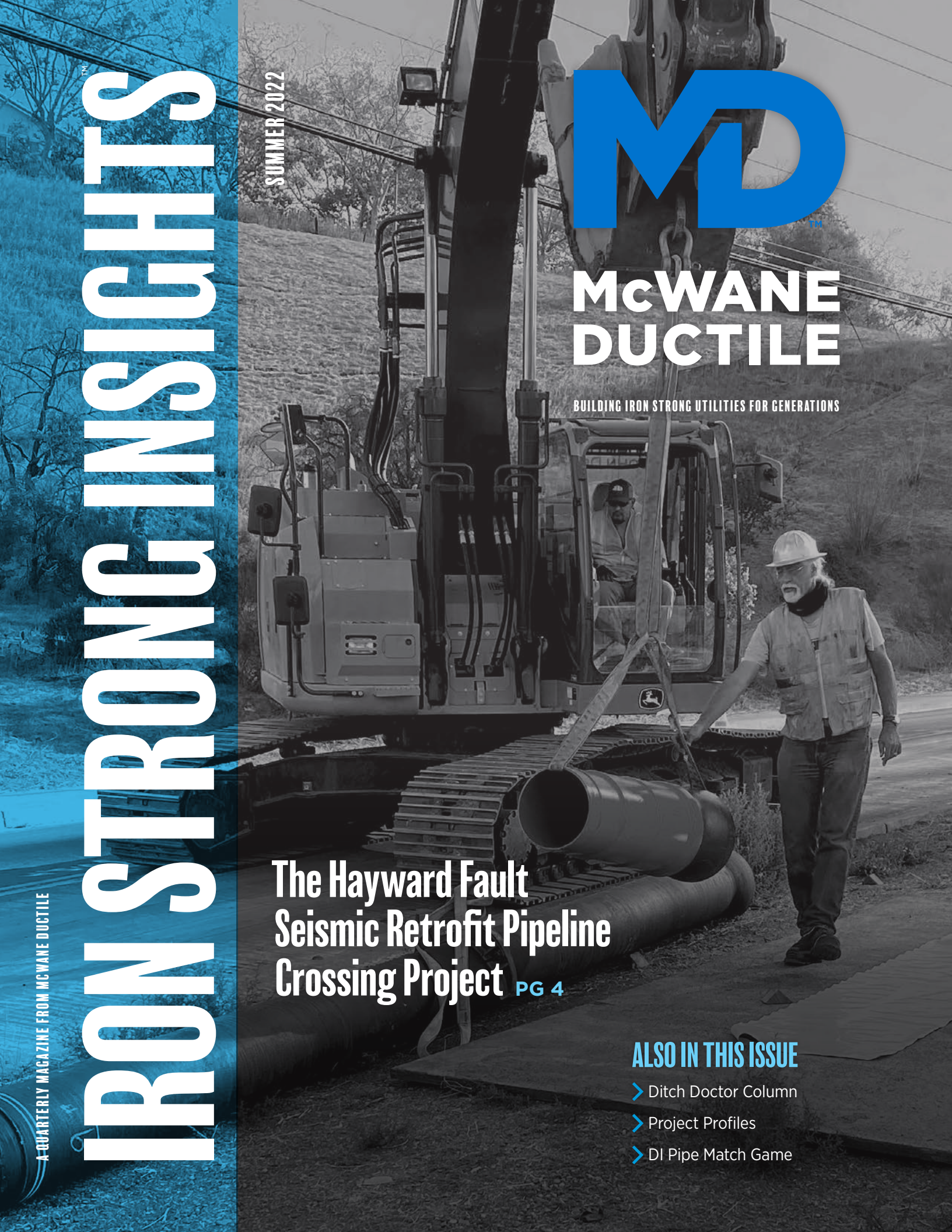
IRON STRONG INSIGHTS™

A QUARTERLY MAGAZINE FROM MCWANE DUCTILE

SUMMER 2022

McWANE DUCTILE

BUILDING IRON STRONG UTILITIES FOR GENERATIONS



The Hayward Fault Seismic Retrofit Pipeline Crossing Project PG 4

ALSO IN THIS ISSUE

McWANE DUCTILE

Contact Us: McWaneDuctile.com

Mike Dodge, VP Sales & Marketing
Stuart Liddell, Sales Operations Manager
Andrea Kubik, Marketing Manager

Inside

IRON STRONG INSIGHTS™

McWane Ductile has been an industry leader in the manufacture of water distribution and infrastructure products since 1921. With three U.S. foundries, McWane Ductile offers superior service while supplying Ductile iron pipe across North America and beyond, all while maintaining an unwavering commitment to safety and quality. Through continued innovation, it is our goal to meet the customer needs and industry demands of the future in order to Build Iron Strong Utilities for Generations.

The Hayward Fault Seismic Retrofit Pipeline Crossing Project

PG 4

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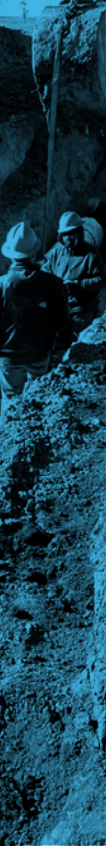


IN THIS ISSUE

Welcome to Iron Strong Insights™

Dear Readers,

Welcome to the Summer edition of Iron Strong Insights. It's the time of year to take some time away from work with an extended vacation or maybe some impromptu weekend getaways. Regardless of how you schedule this time away, it is important to take a step back and focus on things like relationships with family and friends. It is also essential to take some time to yourself, decompress and recharge for the balance of the year before the winter holidays come around.

Right now, it seems that things are speeding by faster than ever. Demand for our products has not shown any sign of slowing as public and private projects continue to bid at a good pace. This demand is due in part to recovering from lost time for projects postponed during COVID-19, but also attributable to the various funding that has been made available and earmarked for infrastructure improvements. While this demand is undoubtedly good for business, it puts a tremendous strain on an already stretched supply chain, and especially on the men and women who work so hard to provide products and services we rely on daily. Our heartfelt appreciation for these folks could never be enough as we thank them for their efforts.

This year already, we have seen record-breaking high temperatures across many regions of the US. This was especially felt during last month's ACE conference in San Antonio. While it was a bit uncomfortable outside, it was still a pleasure to get back to a live conference environment where representatives of the McWane family of companies were on hand to interact with waterworks professionals. McWane Ductile will be participating in many more events this year, so please visit our website for a calendar of events.

In this issue, we have a feature highlighting McWane Ductile's initial installation of our Seismic Flex Coupling™ (SFC) for earthquake resilience. The article, written by John Johnson, Regional Engineer for McWane Ductile, and Bert Weiss, Operations and Maintenance Manager for the City of Hayward, CA, details the planning and execution of this project meant to substantially upgrade a critical water line that crosses the Hayward Fault. It also showcases the performance capabilities of the SFC as it relates to expansion/contraction limits as well as allowable deflection that will serve this line for years to come.

As always, we welcome you to review the other Project Profiles and features included in this issue. There is a Match Game challenging readers to identify certain Ductile iron pipe joint types. This could be particularly useful to any new hires in our industry who may not be as familiar with the various options available. This also fits nicely with our aim to educate and assist our customers in building Iron Strong utilities for generations.

Stuart Liddell
Sales Operations Manager
Sales Operations Department

THE HAYWARD

CITY OF HAYWARD SEISMIC RETROFIT 12-INCH PIPELINE CROSSING THE HAYWARD FAULT ALONG GARIN AVENUE

By John Johnson, Regional Engineer, McWane Ductile; and Bert Weiss, Operations and Maintenance Manager, City of Hayward

SITE HISTORY – THE HAYWARD FAULT LINE

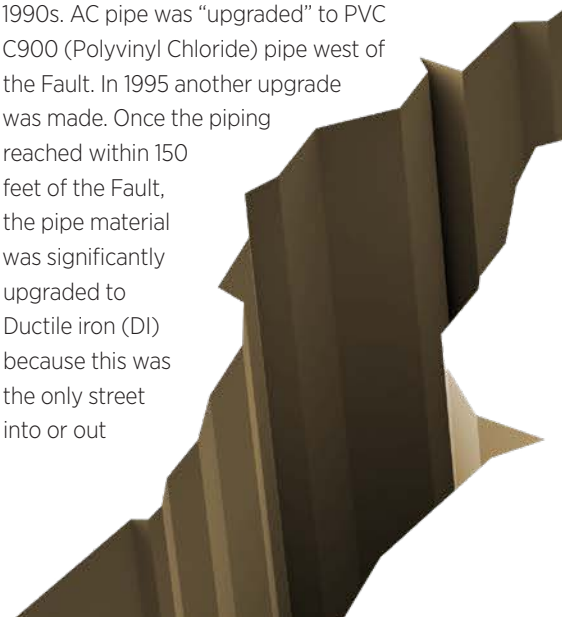
With a storied history involving faults, earthquakes and piping, the city of Hayward, California sits just across the bay from San Francisco (SF), south of Oakland. The first notable seismic event was recorded here in 1868, when an earthquake with an estimated 6.7 magnitude struck, causing significant damage and deaths. Hayward rebuilt, remaining an agricultural community in the early 20th century, then grew quickly, becoming the sixth-largest city in the SF Bay Area.

"From a municipal piping perspective, Hayward and the Bay Area saw a major Post WWII housing boom. With the war effort consuming most of the metal used in the country, Asbestos Cement (AC) pipe was developed to fill the water infrastructure need," said Bert Weiss, City of Hayward Operations & Maintenance Manager. "As a result, many distribution systems in the region are still roughly 70% AC pipe today."

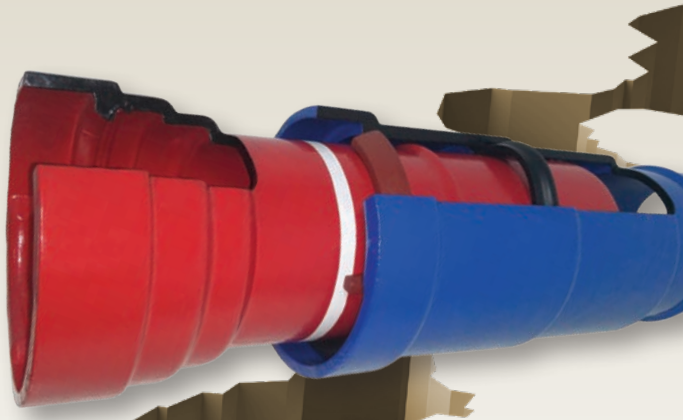
Weiss also said, "While AC pipe might have been viewed as an excellent alternative when it was initially installed, you would be hard-pressed to find a worse-performing pipe material in earthquake-prone areas. Being crisscrossed by the San Andreas and Hayward Faults, one thing the SF Peninsula and the East Bay can count on is seismic activity."

A wake-up call for California, came on October 17, 1989, when the 6.9 magnitude Loma Prieta Earthquake hit the SF Bay Area. The devastation was witnessed live by millions when the MLB World Series broadcast blinked off, followed by news reports of collapsed roadways on the Bay Bridge and Cypress elevated freeway, and the broken and burning buildings in San Francisco.

Hayward responded to this near-miss with a costly and extensive study of its water distribution system's vulnerability to seismic events on the fault that runs the length of the city. The Garin Fault crossing was identified as a significant risk, and the first incremental improvements were made in the early 1990s. AC pipe was "upgraded" to PVC C900 (Polyvinyl Chloride) pipe west of the Fault. In 1995 another upgrade was made. Once the piping reached within 150 feet of the Fault, the pipe material was significantly upgraded to Ductile iron (DI) because this was the only street into or out



FAULT



of the development it served. At the time, these seismic improvements were considered state-of-the-art.

Unfortunately for Hayward and other water utilities in the Bay Area, replacing all piping susceptible to earthquakes isn't feasible due to upgrade costs that require hefty rate increases for end consumers. So, the most vulnerable and critical pipelines with the highest consequence of failure have been identified for incremental improvements.

COMMENTS FROM JOHN JOHNSON (REGIONAL ENGINEER, MCWANE DUCTILE):

PROJECT CONCEPTION – SPRING 2020

This recent retrofit was conceived when Bert Weiss and I met to discuss a presentation on Seismic Resilience for Buried Pipelines. Bert mentioned a 12-inch DI push-on joint pipeline along Garin Avenue installed in 1995 with restraint gaskets was at high risk because it crossed directly over the Hayward Fault. This pipe was the sole source of potable water and fire protection for nearly 300 homes and 11 apartment buildings. His concerns were twofold:

1. The Hayward Fault is one of the more dangerous faults in California. According to the US Geological Survey (USGS), as of 2014, there was nearly a 75% chance of a damaging 6.7 to 7.0 magnitude earthquake along the Fault in the next 30 years.

2. Typical lateral fault movement along the Fault is 0.25 to 1 inch annually, which causes tremendous strain on the pipeline over time.

To address his concerns, I presented the McWane Ductile (MD) Earthquake Resistant Ductile Iron Pipe (ERDIP) product, with 11.5 degrees of joint deflection and 10.66 inches of axial capacity, to reduce the risk to the Garin Avenue pipeline. We agreed to complete the retrofit with the recently developed Seismic Flex Coupling™ (SFC) from McWane Ductile. The city's field staff would perform the installation, and McWane Ductile would provide a

Faults location and movement as it crossed Garin Ave. (Source: Paul Saffo via USGS Aerial Photos, Feb 2021)

Regional Engineer, Product Engineer, and Technical Services to consult on project design and installation.

PLANNING — FALL 2020

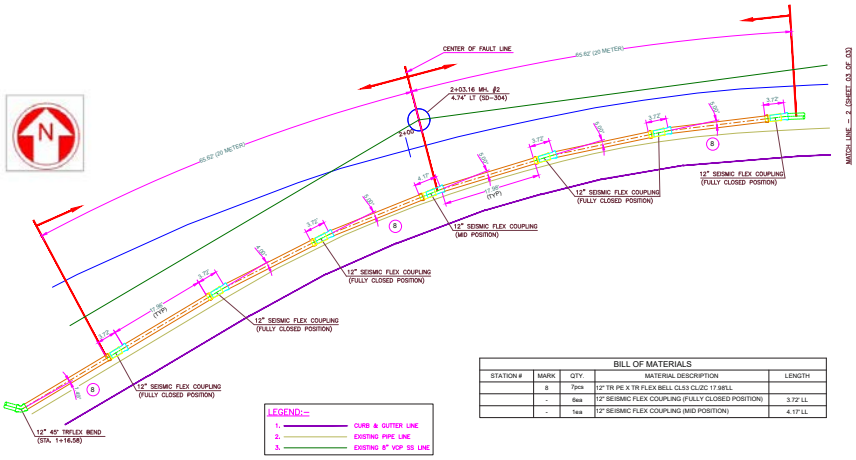
I then met with Bert Weiss again to evaluate site conditions. Also included was Paul Saffo, Stanford Engineering Professor, who has conducted significant research on the Hayward Fault. Paul showed aerial photography and USGS sources illustrating the Fault's general location. We identified where the Fault line is of most concern to the existing pipeline, noted it on the 1995 As-Built plans and indicated the lateral direction the fault is moving. The USGS estimates the total width of the Fault at 40 meters (approx. ± 20 meters from the Fault centerline).

With this information, we developed a lay schedule to upgrade the system with MD SFC, which provides superior joint deflection and axial range capacity, a significant increase in resilience for future earthquakes and accommodates annual lateral movement of the Fault for decades to come.

DESIGN PHASE — SPRING 2021

A primary concern was identifying the location of existing Mechanical Joint (MJ) connections for relocation outside the Fault margins due to their limited deflection and lower seismic strain capacity than restrained joint ERDIP. We found existing isolation valves were outside the fault margins. However, a 6-inch main to a fire hydrant required relocation below the west Fault margin. Next, a layout was needed to take advantage of the best-in-class joint deflection and axial capacity available with the McWane Ductile SFC. With fault margins of approximately 40 meters total (131 feet), a design consisting of seven Seismic Flex Couplings (SFC) at every Class 52 TR Flex® restrained joint pipe was recommended. Six SFCs would be set in the fully closed position. The seventh SFC would be set in the mid position with an additional 5.33 inches of axial expansion or compression totaling 74.31 inches of axial expansion capacity. The design was reviewed and approved by Karla Castro, P.E., City of Hayward Engineering.

Assuming an average annual movement along the fault of 0.50 inches, this layout provides 148 years of axial expansion and a considerable increase in seismic resilience where the pipeline crosses the Fault. It also significantly exceeds the performance level guideline for strain capacity in the ISO 16134 Standard, dramatically limiting the strain from fault activity affecting MJ connections above and/or below the fault margins.



Similarly, the joint deflection would be the best-in-class, providing 11.5 degrees at every joint through the Fault margin. Additionally, a 12-inch x 6-inch TR Flex Tee fitting was installed below the west margin to connect the 6-inch Class 52 TR Flex pipe to the relocated hydrant. A 6-inch SFC and TR Flex pipe was utilized for the hydrant connection to provide an additional 11.5 degrees deflection. This SFC is set in the mid-position (±5.33 inches) accommodating earthquake tension or compression.

One final design improvement took advantage of the unique external load strength of Ductile iron pipe, allowing it to be buried with less cover. The Fault crossing piping has between 2.5 to 3 feet maximum cover, except where it ties back into the existing pipeline. This provides an advantage of being cheaper to install because a shallower trench takes less time to dig, uses less fuel and requires less backfill material transport.

INSTALLATION AND TESTING — FALL 2021

A City of Hayward field crew installed the mid to top section of the new ERDIP pipeline with guidance from McWane Ductile Product Engineer Jerry Regula. Here the pipeline runs from the lowest (western) SFC uphill (easterly) through the Fault margins to the east end of the retrofit connecting to the upper isolation valve. The new pipeline follows the Garin Avenue radius, installed at 2.5–3 feet of cover to the top of the pipe. It runs parallel to the existing 12-inch main, which was kept as a backup.

Workers installing V-Bio.

Hold in Place mechanisms installed.

According to Bert Weiss, the city's field crew found the McWane Ductile ERDIP system "simple and easy to install." V-Bio® Enhanced Polyethylene Encasement was used on the retrofit, as it is a recommended laying practice listed in the ISO 16134 Standard, reducing friction on the pipeline by over 30%.

Hold in Place (HIP) mechanisms were utilized on installed SFCs to maintain their position through installation and pressure testing phases only. For 12-inch SFCs, these mechanisms release when forces exceed 160 psi, allowing the SFC to accommodate seismic forces. In late October 2021, the city of Hayward installed the 6-inch ERDIP section for the fire hydrant connected to the 12-inch ERDIP section. The final pressure testing and disinfection were completed on November 29, and the line was put into service.

PROJECT REVIEW – LESSONS LEARNED

The Fault location information received from the USGS was highly accurate. When the trench was dug, the fault line was within 1 foot of the location provided by the survey.

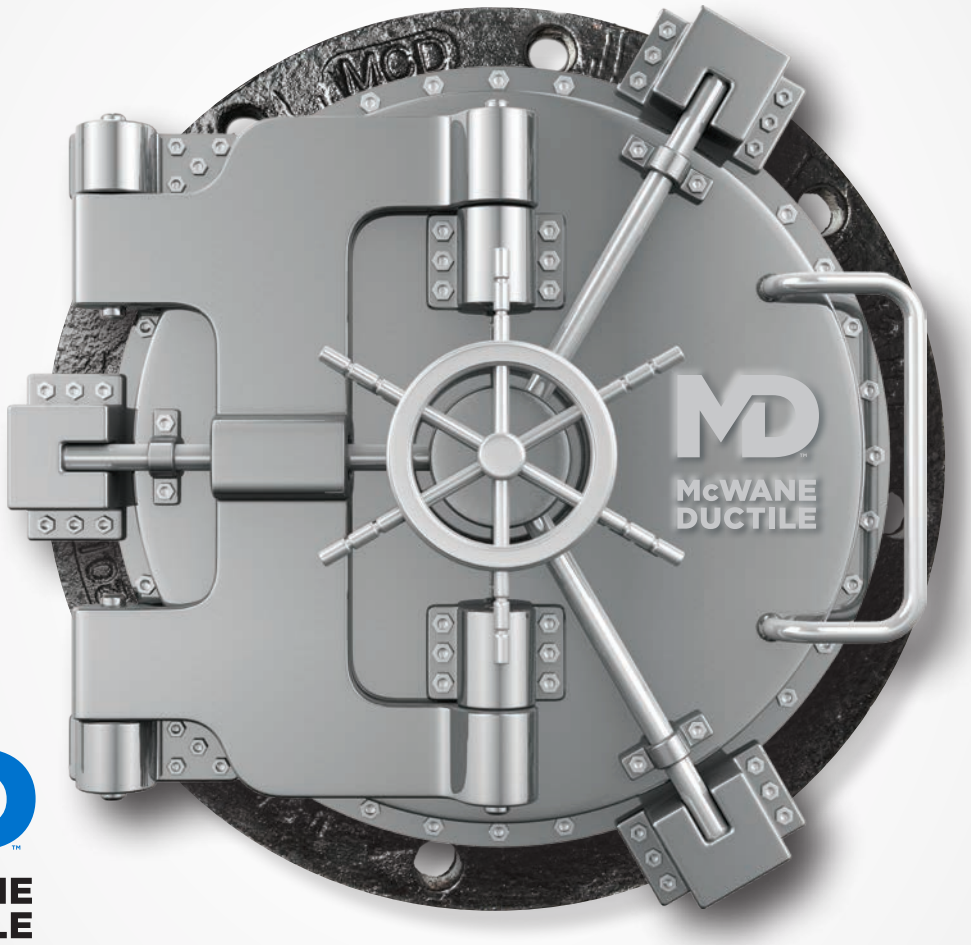
The learning curve for Hayward crews was extremely short. They expressed the desire to significantly increase the amount of TR Flex pipe on future projects, as it was easy to install. Also, we found that upsizing the V-Bio to an 18 through 20-inch product made it easier to slide over the installed SFCs. The installation was simplified further by extending the TR Flex pipeline section, below the western margin, before using 45-inch TR Flex fittings to tie back into the existing pipeline. This method avoided other utilities in the area. Finally, special thanks are extended to Paul Saffo, Stanford University Engineering Department, and Scott Silverthorne, Outside Sales for R&B Company. Your assistance on this project was greatly appreciated.

Change in soil color indicates the actual fault line.

Bert Weiss marks the fault line.

Finished pipe installation.

Safeguard yOUR water.



McWANE DUCTILE

IRON STRONG

Clean and safe drinking water is essential for life and the environment. McWane Ductile produces durable and resilient iron pipes that aren't adversely affected by temperature change, ground deformation or permeation, which safeguards the water supply and ecosystems across our country. Our iron-strong pipe systems have a 100+ year service life, are easily assembled and can be installed during almost any weather conditions. No matter the challenges your water system faces, McWane Ductile can help deliver safe and reliable water for generations.

McWane Ductile: **Building Iron Strong Utilities for Generations.**

McWaneDuctile.com

POCKET ENGINEER
Available for **iOS + Android**
or online at **pe.mcwane.com**

DEAR DITCH DOCTOR,
I've been having an ongoing "discussion" with both the on-site project inspector and my pipe crew. We are trying to establish a simple and reliable way of determining in the trench when the post-assembly deflection of a joint has reached the maximum recommended amount. It's almost impossible to physically "measure" the amount applied, given the ever-changing geometry of a trench. We, of course, want to follow all guidelines and avoid creating any deficiencies in the finished pipeline, but this never-ending debate on deflection is becoming quite aggravating. Please, if you have any suggestions, share them with us!

Sincerely,
Living Within Limits in Laconia

DEAR LIVING WITHIN,
Through the years, I've heard of and seen many different attempts to solve your concern in the field, and here is the best and most reliable suggestion I can offer, with no "measuring" needed! Regardless of pipe diameter and joint configuration, restrained or not, when the pipe you just assembled, and are now shifting in any direction, begins to move the pipe it is inserted to … you've reached maximum recommended deflection. This indicates that the first opportunity for metal-to-metal contact within the body of the joint has been met. It's OK for that first joint away from you to actually move a tiny bit in the trench: Ductile iron pipe is incredibly strong and resilient. You would need to place excessive force on the pipe past this initial point of "contact movement" to affect the joint adversely. And by that, I mean purposely using a good portion of the excavator's hydraulic capacity. Don't do that, and all will be just fine!

Sincerely,
The Ditch Doctor

DEAR DITCH DOCTOR,
We have an upcoming pipeline project where it is very possible to encounter some polluted soils; mainly areas where old gas stations were demolished years ago. We are concerned that contaminants could somehow infiltrate the new waterline over time. Is there a way to reliably prevent this?

Sincerely,
Worried in Walla Walla

DEAR WORRIED,
No need to stress if you use Ductile iron pipe and the appropriate gaskets! Unlike some alternate materials available in the utility marketplace, Ductile iron pipe is impermeable to exterior pollutants typical to contaminated soils, including hydrocarbons. The gasketed joint resists up to 430 psi of external fluid pressure in all circumstances, so infiltrating the pipeline would require damage or destruction of the rubber gasket itself to occur from said potential pollutants. Fortunately, the Ductile iron industry has extensively researched and made available a wide array of specialized rubber compounds for decades for one to select as the gasket material. From seawater to dilute acids or alkalis, oils, hydrocarbons, chemicals, refined petroleum, solvents and even aromatic hydrocarbons; we've got a compound to cover you! Styrene-Butadiene Rubber (SBR) is the default gasket material provided with Ductile iron pipe and fittings, with Ethylene Propylene Diene Monomer (EPDM), Nitrile (NBR), Neoprene (CR), and Fluorocarbon (Viton) gaskets rounding out the advanced gasket options. If the surrounding soils contain corrosive contaminants, there are proven exterior protection options available as well, from enhanced polyethylene film encasement (V-Bio®) to specialized exterior coatings designed specifically for Ductile iron pipe. You can Google "McWane Ductile Specialty Gaskets" for more detail and a helpful downloadable tipsheet.

Sincerely,
The Ditch Doctor

PROJECT PROFILES

West

PROJECT PROFILE

Dantoni Ranch is a new and upcoming residential subdivision north of Sacramento located in the town of Linda, California. This growing city, nestled near Marysville and Beale Air Force Base, will showcase this single-family development allowing accessibility to the mountains, lakes, rivers and the capital city of Sacramento. The specifying engineer and the governing water authority have been specifying and requiring Ductile iron for their waterlines in this area for quite some time now, making this project an excellent fit for McWane Ductile iron pipe. Teichert Construction was able to start this project on time due to having material on-site within the time frame requested. Our partner and local distribution house, Core & Main West Sacramento, helped make this project run smoothly. It was a pleasure to work with all parties involved to bring this project to completion.

Sales Region: West
Sales Representative: Bill Kleczka
Project Location: Linda, CA
Project Name: Dantoni Ranch
Project Owner/Utility: LGI Homes, LLC / Linda County Water Authority
Project Engineer: MHM
Project Contractor: Teichert Construction
Project Distributor: Core & Main West Sacramento

Types of Ductile iron pipe used on the project:

DIAMETER	JOINT	CLASS	FOOTAGE
6″	Tyton®	52	650
8″	Tyton®	52	8,500
18″	Tyton®	52	100

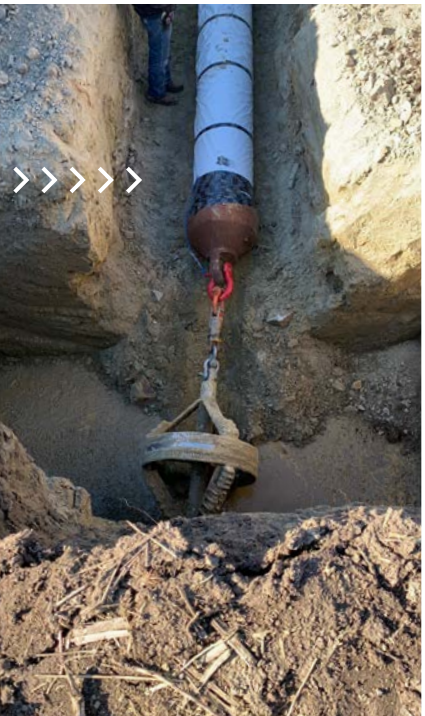
Sales Region: Midwest
Sales Representative: Shawn Smith
Project Location: Watford City, ND
Project Name: Cascade Pipeline
Project Owner/Utility: Elkan Water
Project Engineer: KLJ Engineering
Project Contractor: Elkan Water
Project Distributor: McWane Ductile Direct

Types of Ductile iron pipe used on the project:

DIAMETER	JOINT	CLASS	FOOTAGE
24"	Tyton®	350	684
20"	Tyton®	350	5,472
20"	Tyton®	250	720
16"	TR Flex®	350	1,800

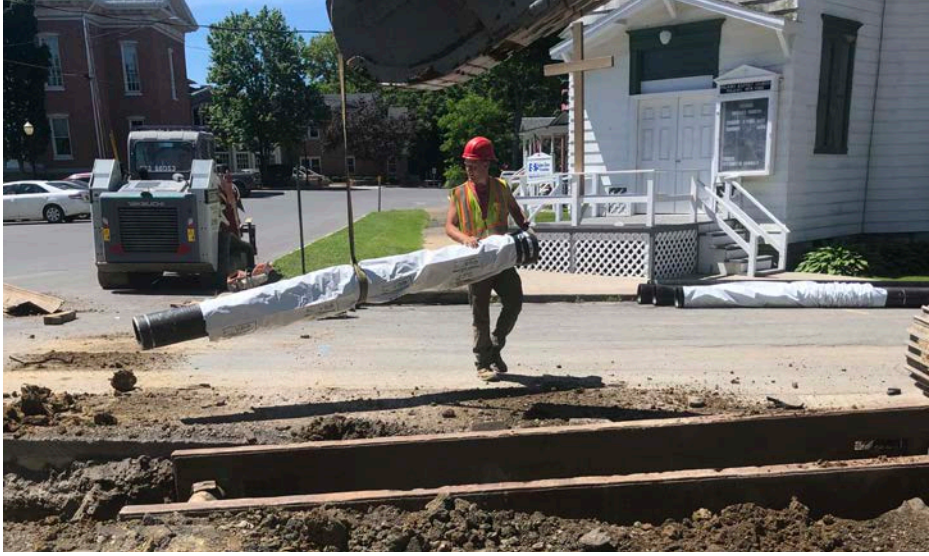
Elkan Water is currently in the construction phase of its Cascade Water Pipeline. The project will include over 100 miles of Ductile iron pipeline set to be installed over the next five years. The initial purpose of the pipeline is to provide water infrastructure to the oil fracking operations throughout the McKenzie County region of Northwestern North Dakota. However, once the fracking operations are complete, the pipeline will shift its focus to providing water for agriculture and livestock operations in the region, providing a much-needed service to the farmers in the community. The project also includes several horizontal drilling applications using Ductile iron pipe as well as the utilization of SureStop 350® gaskets. Elkan Water decided to go with McWane Ductile iron pipe due to the strength and versatility of the product. "McWane Ductile iron pipe has been a very reliable product for us throughout the project. Working in the Badlands region can provide some very treacherous terrain. However, with teamwork and dedication, we have been able to triumph over the obstacles it has put in front of us. McWane Ductile iron pipe has been able to handle every challenge we've thrown at it so far," said Scott Hart, Operations Manager for Elkan Inc.

Kirk Hartel, President and Co-Founder of Elkan, Inc. said, "McWane Ductile's expertise and knowledge of their product has been a valuable resource for our company as we navigate this tremendous project. Our pipeline requires very high-pressure ratings in several areas, and McWane Ductile iron pipe has met the challenge head-on, outperforming our expectations. Their team of experts has made several job site visits to help educate our staff and answer any questions we may have along the way. We have been very pleased with our previous experience with the company and its product."



PROJECT PROFILE

Midwest



Northeast

PROJECT PROFILE

The Village of Pulaski, New York, selected Highlander Construction to install approximately 19,000 feet of 8-inch diameter Ductile iron water main for their Water System Improvement Project. The 8-inch Ductile will replace 8-inch and 6-inch transite. The pipe will have V-Bio® Enhanced Polyethylene Encasement for corrosion protection. Highlander Construction has been in business for over 27 years. Brian Olin, Superintendent of Highlander Construction, said, "The existing transite line breaks frequently and is difficult to locate. The new Ductile iron line will save the Village time and money." McWane Ductile is proud to partner with Highlander on this $4 million-dollar project. The Village of Pulaski is one of the premier salmon fishing destinations in the country. Fishing enthusiasts can also catch Brown Trout and Steelhead during the fall run. Anglers from all over the world come to Pulaski pursuing the dream of landing a trophy fish. Pulaski is also known for winning the best-tasting water awards for their area.

Sales Region: Northeast
Sales Representative: Mike Palermo
Project Location: Pulaski, NY
Project Name: Water Distribution System Improvements
Project Owner/Utility: Village of Pulaksi, Pulaski, NY
Project Engineer: BCA Architects & Engineers, Watertown, NY
Project Contractor: Highlander Construction, Inc., Memphis, NY

Types of Ductile iron pipe used on the project:

DIAMETER	JOINT	CLASS	FOOTAGE
6"	Tyton®	52	290
8"	Tyton®	52	19,250
10"	Tyton®	52	108
12"	Tyton®	52	36

Sales Region: South
Sales Representative: Josh Baker
Project Location: Maryville, TN
Project Contractor: Merkel Brothers Construction
Project Engineer: WK Dickson & Co., Inc., Knoxville, TN
Project Contractor: Merkel Brothers Construction

Types of Ductile iron pipe used on the project:

DIAMETER	JOINT	CLASS	FOOTAGE
6″	Tyton®	350	180
8″	Tyton®	350	180
12″	Tyton®	350	61,488

PROJECT PROFILE

South

The Tellico Area Services System (TASS) in Maryville, TN, is a water utility created by a joint agreement between Loudon and Monroe Counties for the purpose of providing a modern water and wastewater treatment system to its citizens and to realize the area's potential for industrial and residential growth. The purpose of this project was to provide reliable drinking water to its growing customer base in the northern area of the TASS distribution system.

COMMENTS FROM MARK CLINTON (TASS SUPERINTENDENT):

I can tell you from personal experience that water truly is one of nature's most precious natural resources we enjoy.

At TASS, we take pride in being stewards of this tremendous natural resource. It is also an extraordinary feat to supply safe, quality drinking water to our customers and restore domestic and industrial wastewater discharges to state and federal standards.

The timing of this project was a blessing and simply the best decision for the utility and its customers.

Merkel Brothers are by far the best contractors we have ever partnered with. Customers would call to compliment the cleanliness of the job sites and the crew.

This project simply had the best Engineers, contractors, and products.

The Ductile iron pipe supplied by McWane Ductile was superior to any other product. We completed the job without a single joint of defective pipe or returns.

We can look ahead knowing this line will serve generations to come.

COMMENTS FROM RYAN D. BLAKE, P.E. (VP & TENNESSEE MANAGER, WK DICKSON & CO. INC.):

It is always a pleasure to work with such a great team. Merkel Brothers Construction once again delivered a quality product that exceeded the expectations of Tellico Area Services Systems and WK Dickson.

COMMENTS FROM RANCE MERKEL (PRESIDENT, MERKEL CONSTRUCTION):

We completed the Tellico Area Service Systems project last year, 2021. The thing that sticks out the most to me about this project was the cooperation of the Tellico areas service system employees and the serene landscape with which this project was constructed.

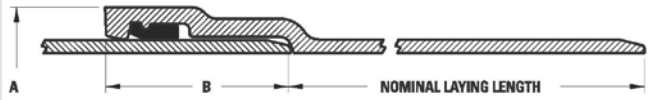
The project was completed November of 2021. McWane Ductile is proud to have partnered with Merkel Brothers to provide Iron Strong utilities for generations.

DUCTILE IRON PIPE MATCH GAME

Instructions: Know your Ductile Iron Pipe? Match the product title below with the correct product diagram.

____ TR Flex® Restrained Joint Pipe
____ Mechanical Joint Pipe
____ Grooved Pipe
____ Fabricated Flange Pipe
____ Seismic Flex Coupling™
____ Mechanical Joint Lock Joint Pipe
____ Ball & Socket Joint Pipe
____ Tyton® Joint Pipe

A



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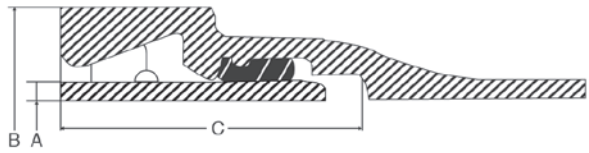

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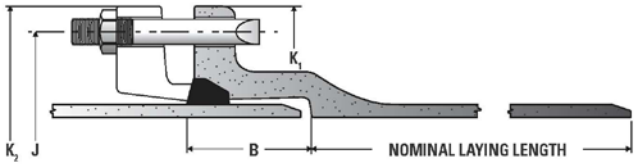

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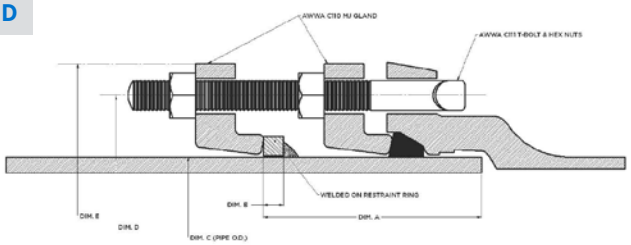

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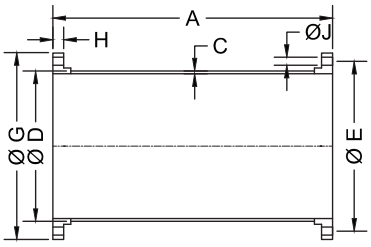

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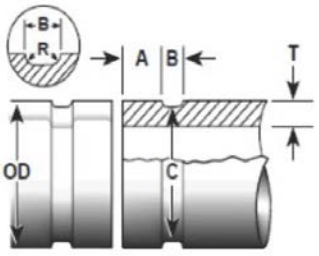

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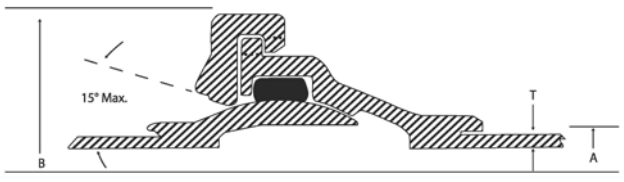

ANSWERS A. Tyton® Joint Pipe B. TR Flex® Restrained Joint Pipe C. Mechanical Joint Pipe D. Mechanical Joint Lock Joint Pipe E. Fabricated Flange Pipe F. Grooved Pipe G. Seismic Flex Coupling™ H. Ball & Socket Joint Pipe

MIKE DODGE, VP SALES & MARKETING

SALES REPRESENTATIVES

EAST SALES TEAM

GENERAL SALES

Craig Spitzer, General Sales Manager
Cell: 908-878-0822
craig.spitzer@mcwaneductile.com

Kelly Bray, Inside Sales Manager
Office: 908-878-0837
kelly.bray@mcwaneductile.com

NEW JERSEY, DELAWARE, NEW YORK CITY

Gary Kurtz, Senior Sales Representative
Cell: 908-235-6001
gary.kurtz@mcwaneductile.com

NEW ENGLAND

Jeff Houser, Senior Sales Representative
Cell: 518-275-1780
jeff.houser@mcwaneductile.com

NEW YORK

Mike Palermo, Senior Sales Representative
Cell: 585-737-0456
mike.palermo@mcwaneductile.com

CENTRAL & EASTERN PENNSYLVANIA

Bob Hartzel, Senior Sales Representative
Cell: 717-571-5683
bob.hartzel@mcwaneductile.com

MARYLAND & WESTERN PENNSYLVANIA

Ben Leonard, Sales Representative
Cell: 908-442-5241
benjamin.leonard@mcwaneductile.com

NORTH CAROLINA

Dwayne Shelton, Senior Sales Representative
Cell: 336-682-6187
dwayne.shelton@mcwaneductile.com

VIRGINIA

Todd Soady, Senior Sales Representative
Office: 757-262-6174
todd.soady@mcwaneductile.com

MIDWEST SALES TEAM

GENERAL SALES

Scott Frank, General Sales Manager
Office: 740-622-6651
Cell: 740-202-3094
scott.frank@mcwaneductile.com

Dave Bursh, Inside Sales Manager
Office: 740-291-1064
dave.bursh@mcwaneductile.com

ILLINOIS

Dan Flaig, Senior Sales Representative
Cell: 815-353-4607
dan.flaig@mcwaneductile.com

KENTUCKY, SOUTHERN INDIANA & SOUTHWESTERN OHIO

Cole Mitcham, Sales Representative
Cell: 330-440-2677
cole.mitcham@mcwaneductile.com

MICHIGAN, NORTHERN INDIANA & NORTHWESTERN OHIO

Kevin Christian, Sales Representative
Cell: 734-223-5632
kevin.christian@mcwaneductile.com

NEBRASKA, KANSAS, MISSOURI, IOWA, SOUTHERN ILLINOIS & SOUTH DAKOTA

Chris Williams, Sales Representative
Cell: 913-302-8899
chris.williams@mcwaneductile.com

CENTRAL & NORTHEAST OHIO & WEST VIRGINIA

Clinton (CJ) Fowler, Sales Representative
Cell: 330-260-9292
clinton.fowler@mcwaneductile.com

WISCONSIN, MINNESOTA, NORTH DAKOTA

Shawn Smith, Sales Representative
Cell: 608-440-0667
shawn.smith@mcwaneductile.com

CANADA SALES TEAM

NATIONAL SALES

Steve Philpott, National Sales Manager
Cell: 709-728-8760
steve.philpott@canadapipe.com

ONTARIO

Greg Principi, National Product Engineer
Office: 905-974-3026
Cell: 289-244-6415
greg.principi@canadapipe.com

ATLANTIC

Martin Phinney, National Product Engineer
Cell: 506-961-9229
martin.phinney@canadapipe.com

QUEBEC

David Rouleau, Sales Representative
Cell: 413-223-6882
david.rouleau@canadapipe.com

WESTERN CANADA

Jody Wall, Western Sales Representative
Cell: 604-360-0960
jody.wall@canadapipe.com

SOUTH SALES TEAM

GENERAL SALES

Dusty Henderson, General Sales Manager
Cell: 615-418-0741
dustin.henderson@mcwaneductile.com

WESTERN CAROLINA & GEORGIA

Dusty Henderson, General Sales Manager
Cell: 615-418-0741
dustin.henderson@mcwaneductile.com

ARKANSAS, OKLAHOMA & NORTH TEXAS

Jaycie Howell, Sales Representative
Cell: 615-663-5069
jaycie.howell@mcwaneductile.com

FLORIDA (Except Panhandle) & EASTERN SOUTH CAROLINA

Gary Gula, Senior Sales Representative
Cell: 239-989-6298
gary.gula@mcwaneductile.com

ALABAMA, LOUISIANA, FLORIDA (Panhandle only) & TENNESSEE (Memphis only)

Doug Clark, Sales Representative
Cell: 662-341-0205
doug.clark@mcwaneductile.com

TENNESSEE & NORTH GEORGIA

Josh Baker, Sales Representative
Cell: 615-975-0806
josh.baker@mcwaneductile.com

TEXAS (Except El Paso & North Texas)

Scott Rhorick, Sales Representative
Cell: 254-317-8455
scott.rhorick@mcwaneductile.com

WEST SALES TEAM

GENERAL SALES

Nick Koncar, General Sales Manager
Office: 801-623-4256
Cell: 801-864-5544
nick.koncar@mcwaneductile.com

Kim Christensen, Inside Sales Manager
Office: 801-623-4254
kim.christensen@mcwaneductile.com

ARIZONA, NEW MEXICO, LAS VEGAS, NV & EL PASO, TX

Wes Cassiere, Senior Sales Representative
Cell: 480-280-5424
wes.cassiere@mcwaneductile.com

SOUTHERN CALIFORNIA

Carolyn Lopez, Senior Sales Representative
Cell: 951-310-6444
carolyn.lopez@mcwaneductile.com

NORTHERN CALIFORNIA & NEVADA

Bill Kleczka, Sales Representative
Cell: 559-401-9006
bill.kleczka@mcwaneductile.com

UTAH & COLORADO

Chris Howe, Sales Representative
Cell: 385-227-0600
chris.howe@mcwaneductile.com

WEST WASHINGTON, ALASKA & HAWAII

Jason Harrison, Senior Sales Representative
Cell: 425-681-1394
jason.harrison@mcwaneductile.com

OREGON

Carrie Stephens, Sales Representative
Cell: 503-577-4177
carrie.stephens@mcwaneductile.com

WASHINGTON, IDAHO, WYOMING, MONTANA

David Bridge, Sales Representative
Cell: 951-520-6416
david.bridge@mcwaneductile.com

SALES OPERATIONS

Stuart Liddell, Sales Operations Manager
Cell: 352-208-5709
stuart.liddell@mcwaneductile.com

Jeff Henderson, National Account Manager
Cell: 614-404-4909
jeff.henderson@mcwaneductile.com

Jerry Regula, National Product Engineer
Cell: 740-294-7899
jerry.regula@mcwaneductile.com

Ken Rickvalsky, National Product Engineer
Cell: 609-290-7701
ken.rickvalsky@mcwaneductile.com

Roy Mundy, Senior Regional Engineer
Cell: 859-361-8585
Fax: 859-273-4799
roy.mundy@mcwaneductile.com

John Johnson, Regional Engineer
Cell: 951-813-9589
john.johnson@mcwaneductile.com

John Simpson, Regional Engineer
Cell: 865-256-2541
john.simpson@mcwaneductile.com

Cory Humphreys, Technical Services Specialist
Office: 740-291-1046
cory.humphreys@mcwaneductile.com

Andrea Kubik, Marketing Manager
Office: 740-202-7352
andrea.kubik@mcwaneductile.com

Cris Dupont, Media Specialist
Office: 740-291-1012
cris.dupont@mcwaneductile.com

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