underground Magnetics at umaghdd.com for more information or to schedule your demo today!

SPONSORED CONTENT

GEONEX HORIZONTAL HAMMER BORING SYSTEMS

Pulverizing obstructions, GEONEX makes boring through rock and mixed conditions look easy. In 2022, the Finnish manufacturer of Down-The-Hole (DTH) Horizontal Hammer boring systems added another step in their growth by furthering their investment in North America. After receiving the innovative product award at No-Dig in 2019, GEONEX Inc, the U.S. Based company, has now internalized all sales and distribution operations throughout the U.S. and Canada.

With 5 Existing clients in North America accounting for 13 GEONEX Systems, satisfaction and reliability of the brand and method keeps their clients wanting more, which has further led to offering rental options which are proving advantageous in offering the solution to more clients in more places.

If you have ever gotten a cobble stuck in your auger, had to pull auger to investigate a rock out cropping, or simply had to change methods based on differing soils in your bore path, the DTH Horizontal Hammer Boring method is a proven viable solution. Used in both new utility installations in similar situations to auger boring and other pipe jacking methods, the GEONEX DTH System has proven an asset in in installing HDD Conductor casings.

What separates GEONEX and DTH Horizontal boring from traditional pipe jacking is the DTH Hammer. First, cutting action is done in-line with the bore path by accelerating a heavy carbide buttoned steel bit to breakdown solid formations at the front of the bore path. This differs significantly to other methods that utilize a rotating face designed to cut and scrape as difficult soils. Casing is advanced further by the steel bit striking the inside of the casing creating a straight installation with minimal deviation, as opposed to traditional jacking from the rear which is more susceptible to deviations to a path of least resistance.

Other specific incorporated innovations make site set-up and boring with GEONEX fast and efficient despite cobbles, boulders, solid bedrock, and mixed face conditions. The wide range of soil conditions with the same down-hole tooling make the GEONEX DTH Boring system a great tool for any Trenchless Contractors' toolbox.

For more information visit www.geonex.fi or call 1-844-4GEONEX

SPONSORED CONTENT

THE INTERSECT SPECIALISTS

ParaTrack™ Magnetic Intersect technology traces its origins back to the year 1980 when Vector Magnetics successfully intersected a 12 ¼" steel casing at 18,562 feet near Baton Rouge, Louisiana. Vector Magnetics has since delivered thousands of successful intersections for customers around the globe.

Vector Magnetics first released the ParaTrack™ Guidance System to the HDD market in 1999.

Just one year later, ParaTrack™ Magnetic Intersect guided the world's first successful HDD intersection while drilling under the Tees River in England, operated by Prime Horizontal. The feat was replicated the following year when Prime Horizontal completed the world's second HDD intersection under the Maas River in the Netherlands.

Building upon that early success, ParaTrack™ Magnetic Intersect was quickly adopted by the industry and has become the world's most widely used HDD intersect system.

Magnetic Intersect is available as part of the standard ParaTrack™ HDD Guidance System and requires no intersect-specific hardware. Magnetic Intersect data are acquired as part of normal pilot bore surveying using standard ParaTrack™ guidance equipment. This simplifies the tool configuration, minimizing the number of potential failure points, while keeping operating costs low.

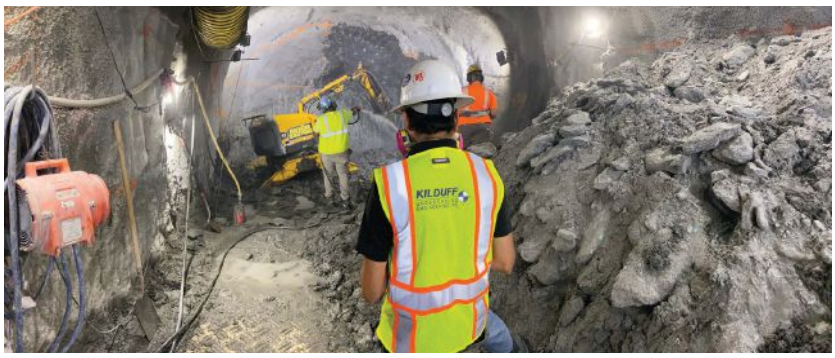
ParaTrack™ Magnetic Intersect delivers a multifaceted approach, offering an array of both active and passive intersect options, reducing engineer design constraints and expanding the scope of what is constructable by HDD.

Contact your ParaTrack™ distributor today to discuss how Magnetic Intersect can work for you.

Intersect Method	Year	Length	Location	Pipe Dia
P2 Intersect	2023	13,421 ft	Brahmaputra River, India	24 in
PMR Intersect	2023	9,875 ft	Offshore Brazil	20 in
Rotating Magnet	2015	23,000 ft	Congo River, Angola	20 in
Rotating Magnet	2008	7,546 ft	Miami, Florida	44 in
P2 Intersect	2000	2,821 ft	Tees River, England	16 in

A sample of the thousands of successful ParaTrack™ Magnetic Intersections

KILDUFF UNDERGROUND ENGINEERING



Kilduff Underground Engineering, Inc. (KUE), is an underground design and Construction Management (CM) firm, specializing in tunnels and trenchless crossings ranging in size from 12-inches up to 60-feet in diameter. Our team of dedicated engineers and geologists are experienced in delivering the support our clients expect in order to ensure the successful completion of a project. What separates our firm from other geotechnical design firms is our experience with both design and construction. This ability to be equally familiar with both aspects of underground projects provides a unique and efficient solution to the contractors, A/E firms and owners we support.

KUE senior staff are experts with the design and construction elements of conventional tunneling methodologies and trenchless technologies including Horizontal Directional Drilling (HDD), Pipe Ramming, Auger Boring, Pipe Jacking, Microtunneling, Horizontal Hammer Boring/DTH, and Rehabilitation. Additionally, the firm provides standard geotechnical design services, deep excavation support designs (SOE), dewatering design, claims support, construction management services, as well as designs, installs and monitors geotechnical instrumentation. With over 150 years of combined experience among it's senior staff, KUE is able to offer a complete service to its clients that is unmatched in the industry.

In our ninth year in operation, the firm was founded in Denver, Colorado in 2014 and is supported by a second office opened in 2020 located in Red Bank, New Jersey. The firm is SBE, DBE, and MBE certified, and has P.E. registrations in, CA, CO, CT, DE, FL, GA, ID, IL, MT, MA, MI, MD, NY, NJ, ND, UT, OR, OH, PA, SC, TX, VA, WA, WY, and WV, and is certified through NCEES.

SPONSORED CONTENT

SEWPER® LINER BY IMERYS: A NEW INNOVATIVE AND SUSTAINABLE MINERAL SOLUTION TO PROTECT NEW WASTEWATER ASSETS FROM H2S CORROSION

With 30 years of proven performance of our flagship product SewperCoat®, Imerys has innovated to offer a new more sustainable mineral solution. It is designed to be used at a competitive price point in applications where the industry standard inert products are typically used to protect wastewater assets exposed to H2S corrosion. SEWPER® LINER is based on the calcium aluminate technology of SewperCoat® to provide exceptional H2S corrosion resistance, but optimized to protect new concrete surfaces. It offers a game-changing alternative to commonly used inert coatings and linings: a mineral solution able to offer a long service life and a reduced environmental footprint.

SEWPER® LINER is a dry, ready-to-use, high-performance mortar composed of calcium aluminate binder and aggregates. It is designed to protect newly built concrete structures in wastewater treatment plants and other sewage network assets such as: grit chambers, sludge tanks, trunk sewers, pump stations, and precast concrete shapes. SEWPER® LINER offers monolithic bonding to concrete surfaces, high productivity, fast application, adhesion to smooth, flat surfaces that are wet or dry, with exceptional durability and less impact on health and the environment with no BPA and VOC compounds.

SEWPER® LINER is designed to be spray-applied in a thin layer - 5/32" to 1/4" (4-6 mm) - on large flat new concrete surfaces with minimal preparation. Large surfaces can be protected in a rapid and productive way with the absence of dust, an almost zero rebound rate, and the absence of any solvent. SEWPER® LINER also provides resistance to pure water, salt water, sulphonated soils and other dilute acids.

The new SEWPER® LINER product effectively provides new wastewater assets the proven H2S Biogenic Corrosion Resistance that SewperCoat® has demonstrated for over 30 years for the rehabilitation of same assets.

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757-284-3200

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CUES' GRANITENET - NEW DEFECT CODING SERVICE ORLANDO, FLORIDA, USA

Tired of looking at pipeline videos? Outsource this tedious work to the CUES Defect Coding Service and let its machines process the video using Artificial Intelligence (AI) for consistent accuracy, speed-to-completion, and final review done by PACP-certified inspectors. Get caught up and allow your staff and Engineers to focus on more inspiring and productive work and let the machines do most of the work.

Also, CUES offers a sophisticated decision-support service, called Prescriptive Planning, that is based on the results of the AI-processed inspections to help prioritize risk and organize the types of work that should be done along with the suggested method of repair/replacement - based on out-of-the-box or customized decision logic. Quantify the type of work, assess your budgets, and streamline contractor bids for the specific rehabilitation jobs needed to be done.

For anyone looking to transform their organization from reactive to proactive, CUES Defect Coding and AI services are a turnkey solution to make it happen! Call for a discussion or demo.

About CUES, a Subsidiary of SPX Corporation - As the world's leading manufacturer of water, wastewater, and stormwater inspection equipment, CUES provides the necessary tools for both pipeline inspection and repair. For 50+ years, CUES has manufactured the most rugged and reliable pipeline inspection equipment in the industry. For more information, visit www.cuesinc.com.

CETCO'S HYDRAUL-EZ®

Are you looking for an improved product that helps make your job easier and increase productivity?

Look no further than CETCO's HYDRAUL-EZ®. Our newly reformulated formula has a 25% increased product yield, 20% better fluid loss properties, and mixes quicker and easier than our original formula.

Get the most out of your drilling projects with the best available HHD solutions on the market. With CETCO's HYDRAUL-EZ®, you can be sure that your projects are getting the quality they deserve while maintaining maximum efficiency.

Reach out to your local distributor today and pick up some New Improved Formula HYDRAUL-EZ®.

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A SMART WATER SOLUTION TO PRIORITIZE COLLECTION SYSTEM MAINTENANCE

Wastewater professionals face a myriad of challenges, from staffing shortages to budget constraints, regulatory compliance, and overflow prevention. Amidst this growing list, adopting a condition-based maintenance approach has emerged as the New Standard for optimizing sewer cleaning programs. InfoSense's turnkey sewer blockage and manhole assessment services provide a comprehensive overview of your system for a fraction of the cost of alternatives.

Utilizing the Sewer Line Rapid Assessment Tool, our experienced service teams can quickly screen your system and identify the specific pipe segments and manholes that require attention—saving you money by targeting maintenance efforts. The data is delivered in a GIS-powered dashboard that offers an overview of your system, highlighting areas that need attention.

Empower yourself to be proactive - concentrating your cleaning resources on the right pipes at the right time. For a free quote, please reach out to sales@infosense.com or call 877-747-3245 ext 1.

SMARTER TOOLS FOR A SMARTER JOBSITE

McELROY

The McElroy Tritan™ 560 is all you need to maximize jobsite efficiency. It's self-contained so it can be driven and positioned precisely alongside the pipe. An innovative jaw design enables a single operator to load pipe directly from the ground. All while the built-in DataLogger® records the entire fusion process to help ensure the job is done correctly. See how McElroy's Smart Fusion Tools and Accessories can improve your jobsite at mcelroy.com.

SPRAYWALL: THE INDUSTRY-LEADING SPRAY-APPLIED STRUCTURAL SOLUTION

SPRAYROQ
PROTECTIVE LINING SYSTEMS

In 2020, a project was identified through a Florida-based sewer authority's engineering department for seven severely deteriorated manholes in the area. The initial capital-improvements-funded project called for these seven manholes to be conventionally excavated and replaced with new structures. Unfortunately, this work would disrupt the local community for at least six months with heavy construction, bypass pumping, and extensive M.O.T. that would reroute residents for miles around the construction site.

Rather than the conventional dig-and-replace method, Florida-based contractor Engineered Spray Solutions concluded that the project was suitable for structural lining using SprayWall® at various thicknesses. The client was ecstatic and accepted the proposal noting the tremendous cost savings and minimal disruption to the community. The project was completed on time, on budget, and without a single neighborhood complaint.

Only SprayWall® could provide the proven structural integrity needed to repair this critical infrastructure. Learn more about SprayWall®, our industry-leading structural liner, at Sprayroq.com.

A MILE AT A TIME

Nebraska's Largest City Shifts to HDPE for Water Line Rehabilitation

By Larissa Copeland

In the midwestern United States, Omaha, Nebraska, has a lofty goal: rehabilitate 25 miles of water mains annually by 2025.

In 2019, Omaha's Metropolitan Utilities District (MUD) began ramping up its water infrastructure replacement program. Omaha is the largest city in Nebraska, with a population of about 486,000 and a metropolitan area of about 1.5 million people. MUD serves approximately 600,000 people.

"We understood that we needed to replace at a higher rate than we had been doing," said infrastructure integrity director Jared Svagera.

Part of that replacement program was determining which piping material to use when rehabilitating portions of the city's 3,100 miles of water mains.

Omaha has cast iron mains dating back to the 1880s, but it was the post-Depression-era spun cast iron installed in the 1940s that was identified as most critical for replacement. Other cast iron mains installed in the 1950s and 1960s were also marked as high-failure areas due to corrosion.

Omaha crews have also recorded a number of corrosion hole failures linked to imperfections in poly-wrapped ductile iron pipe installed in the 1990s. At the time, Svagera said, the poly wrap process wasn't as well understood as it is today, leading to some improperly installed or tapped poly-wrap pipes that are now prone to failure due to targeted corrosion.

As MUD weighed those challenges, officials realized it was time for a change.

"We knew we needed to shift toward plastic pipe that won't corrode," Svagera said. "We began a couple of direct replacement projects with HDPE, installed using directional drilling."

But it was a partnership with Murphy Pipeline Contractors that really got the ball rolling.

"Things really took off last year when we partnered with Murphy to do some pipe-bursting work for us," Svagera said. "We had been doing pipe bursting for a few years with C900 PVC, but seeing them install HDPE via pipe bursting was a big eye-opener for our crews and our engineers."

During pipe bursting, an expansion head is pulled through an existing line, causing the line to break apart. As the expansion head is pulled through the existing line, it also pulls the new pipeline behind it, immediately filling the space left by the previous pipeline. HDPE is especially well-suited for pipe bursting, due to its durability and flexibility.

In contrast to traditional methods, pipe bursting does not require unearthing to reconnect water services and less excavating to install the new pipe. This lessens the overall cost of replacement projects, while also minimizing disruptions for residents and businesses around the jobsite.

Murphy's projects this season consist

of more than three miles of pipe, the first project of which services about 157 residential water customers. This first phase began the last week of April, with a Murphy crew on-site fusing 6,600 ft of 6-in. and 8-in. HDPE in the northwest portion of the city.

Fusions were made using a McElroy TracStar 412 Series 2. Designed to butt fuse pipe sizes from 4-in. IPS to 12-in. DIPS, the TracStar 412 Series 2 offers a self-contained, self-propelled vehicle that allows fusion technicians to drive the machine directly to the fusion site.

The site superintendent, Jose "Lupe" Quintero, said his crew was able to fuse between 800 and 900 ft of HDPE each day with a single McElroy fusion machine.

"It's one of our favorite machines to work with," Quintero said. "Plus, HDPE is flexible, so it makes it easier to install the pipe as well, and there's no risk of corrosion like you see with cast iron."

MUD is targeting its rehabilitation efforts toward the areas with the highest failure rates, rather than targeting by the age or material of the pipe. Right now, the utility's water main makeup is roughly 37 percent cast iron and 58 percent ductile iron pipe, with a smattering of plastic, steel, concrete and transite (cement pipe mixed with asbestos fibers) making up the difference between the two.

Because the rehabilitation is being done based on risk assessment, the replacement work is happening in stages.

"The pipe material influences your labor and design plans," Svagera said. "HDPE represents a lower installation cost, plus a lower material cost, and we want to do right by our ratepayers by installing what will give us the highest quality and longest lifespan, at the end of the day."

In the summer 2022, MUD designed its replacement plan around using PVC. However, after seeing the success of Murphy's initial HDPE pipe-bursting project, the utility coordinated one HDPE project to see how their crew felt about the installation process.

"They just loved it," Svagera said.

In 2023, the utility swapped many of its internal water projects to HDPE.

In-house fusion work will be completed using a McElroy TracStar 618. Like the TracStar 412, the TracStar 618 is self-contained, self-propelled and track-mounted. TracStar machines minimize damage to concrete and asphalt surfaces, which is a plus on public and private properties. Additionally, because the equipment can be driven directly to the jobsite, there's no need for a crane or large piece of equipment to maneuver the fusion machine to the site.

While there is some overlap between the two machines' pipe ranges, the TracStar 618 is capable of fusing pipe from 6-in. IPS to 18-in. OD. Crews gleaned some fusion expertise from the work done by Murphy, Svagera said, but utility crews were already fusion certified because of their work with MDPE gas mains throughout the city.

"Most of our construction crews are operator-qualified to fuse gas pipe," Svagera said. "That knowledge translated right over to the water side."

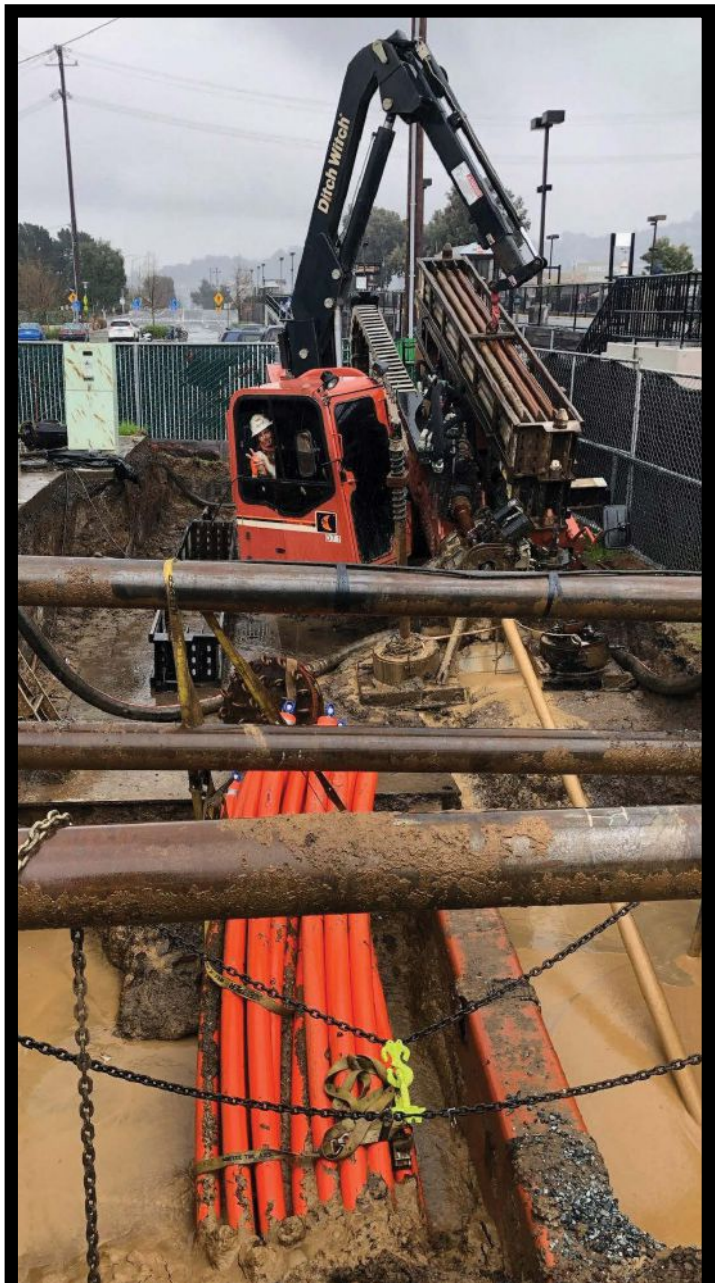
In 2023, Svagera expects to see MUD replace 16 miles of the existing water mains. He wants to see another 17 miles of replacement completed in 2024.

"We're ramping up a mile at a time," he said.

Larissa Copeland is a public relations specialist at McElroy Mfg.

LT DIRECTIONAL'S LARGE 27-WAY, 2-in. Multi-Duct Installation

By Josh Parker



During a rainy week in San Mateo, California, LT Directional was up against some mighty odds. Not only was Mother Nature on their tails with some major rains threatening the productivity of the job, but they also were in a metropolitan area that put them up against a public transportation railway on the surface, as well as the risk and hazards that come with drilling next to that. They were also battling an especially complex maze of existing underground utilities under the surface.

With some major high-tech companies — such as Survey Monkey, Sony Interactive and GoPro — headquartered on neighboring streets, LT Directional had a lot to lose if they inadvertently hit some existing power or communication utility lines. The safety of the crew was paramount from the time they arrived on the scene at 6 a.m., ready for the safety briefing. It was made clear that the weather was not going to be favorable or sunny anytime before sundown, so with several hundred feet to bore, it was going to take full alertness from every member of the crew — from rig operator to mud specialist.

That job was to install 27, 2-in. pipes over a few hundred feet that paralleled the San Mateo rail. This meant that there were a few different factors to take into consideration for the job.

Bore Hole Size

First, LT Directional would need to widen the hole enough to provide enough clearance for a 24-way puller. This meant that the final hole size would need to be at least 32 in. in diameter. With 27 pipes bundled together, the hole would need to be large enough

that there was clearance for the pipes to pull freely without creating suction that often accompanies the deadly combination of too little clearance in a hole with not the right mud recipe. When you create a hole that large in the shale, clay and sand composite mixture often found in Northern California, suddenly the wall pack also becomes a concern — which leads to the next factor.

Hole Stability

With a 32-in. hole, there is a lot of room for gravity to take over, and the hole collapse in on itself or deforms. LT Directional worked with the local Melfred Borzall HDD specialist to get the right mud mix for the rainy conditions, but they also decided to opt for a barrel stabilizer to ensure the wall pack's integrity stayed true. They opted for a Deluxe Barrel, or pig, from Melfred Borzall with added hardfacing, mudflow ports and cutter teeth options. It proved to be a wise choice as they reamed and pre-reamed prior to pullback.

HDD Tooling

Average tooling was not going to cut it for this big of a job. LT Directional knew they needed tooling custom-fit to this large bore, tooling that was not quite maxi, but larger than typical jobs. The tools they decided to include in their arsenal were a 32-in. Deluxe Barrel and Tornado Reamer combo for mixing and pumping action that simultaneously provided wall-pack stability. The reamer they chose was due to the ground conditions. Northern California is known for its varying conditions as much as for its rocky, hard drilling. If one thing is certain, it is that you will encounter more than one ground type within a bore that is deeper than 18 in. This job was no different. Running a Ditch Witch JT100, this crew encountered rocky conditions but ample amounts of sandy soil that posed the risk of collapsing the hole. The Tornado's large paddle cutter blades provide the mixing action needed to keep the risk low for balling up. The barrel stabilizer also kept fluid flowing

with its built-in fluid ports.

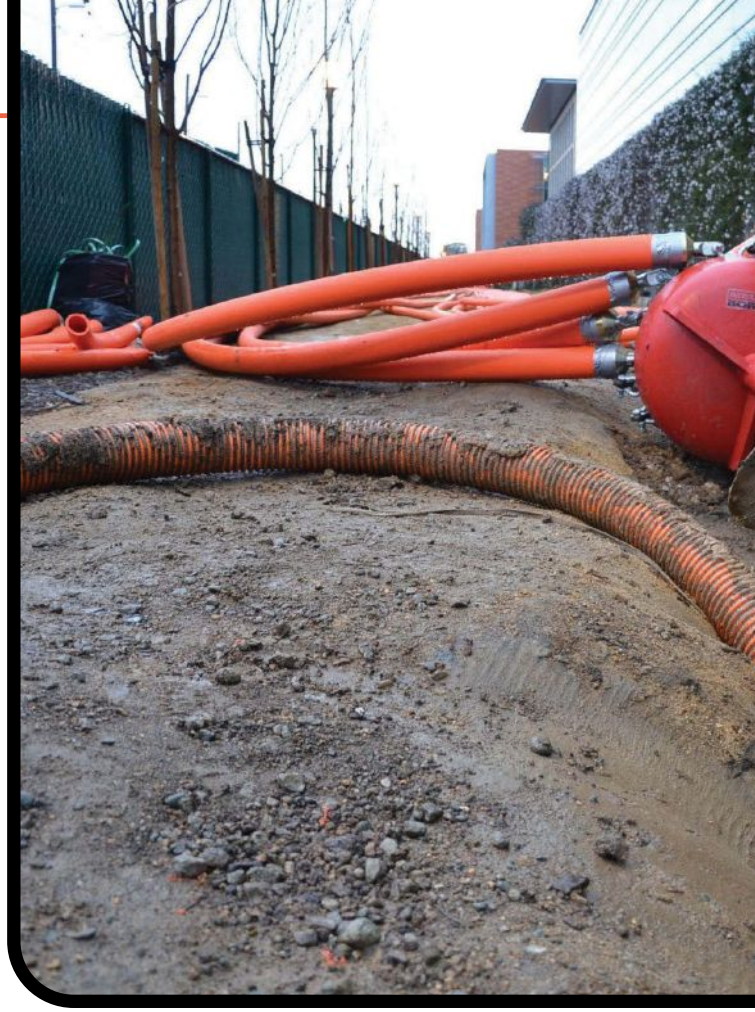
They trailed that with a swivel and custom-manufactured multi-duct puller from the Melfred Borzall engineering team. The multi-duct puller had 27 eyes that connected to 27 DCD Deluxe Duct Pullers that protected the pipe ends with a bell.

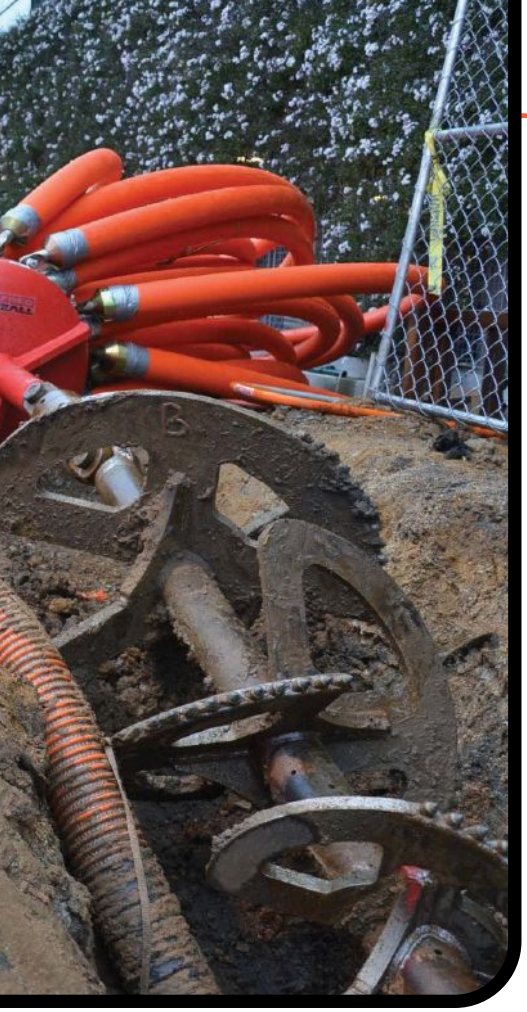
Melfred Borzall engineers had a challenge ahead of them as they had to build this from scratch and tailor it to the specs of LT Directional's job. After sharing designs, collaborating and finalizing the puller, it was tested and delivered on-site by their Northern California HDD specialist.

Mud & Fluid Management

This was the sticky part (pun intended). With the steady light rain and the necessity for mud flow to be just right, the mud specialist had to be on point that day. With a proper mix of bentonite and Melfred Borzall's Drill Kleen Plus Additives, they were able to keep the cuttings at the right level of viscosity to keep it moving downhole. It did not come without some effort though — with the rains — LT Directional did make the call to bring in a vac truck to excavate some excess mud and not risk the bore.

Taking all the proper safety precautions with the crew members, a spot-on mud mix and the correct tooling choices





that were customized and tailored to this specific job enabled LT Directional to have a successful day. With no more than a few feet of clearance on either side of the bore, the rig operator had a great day as he successfully threaded that needle and the crew was done before sundown. This was a great example of careful planning, proper preparation and investment in the right areas to ensure a successful job … even when Mother Nature isn't cooperating with the job.

Josh Parker is director of marketing at Melfred Borzall.

business cards

Call For Abstracts

2024 Sharing Technologies Seminar

The Pipe Users Group of Northern California invites abstracts for presentation at its 32nd annual SHARING TECHNOLOGIES SEMINAR to be held in Concord, CA on Thursday, February 8th, 2024.

The **Pipe Users Group** is a forum of collection and water system owners, engineers, contractors, vendors and suppliers dedicated to:

- Evaluating new and current rehabilitation and installation methods;
- Improving the design, construction, and operation of conveyance and collection systems;
- Pooling of resources for demonstrations, workshops, field trips and seminars showcasing new and existing technologies; and
- Keeping up with upcoming and current regulations, policies, laws, and standards impacting pipeline design and construction.

The **SHARING TECHNOLOGIES SEMINAR** objective is to share information developed by agencies and industry professionals throughout the world. Topics for presentations should relate to pipe technology in construction, rehabilitation or maintenance. Emerging technologies and trenchless construction processes are of special interest. Case histories and/or lessons learned on special projects using new technologies to solve unusual situations are good topics. Abstracts must be submitted online and should include the title, a brief description of the project (limit 200 words), author(s), agency/company, contact person, address, telephone, and email. Preference is given to project based presentations.

Technical papers will be requested upon acceptance of abstract.

Abstracts are due: Friday, September 15th, 2023 by 5:00p.m.

Submit abstracts by visiting https://norcalpug.com/calendar/annual-seminars/

Phone: 530.204.5208
Email: pugnorcal@gmail.com

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NATIONAL ASSOCIATION OF SEWER SERVICE COMPANIES

NASSCO NEWS

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NASSCO's Focus on Safety

By Sheila Joy, NASSCO Executive Director

WELCOME DENNIS PIVIN, CSP

On April 3, Dennis Pivin officially joined NASSCO as its Health, Safety and Environmental Consultant. Dennis brings to NASSCO over 25 years of professional experience in safety, health and environmental program development, implementation and management. He has spent the past 19 years working for Aegion LLC and is a Certified Safety Professional (CSP) with the Board of Certified Safety Professionals.

Dennis currently serves as the President of the St. Louis Chapter of the American Society of Safety Professionals, and is the Chair of the Health and Safety Committee for NASSCO. In addtion, he recently published a peer reveiwed paper titled "Helath Assessment from Cured-in-Place Pipe Lining Fugitive Styrene Emissions in Laterals" in the Journal of Pipeline Systems & Engineering Practices.

In his role as NASSCO's Health, Safety and Environmental Consultant, Dennis will also serve as a member of NASSCO's highly respected Technical Advisory Council to ensure that safety is considered and incorporated into all materials produced, presentations shared, and resources developed by NASSCO Committees. Dennis is available to answer questions specific to safety via Safety@NASSCO.org.

CIPP BEST PRACTICES RESOURCES ON NASSCO.ORG

The cured-in-place pipe (CIPP) process has become one of the most widely used rehabilitation methods in the world. First introduced to North America in the 1970s, it – along with many other trenchless technologies such as pipe bursting, spiral wound systems and others – has proven to be an effective alternative to dig and replace methods which require the old pipe to be dug up and hauled off to a landfill.

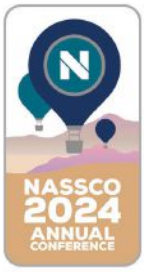
Given CIPP's popularity and wide (and growing) use, over the past several years and months NASSCO has amassed and developed educational videos, specification guidelines, research, and other materials to help support the safe and proper installation of CIPP. The following information is all available on NASSCO.org and we encourage anyone involved in the installation of CIPP to know and understand the proper application of the technology and the measures required to keep workers and our communities safe.

Below are a few of the resources available for free download:

- After years of research on the safety of styrene emissions in the CIPP process, the Trenchless Technology Center at Louisiana Tech (TTC) has provided specific recommendations for CIPP installations using styrenated resins. The entire reports are available at NASSCO.org/Safety/Styrene-Safety, and TTC's one-page, easy-to-read document titled Recommendations for CIPP Installations using Styrene Resins can be found on that same page under "Related Resources." We strongly encourage everyone to read, understand and follow these important recommendations.
- Styrene has a very noticeable odor, even at very low levels. NASSCO's Pipe Rehabilitation Committee's CIPP Safety Workgroup created a two-page What's that Odor? Brochure which can be shared with property owners and anyone curious about how to minimize odor during the installation process when styrene-based resins are used. This document is also available for download on NASSCO.org/Safety/Styrene-Safety and can be printed, shared, and even posted to your own website.
- To accompany this brochure, there is also a short and entertaining video called What's that Odor? This is available for download to your website, for sharing on social media, and can be found on NASSCO'S Vimeo page: https://vimeo.com/528370223
- To build awareness for aging underground infrastructure, NASSCO's vision is to provide education, technical resources, and advocacy to our industry. Two important technical resources pertaining to CIPP installations and safety are available on the NASSCO website at NASSCO.org/Resources/NASSCO-Specification-Guidelines.
- Safe Use and Handling of Styrenated Resins in CIPP Specification Guideline
- Cured-in-Place Pipe (CIPP) Installation Performance Specification Guideline
- Based on the Safe Use and Handling of Styrenated Resins in CIPP Specification Guideline, NASSCO now offers an online course on the subject. Successful completion of NASSCO's Safe Use and Handling of Styrene-Based Resins in CIPP Exam demonstrates that a student has a basic understanding of knowledge to help protect employees and the environment from potential hazards. To register for the eLearning session, visit NASSCOTrainingSource.org.
- Do you need to educate a customer or community on the CIPP process and the benefits the technology offers? Please share, download, and post NASSCO's CIPP 101 Video which may be found here: https://vimeo.com/672110918

NASSCO continues to update its Safety web page on styrene and many other topics, including vital safety updates, and encourages you to visit NASSCO.org/Safety often, as it is continually updated. To learn more please visit our website. For specific questions regarding styrene or any other safety issue, please email Safety@NASSCO.org. For technical questions, please email our Technical Advisory Council via TAC@NASSCO.org.

SAVE THE DATE!



Join us April 17-19, 2024 for NASSCO's 48th Annual Conference at Hyatt Regency Tamaya Resort and Spa in Santa Ana Pueblo, New Mexico. If you are not yet a member, please join NASSCO and get involved in our dynamic committees so you may have a voice in the development of our important educational programs, technical resources, and industry advocacy. Learn more at NASSCO.org/Join. Registration for NASSCO's Annual Conference opens soon at NASSCO.org/Events.

WORLD TRENCHLESS DAY

September 28, 2023

LIGHTS CAMERA ACTION

Be a part of *Trenchless Technology*'s World Trenchless Day Video Tribute and help us spread the word about the benefits of trenchless technology!

It's FREE!

Here's how you can participate.

Submit a 30-second video clip

with your World Trenchless Day message by Aug. 4, 2023. *Trenchless Technology* will share videos on World Trenchless Day, Sept. 28, 2023. The video with the most social interactions will be shown during *Trenchless Technology*'s Perspectives Live Webinar!

Questions? Want to participate?

Email Chelsea Ulmer at culmer@benjaminmedia.com.

tech forum

By Cheryl Stratos

Don't Forget the SPF!

Construction workers risk of melanoma cancer, to double by 2060

It's summer and you spend a lot of time working outdoors. You're wearing all your safety equipment, right? The right boots, pants, helmets, vests…..

Don't forget your SPF and sun-protective clothing.

Construction workers have an increased risk of melanoma cancer, and cases are estimated to double by 2060, unless preventative measures aren't taken fast, according to new research done by the Institute for Work & Health (IWH). Skin cancer is the second most common cancer in construction work (the first is lung cancer).

One in 40 Americans is diagnosed every year with melanoma, a skin cancer primarily caused by sun exposure. In 2023, an estimated 186,680 cases of melanoma will be diagnosed in the United States. Of those, 89,070 cases will be in situ (noninvasive), meaning that it is confined to the top layer of skin (the epidermis), and 97,610 cases will be invasive, meaning that the melanoma penetrates the epidermis into the skin's second layer (the dermis).

Of the invasive cases, 58,120 will be men, and 39,490 will be women.

Melanoma and other skin cancers are primarily caused by exposure to solar radiation. You can mitigate this risk by protecting your skin with SPF 30+ sunscreen, clothing, or other shade equipment. Since 1992, OSHA has stated that employers must protect workers exposed to the sun on the job and risk serious physical harm or death.

In the field we tend to focus on our exposure to more immediate hazards, like the ones that can kill us immediately. We often ignore the risk of skin cancer. In fact, every hour of every day, more than two people will die from the disease.

Working in construction, for the most part, you are an outdoor worker exposed to UV radiation both directly from the sun and indirectly as it is reflected from surrounding surfaces. That's why it's important to continue wearing sun protection (protective clothing and sunscreen) even when you're in the shade, for maximum protection.

Melanoma is an equal-opportunity cancer — it does not discriminate by age, race, or gender.

You can protect through:

Reorganize work: Keep in mind the heat of the day is between 10 a.m. to 4 p.m.

Use shade: There are plenty of options even when working near reflective surfaces with no natural shade. You can have a physical barrier to ward off UV radiation by erecting temporary shade structures.

Protective clothing: UV protection clothing increase with the density of the fabric's weave, and darker colors absorb more UV radiation than lighter colors of the same fabric.

Hats: If hard hats are mandatory, various sun protection accessories are available for attaching to helmets, such as broad brims or Legionnaire covers with peaks and flaps at the back and sides.

Sunglasses: Eyes are also susceptible to sun damage, wear closefitting, wraparound style sunglasses or sunglasses with side shields.

Sunscreen: Sunscreen is not a "blockout" workers should not forget to apply protection to lips using either SPF 30+ lip balm or zinc cream.

I know this seems trivial in some regards, especially when there are other hazards on the job, but limiting your sun exposure is worth it. Melanoma is one cancer you don't want to experience.

In 2009, I was diagnosed with Stage IV Metastatic Melanoma Cancer. My doctor told me I had six months to live. That's not the type of reality check anyone wants. It took me six years of treatments, with lots of drug side effects to overcome melanoma cancer. Early detection is key to survival, and a poster with skin cancer screening guidelines should be in your trailer along with a big bottle of SPF Sunscreen.

Remember, melanoma is not just skin cancer. It can develop anywhere on the body - in your eyes, on your scalp, nails, feet, mouth, and even in your lungs.

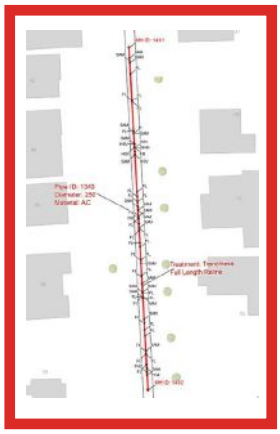
Take a few minutes to apply your SPF and wear sun-protective clothing when you are out in the field – these things are just as important as wearing a hard hat and are part of your daily protection. It too could save your life!

Cheryl Stratos is director of marketing and sales at the National Utility Contractors Association (NUCA) and a skin cancer survivor/advocate.

nassco report

By Tanya Stephens, A.Sc.T.

INFRASTRUCTURE CONDITION ASSESSMENT COMMITTEE



Located in the Province of Ontario, Canada, The City of Welland's sewer network is comprised of 6,200 reaches of active sanitary, combined and stormwater pipes totaling approximately 400 km, and 8,000 maintenance holes. Historically, the City's sewer inspection and maintenance revolved around widely accepted and utilized area-based programs. However, due to the sharp rise in inflation and budget constraints, City staff turned to GM BluePlan Engineering to assist in designing a programmatic, evidence-based approach.

To ensure the proper collection of data and to take advantage of the wealth of information contained in NASSCO's Exchange Databases for the purpose of making well-informed decisions for their rehabilitation and replacement strategies, it was decided to build logic that would develop programs for the city-wide collection of CCTV sewer data in an optimized multi-year process, including CCTV data assessment aids to maximize efficiencies in capital project planning.

Consider the following scenario: a PVC pipe constructed five years ago has a recent post-construction CCTV inspection documenting its satisfactory condition, suggesting an asset that has a lesser risk of failure. In contrast, consider an asbestos cement pipe constructed in the 1960s with a history of service calls which may imply an asset with a higher risk of failure. Prioritizing pipes for rehabilitation using decision logic leverages automated processes that utilize existing data within the City's GIS and five-year historical CCTV data collection.

With over 6,500 inspections collected, the first step was to ensure each inspection matched successfully to its GIS inventory counterpart. Reverse inspections were merged with first attempts, recognizing that two inspections combined should determine the overall pipe's condition rating.

The logic was developed in SQL Server with stored procedures separating each applicable task: Quality Control and Quality Assurance, Treatment Recommendations, and Inspection Prioritization.

Utilizing NASSCO's PACP database structure, observed defects were programmatically visualized along each pipe length spatially. With the logic applied to the most recent inspection on each pipe section within the dataset, results are displayed using the most current pipe condition.

From the raw CCTV data, the logic produces QA/QC tables that recommend edits to the City's GIS geometry and attribution; identifies code discrepancies; and facilitates adjustments to recorded defects where reasonable. It pinpoints inspections requiring video to database review to ensure refined data is available for analysis. With more than 100,000 defect codes in the dataset, the analysis and reporting of corrections and/or recommendations for video review was completed in less than 20 seconds.

With a dataset of this size, manual review of CCTV inspections with recommended actions was estimated to be approximately 135 workdays from a staff member to produce similar results provided by the logic.

The optimized dataset was utilized for programmatic spatial display by condition rating. A hybrid inspection model was built with the consideration of inspection technologies and their associated costs to meet budgetary and risk parameters. Pipes with severe condition ratings were assigned cleaning and CCTV inspection, while pipes without condition information were assigned zoom technology inspection to provide baseline condition ratings for future CCTV inspection prioritization.

Pipes experiencing structural failure are prioritized and assigned the most cost efficient method of rehabilitation, replacement, or repair based on custom parameters within the logic. The resulting pipes were included in the City's current capital projects and excluded from high priority inspection schedules by pre-determining them to like-new condition.

Pipes with special considerations, such as infiltration and inflow study requirements and chronic maintenance service calls are brought into focus. The spatial tables enable staff to focus on problematic areas, assisting with the planning, execution and tracking of inspection and treatment programs. Results are shared across departments, fueling effective communication for all stakeholders.

In only four years, the City's entire sewer network will be prioritized based on condition, with assigned rehabilitation and maintenance needs. Prioritization of inspection and rehabilitation treatments are automatically adjusted as newer condition data is imported, with an emphasis and preference toward trenchless technologies to maintain budgetary efficiencies.

Welland's proactive, programmatic approach to pipe maintenance reaffirms their commitment to regulatory compliance and public and environmental protection within an attainable budget. Results may be verified using the transparent and repeatable process which specifically targets areas of concern in a fraction of the time and expense whilst providing an improved understanding of their network's needs.

Tanya Stephens, A.Sc.T is a NASSCO-certified trainer and co-chair of the NASSCO Infrastructure Condition Assessment Committee.

product spotlight

ATLAS COPCO

Atlas Copco Power and Flow has launched a next-generation electric submersible dewatering pump, the WEDA D95, incorporating state-of-the-art Wear Deflector Technology. The pump delivers best-in-class performance over a longer lifetime than comparable pumps in heavily abrasive environments such as mining, tunneling and construction. WEDA D95 has a power rating of 37 – 43kW and is the latest pump in the WEDA D drainage range to feature the innovative Wear Deflector Technology designed to minimize wear and provide consistent performance over a longer operating life. Features such as a high chrome wear resistant impeller combined with solid-redirecting auxiliary vanes contribute towards its exceptional performance. The pump also features re-adjustable hydraulics which allow the pump to be simply realigned to compensate for any wear, thus prolonging its life. All these elements have a significant positive impact on the overall operational productivity, meaning users can achieve a lower total cost of ownership.

For more information, visit atlascopco.com.

EARTEC

Eartec Evade are a new class of light industrial, full duplex headsets designed for professional crews that need hands free, simultaneous talk, wireless communication. Single and dual ear Evade feature deluxe padding and a sleek, fully adjustable headband that provide outstanding comfort. The Evade XTreme is a heavy duty, dual ear model that can be worn with a hard hat. All Evade headsets are self-contained and feature a compact full duplex transceiver built inside the ear cups eliminating wires and belt packs. Complete intercoms include one main unit that relays the digital signals generated by up to eight remote units. The headsets link automatically without a HUB or base station making them easy to operate and affordable. The Eartec Evade wireless can connect up to 32 users within a 400-yd range enhancing coordination, productivity, and safety.

For more information, visit eartec.com.

TOPCON

Topcon Positioning Systems introduces Digital Layout, designed to provide a distinct competitive advantage in the fast-paced building construction industry for general contractors, concrete contractors, This cost-efficient building construction field software works in combination with a 3D laser — the Topcon LN — or a Topcon GT robotic total station, providing a step-by-step guide to streamline routines and workflows. Additionally, the software can be used with the Point Manager plug-in for Autodesk Revit or AutoCAD to create point files in the office and seamlessly transfer as-built data back to a contractor's design software. It is compatible with 2D, 3D and BIM workflows, and is supported by Microsoft Windows and Android operating systems. Users can easily generate real-time PDF reports to summarize work progress for stakeholders. Topcon MAGNET Enterprise web service is also included, enabling users to easily share data between the office and field.

For more information, visit topconpositioning.com.

TRENCHLESS EVENTS CALENDAR 2023

****RED BOX DENOTES NOTABLE EVENTS****

***All events are current as of June 20. Please check the event's website for updates.**

JULY

24-27 DCA Mid Year Meeting
Stowe, Vermont
Web: dcaweb.org

AUGUST

2-5 2023 PCCA Mid-Year Meeting
Incline Village, Nevada
Web: pccaweb.org

8-9 2023 Water Finance Conference
Cleveland, Ohio
Web: waterfinanceconference.com

12-16 UESI Pipelines 2023 Conference
San Antonio, Texas
Web: pipelinesconference.org

14-17 2023 DoD Corrosion Prevention Technology and Innovation Symposium
Tucson, Arizona
Web: dodcorrcon.org

22-24 The Water Expo
Miami, Florida
Web: thewaterexpo.com

22-24 The Energy Expo
Miami, Florida
Web: theenergyexpo.com

27-30 PWX 2023
San Diego, California
Web: pwx.apwa.net

SEPTEMBER

11-13 Breakthroughs in Tunneling Short Course
Denver, Colorado
Web: tunnelingshortcourse.com

11-15 IPLOCA 2023 Convention
Vancouver, British Columbia
Web: iploca.com

24-26 Tunnelling Asscoaition of Canada 2023 Conference
Toronto, Ontario
Web: tac2023.ca

26-28 The Utility Expo
Louisville, Kentucky
Web: theutilityexpo.com

28 World Trenchless Day
Global Celebration
Web: worldtrenchlessday.org

30-Oct. 4 WEFTEC 2023
Chicago, Illinois
Web: weftec.org

OCTOBER

1-4 2023 APCA Mid-Year Meeting
Savannah, Georgia
Web: americanpipeline.org

17-18 39th International No-Dig Mexico 2023
Expo Santa Fe, Mexico
Web: no-digmexico.com

23-25 2023 No-Dig North
Edmonton, Alberta
Web: nodignorth.ca

Ad Index

last word

By Wayne Hofmann

BABA AT THE BAR

An engineer, a contractor and a utility owner walked into a bar.

They had just finished a long day reviewing plans at the construction site, and they were all feeling a little drained. They ordered their drinks and saddled up to the bar.

Before long, the conversation drifted to their new favorite bar topic: the Buy American Build America Act (BABA).

"I just cannot make heads or tails of this program," proclaimed Mary the engineer. "Everything we put in this project was sourced from the United States. I'm busy enough, how can I keep track of where everything is coming from? It is like they don't want us to build anything."

Joe, the contractor, added, "You think you have it bad? We need to make sure that all our subcontractors are compliant too. Have you ever tried to herd subcontractors? If we can't get them to comply, we risk losing our funding."

The utility owner, Jim, chimed in. "Wait, don't you mean my funding? You guys need to figure this out because I cannot have you making this project more expensive. We already have a tight budget."

Joe wryly replied, "It might cost a little more upfront, but it is worth it to support American industries and jobs, right?"

Mary groaned. "That's all well and good," she said. "But the only place I can get this special thermosetting resin is from a plant in Germany. It is the best there is and we must have it!"

"Yes, it is a great resin, I agree," mused Jim.

The bartender overheard their conversation and interjected, "You guys always come in here and start complaining about this BABA thing within 10 minutes. Don't you have any solutions?"

The group looked at each other and grumbled.

"You just don't understand," Mary explained, "Sure, it is great to support America companies, but we need this resin!"

Suddenly, Fred the materials supplier walked in. "Hey everyone, sorry I'm late."

"YOU ARE ALWAYS LATE," the group bellowed in unison.

"I know, it always feels like I'm disappointing you. I was stuck at the shop on the phone with this plant in Germany about thisresin I need—it is going to take them six more months to get here," Fred complained.

"Oh no!" Mary cried.

The bartender chuckled. "Boy, I thought I had problems! This sounds challenging, but haven't you thought of any solutions? Isn't that your job?" he asked.

"Look buddy," Jim the utility owner said, "you plan these projects for years and years, only to find out you cannot use some of the materials you have been relying on for so long. And then the rules change!"

"That is right," noted Mary the engineer. "But, I did hear you can get a waiver if you have been planning or designing a project before May 14, 2022. You have some of those, right, Jim?"

"You know, just about everything we are working on right now is in our capital improvement plan," Jim said. "If we can show these projects were planned quite a while ago, we could get a waiver."

"Great idea!" exclaimed Mary. "Plus, we can use that precious resin!"

Fred the supplier spoke up. "That is a great resin, but we're getting this new one that's made in Ohio," he said. "Great story, smaller American producer that is partnering with a company overseas. I'll send you the specs."

"Why didn't you tell me about that at the supplier expo?" Joe the contractor asked. "I walked that entire exhibit hall and not a single booth had 'Made in America' stickers on any of the fancy materials you suppliers are selling. Seems like a great differentiator!"

"You know, you are right," Fred said. "I'm sending marketing an email right this second — don't tell anyone else!"

"Seems silly that a little resin can throw a project sideways," said Jim. "It is not even that big of an expense relative to the rest of the project."

"You know, you are onto something there" Joe thought. "The valve is only about 3 percent of the project as I recall. I can check, but if we can source the rest of the materials domestically, we might be able to get that 5 percent EPA waiver I heard about at the conference last month."

"Look at that," noted the bartender. "You're coming up with some good ideas! This calls for another round!"

Wayne Hofmann is client funding director at Wade Trim.

AFFORDABILITY.
ACCOUNTABILITY.
ADAPTABILITY.

Water Finance CONFERENCE

9th Annual Event

AUGUST 8-9, 2023

Aloft Cleveland Downtown
Cleveland, Ohio

FEATURING
expert speakers on
water/wastewater utility finance

PLUS... join us for a tour of Cleveland Water's
Garrett Morgan Treatment Plant
the morning of Aug. 8!

Registration Open.
Sponsorships Available.

For sponsorship information, contact Hannah Stakolich: hstakolich@benjaminmedia.com or 440-465-9434.

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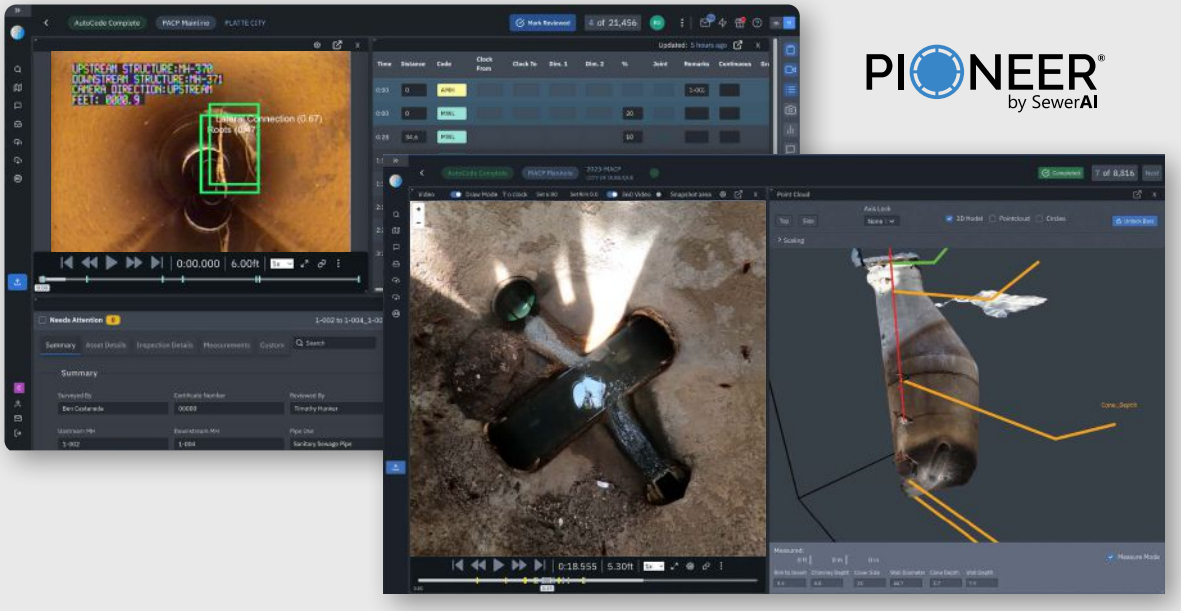

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