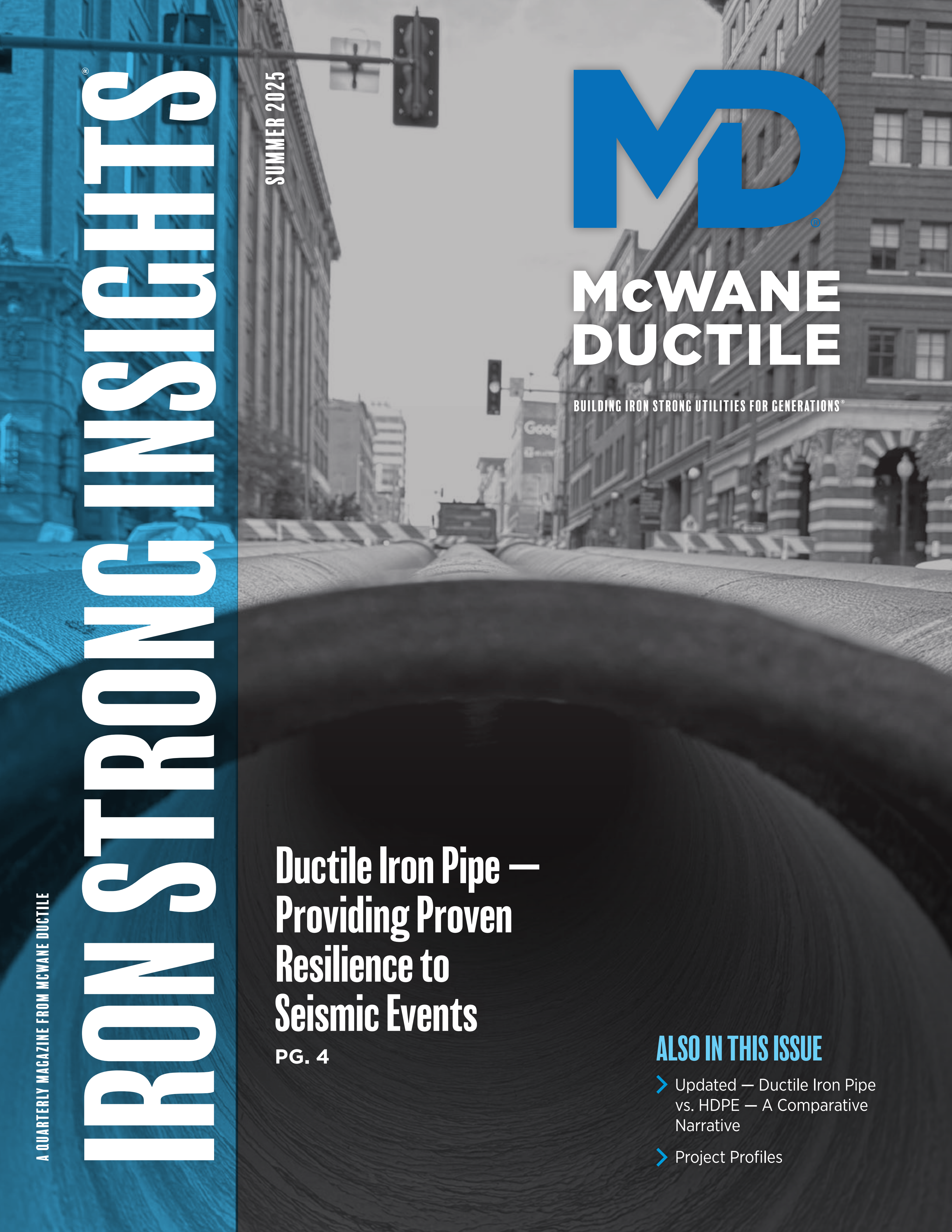


IRON STRONG INSIGHTS®

A QUARTERLY MAGAZINE FROM MCWANE DUCTILE

SUMMER 2025

McWANE DUCTILE

BUILDING IRON STRONG UTILITIES FOR GENERATIONS®

Ductile Iron Pipe — Providing Proven Resilience to Seismic Events

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.

Ductile Iron Pipe — Providing Proven Resilience to Seismic Events

PG. 4

CONNECT WITH US ON

Welcome to

Iron Strong Insights®

Dear Readers,

We are pleased once again to share our latest updates, project profiles and insights with our valued community of waterworks professionals. As we start the second half of 2025, one thing is clear: This year has been busier than expected across the waterworks industry. Fortunately, McWane Ductile was ready to meet that need with key investments made in all our facilities over the past couple of years.

As we move into the start of another storm season with the tropical storms, hurricanes and floods, the need for durable and resilient infrastructure only increases. Our team of resolute employees stand ready to meet this need and remain focused on manufacturing and delivering the Iron Strong products that keep America's water moving.

Our sales staff and Regional Engineers have also been active on the road, hosting customer training courses, attending industry events and staying engaged with our partners across the country. With more events to come this year, we look forward to connecting with you in person at the UESI Pipelines Conference in Tampa this August and the NRWA WaterPro Conference this September held in New Orleans.

We would like to also take this time to say thank you for your continued trust in McWane Ductile. We are proud to be your partner in building strong, sustainable water infrastructure, today and for generations to come.

Stuart Liddell
Sales Operations Manager
Sales Operations Department

EMPLOYEE SPOTLIGHTS

MEET THE NEW FACES AT McWANE DUCTILE

McWane Ductile is excited to welcome four outstanding professionals to our growing team.

Isabella DiCristofaro is our new Sales Representative in Florida. She brings valuable experience in procurement and supplier management from the manufacturing sector and holds a bachelor's degree in materials science and engineering from NC State University. She is also a member of the Society of Women Engineers.

Austin Flynn joins as a Sales Representative for the Rocky Mountain North territory. With 10 years of experience in software, power tools and industrial components, he works closely with distributors and engineers while representing McWane Ductile at key industry events.

Naomi Loveless, Sales Representative for the Central Plains region, comes to McWane Ductile from the logistics industry, where she specialized in business development. A Kansas State University alum with a degree in supply chain management, Naomi is focused on building strong customer relationships and delivering effective solutions.

Kyle Wheeler joins as a Product Engineer. With a civil engineering background and a decade of technical sales and process engineering experience, Kyle will support sales teams nationwide with technical training and field solutions.

Please join us in welcoming these talented individuals to the McWane Ductile family!

DUCTILE IRON PIPE — PROVIDING PROVEN RESILIENCE TO SEISMIC EVENTS

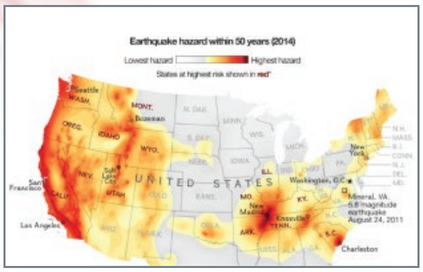
BY JACOB LOVIN, ENV SP,
MCWANE DUCTILE REGIONAL ENGINEER

IN REGIONS PRONE TO SEISMIC ACTIVITY, THE RESILIENCE OF CRITICAL INFRASTRUCTURE PLAYS A PIVOTAL ROLE IN PUBLIC SAFETY.

Among essential systems, water distribution networks are particularly vulnerable during catastrophic earthquakes, where ground movement and soil liquefaction can cause widespread pipe failure. Ductile iron pipe (DI pipe), however, has emerged as a highly reliable material due to its superior properties, joint flexibility and proven performance in past seismic events. This article examines how the unique design and strength characteristics of DI pipes contribute to their remarkable ability to withstand the intense stresses of major earthquakes, ensuring continuity of service when it is needed most.

SEISMIC RESILIENCE

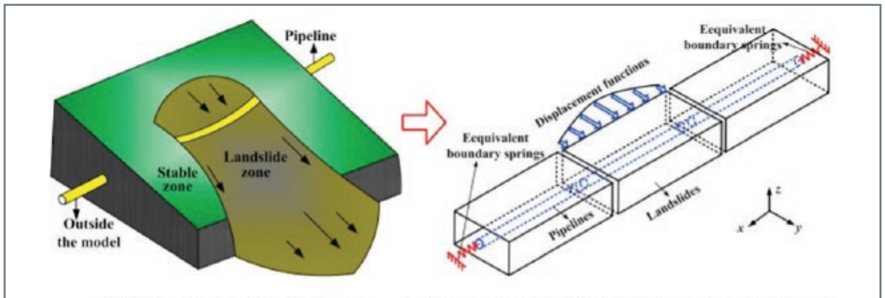
According to the U.S. Geological Survey, more than 4,500 earthquake events of a magnitude of 2.0 or greater occurred in North America in 2017. Most of these were minor, but 31 measured 5.0 or above on the Richter scale. At 5.0, the energy released by the Earth is the equivalent of 200 tons of TNT. The experiences of utilities in the aftermath of the more significant earthquakes led to the conclusion that,



in seismic events, there is no better pipe material available than Ductile iron pipe. Designing or retrofitting for seismic resilience can play a crucial

Effects of liquefaction

role in mitigating damage to buried potable water and wastewater pipelines caused by seismic hazards. These hazards can include earthquake zones, unstable slopes and liquefaction zones. In earthquakes, liquefaction refers to the process where saturated or partially saturated soil temporarily loses strength and behaves like a liquid due to strong ground shaking.



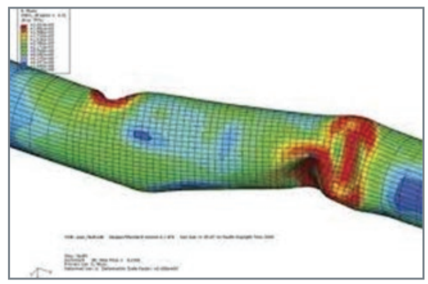
(a) Schematic diagram of landslides (b) Mechanical model for pipelines subjecting to landslides

These seismic events can wreak havoc on buried pipelines if the pipe material is unable to withstand external loads and/or trench failure while also providing excellent joint deflection and having an axial range to handle significant compression or tension on the pipeline. Robust pipe materials such as Ductile iron provide a higher level of seismic resilience to:

- Maintain fire protection
- Reduce the potential of shearing on service connections
- Prevent cross contamination or force main spills

WHY DUCTILE IRON IS THE RIGHT CHOICE FOR SEISMIC RESILIENCE VS. ALTERNATIVE MATERIALS

Restrained joint Ductile iron pipe is the standard for seismic resilience, as listed in the International Standard ISO 16134, due to its minimum tensile strength of 60,000 psi, high joint deflection and strain capacity compared to alternative pipe materials. Restrained joints and next-generation fittings also provide extremely high axial capacity to accommodate tension or compression on the pipeline. For example, the TR Flex® restrained joint from McWane Ductile has demonstrated over 50 years of proven performance in earthquake zones in the western U.S., with no reported failures.



Seismic buckling of HDPE pipe

Seismic buckling failure of steel pipe

PVC seismic failure due to trench failure

Resilience of DI pipe to trench loss

CASE STUDIES: STRENGTH AGAINST EARTHQUAKES

The 1995 Great Hanshin Earthquake (also known as the Kobe Earthquake) struck Japan with a magnitude of 6.9, causing widespread devastation, including severe damage to lifeline infrastructure such as water and gas pipelines. In the aftermath, a comparative evaluation of pipeline performance revealed that Ductile iron pipe demonstrated exceptional resilience under seismic stress, particularly when compared to other materials, such as cast iron and polyvinyl chloride (PVC).

One of the most notable observations came from the water distribution system in Kobe. While thousands of failures were reported in brittle cast iron and older steel pipelines, areas equipped with newer Ductile iron pipe — especially those with restrained or flexible joints — showed significantly fewer failures. According to the Japan Ductile Iron Pipe Association, DI pipe with earthquake-resistant joints experienced a failure rate of just 0.001 per kilometer, compared to over 2.0 per kilometer for other materials (JDIPA, 1995). The flexible joint design enabled the pipe system to absorb seismic energy and remain intact, thereby maintaining essential water supply lines for firefighting and emergency services in certain districts.

The successful performance of Ductile iron pipe in Kobe prompted further adoption of seismic-resistant DI pipe systems throughout Japan and has influenced seismic design practices globally. Utilities in earthquake-prone regions — such as California, the Pacific Northwest and the Midwest — are adopting DI pipe with earthquake-resistant features as part of their resilience strategies. Municipalities recognized the importance of investing in durable infrastructure capable of withstanding future seismic events, leading to widespread implementation in high-risk zones.

SUMMARY

Not all materials are created equal, so selecting the proper pipe material is the first step in ensuring that vital infrastructure is protected and safe in the event of a catastrophic event. With a tensile strength of 60,000 psi, Ductile iron is far superior compared to the tensile strength of alternative materials such as PVC and HDPE. However, selecting DI pipe is not just a matter of efficiency; it's a critical investment in resilience and public safety. Its superior strength, flexibility and proven seismic performance make it a preferred choice for water infrastructure. As natural disasters become more unpredictable, communities must prioritize materials like DI pipe that ensure continuity of service, reduce repair costs and save lives when the forces of nature test infrastructure. Do you have questions about seismic resiliency? Contact us at McWaneDuctile.com.

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Additional Resources:

Liquefaction during the 1906 San Francisco earthquake. (2011, April 6). [Video]. YouTube. https://youtu.be/qmVYbjiNWds

Note: Civil Engineering Magazine (September 2019). Resiliency. [Includes useful maps.]

STRENGTH REBORN
FORGED THROUGH FIRE. BUILT TO LAST ...
Just as the phoenix rises renewed from the flames, McWane Ductile iron pipe emerges from fire, transformed into an unbreakable force. Our process turns recycled iron and steel scrap and raw materials into resilient infrastructure, built to endure the most extreme pressures and conditions. Every pipe carries the strength of its creation, prepared to serve communities for generations to come.
McWane Ductile: Building Iron Strong Utilities for Generations.
POCKET ENGINEER
Available for iOS + Android or online at pe.mcwane.com
McWaneDuctile.com
McWANE DUCTILE
IRON STRONG

UPDATED — DUCTILE IRON PIPE VS. HDPE — A COMPARATIVE NARRATIVE

BY KEN RICKVALSKY, ENV SP, AMPP CT,
NATIONAL PRODUCT ENGINEER

Selecting the right pipe material is essential for the longevity and success of any water infrastructure project. While Ductile iron pipe (DI pipe) and high-density polyethylene (HDPE) each offer distinct benefits, their differences in strength, performance and long-term costs are significant. This article serves as a refresh of our previously published article in November 2019. It outlines key comparisons to help engineers and specifiers make informed decisions based on project-specific conditions, such as soil type, pressure and environmental factors.

RECYCLABILITY AND SUSTAINABILITY

HDPE is made from ethylene derived from petroleum and natural gas. To form HDPE pipe, ethylene in pellet form is melted into a molding machine and then extruded into its finished pipe form. Little to no true recycling is involved with HDPE products manufactured for the water and sewer industry, and reuse requires extensive cleaning.

DI pipe is made from at least 90% recycled materials.

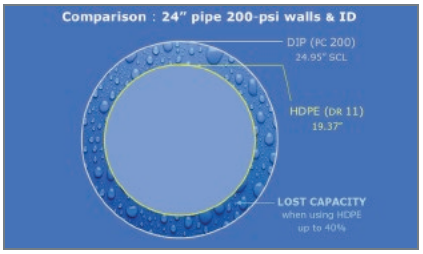
In contrast, Ductile iron pipe is made from ferric scrap metal, typically containing at least 90% recycled content — mostly old automobiles — and is fully recyclable after use. This makes DI pipe an environmentally sound choice with a strong sustainability profile.

DI VS. HDPE? THE STRENGTH IS IN THE NUMBERS

The structural superiority of Ductile iron pipe is clear:

- Hydrostatic Design Basis: DI pipe: 21,000 psi. HDPE: 800 psi — a 26-fold difference when a safety factor of 2.0 is applied.
- Yield Strength: DI pipe: 42,000 psi. HDPE: 1,600 psi (before safety factors).
- Wall Thickness and Pressure Resistance (12-inch example):
  - HDPE at 0.14 inches: withstands only 34 psi.
  - DI pipe at 0.14 inches: withstands 900 psi.
  - Minimum DI pipe wall of 0.25 inches: withstands 1,590 psi.
  - HDPE at 0.25 inches: withstands just 60 psi.

It should be noted that HDPE design standards do not include or involve any surge allowance, even though measurable surges will occur every time transported fluids speed up or slow down within the



pipes. This is simply a fact. Why bother with it? HDPE design standards "absorb" the surges into the safety, thereby reducing the true safety factor to less than 2.0.

Larger HDPE pipes face additional challenges, as extrusion limitations reduce pressure ratings for diameters exceeding 20 inches. HDPE also lacks consistent material strength, whereas Ductile iron pipe utilizes a single, proven grade — 60-42-10 Ductile iron.

A CRUSHING OMISSION — EXTERNAL LOAD RESISTANCE

External loading is often overlooked in HDPE design and wall selection, yet it is a core component of Ductile iron pipe specifications. DI pipe thickness design for buried pipelines accounts for trench types, bending stress and deflection — all critical factors for underground durability. And while there are no specified trench conditions for HDPE pipe in their standards, there are five specified trench conditions for DI pipe in their standards, providing cost-effective, tailored support and protection for the pipelines based on the actual needs of the system in concert with adjacent native soil conditions. HDPE standards, however, omit trench condition guidance, which can often lead to over-excavation and unnecessary costs.

Live loads, such as AASHTO H-20 traffic (16,000 pounds per wheel), are incorporated into DI pipe designs but excluded from HDPE standards. This omission is a critical flaw when designing for real-world service.

TEMPERATURE AND LONGEVITY — DOES IT MATTER?

Ductile iron pipe is unaffected by temperatures from -40°F to 212°F. It has a service life that easily exceeds 100 years.

HDPE, however, is highly temperature-sensitive:

- Its design basis assumes a fixed temperature of 73.4°F.
- For every 10°F temperature shift, HDPE expands or contracts 10 inches per 1,000 feet.
- HDPE loses strength with colder temperatures — most water lines operate around 51°F.
- HDPE pipe walls can be deformed or weakened by pressure surges.

DI pipe is 13 times more stable concerning temperature changes (only 0.75 inches of expansion per 1,000 feet per 10°F) and easily accommodates this via its rubber gasket joints.

DI pipe can be assembled in nearly all weather conditions.

Additionally, the hydrostatic design basis of all thermoplastic pipe materials, including HDPE, is based upon a stress that would cause failure in just 100,000 hours of service, or 11.4 years. There are well-documented installations of gray iron, also called cast iron, that have been in service for more than 300 years, particularly in the case of the Fountains at the Palace of Versailles in France. It is essential to note that Ductile iron is more resilient than gray iron and that Ductile iron is not adversely affected by time or repetitive surges.

FITTING TO BE TIED

Ductile iron fittings, made per the AWWA C153 standard, do not reduce pipeline performance. In contrast, HDPE fittings — produced only by third-party vendors — reduce the pipeline's overall pressure rating by 25%. For example, a 200 psi DR11 HDPE line drops to 150 psi if even one fitting is added.

HDPE connections to alternative piping materials typically require stiffeners and/or flanges, which are poorly suited to underground conditions due to vulnerability to shear forces. In contrast, DI pipe's rubber gasket joints offer reliable, watertight seals with fast installation and no performance trade-offs.

An excellent resource for exploring the numbers and differences between DI pipe and other alternative materials in more detail is the McWane Pocket Engineer, available at PE.McWane.com. This tool is available for both desktop and mobile devices.

EASE OF INSTALLATION

Ductile iron pipe installs with a simple push-on rubber gasket joint — fast and reliable. HDPE, however, requires:

DI pipe uses an easy-to-assemble/disassemble push-on rubber gasket.

- Specialized fusion equipment
- Skilled technicians
- Ideal weather or tenting for welding
- Debeading of internal fusion seams to remove flow obstructions

HDPE must be assembled above ground in optimal weather conditions.

HDPE's standard lengths (40–50 feet) require keeping over 100 feet of trench open during installation. DI pipe, typically in 20-foot segments, needs far less open trench — making it ideal for tight or urban spaces.

In horizontal directional drill installations, HDPE requires a 3–5-day rest period after pull-in to allow for material relaxation, which can cause costly downtime. Surface damage to HDPE (e.g., gouges exceeding 10% of the wall thickness) can disqualify the pipe — another concern not shared with robust DI pipe.

OPERATING COST AND ENERGY USE

While HDPE may seem cheaper upfront, its smaller internal diameter significantly increases long-term operating costs.

HDPE must be welded together with special machinery.

Using a 12-inch pipe example:

- HDPE has an internal diameter that is 24%–40% smaller than DI pipe.
- Pumping the same volume of water through HDPE over 25 years costs over $900,000 more per mile.
- This added friction loss offsets any material cost savings.

HDPE only makes economic sense if it is installed at $170 less per foot than DI pipe — an unrealistic difference in most cases.

A scratch or ding (shown here) would disqualify this HDPE from installation.

CHEMICAL AND ENVIRONMENTAL RESILIENCE

- Oxidation: HDPE can degrade under standard water treatment conditions.
- Fire Resistance: HDPE melts at just 260°F — vulnerable even when buried. DI pipe, with a melting point of 2,100°F, remains unaffected in wildfire zones.
- Soil Contamination: HDPE is permeable to hydrocarbons and many other soil contaminants. DI pipe is not. Installing HDPE in contaminated areas requires expensive and uncertain soil remediation.

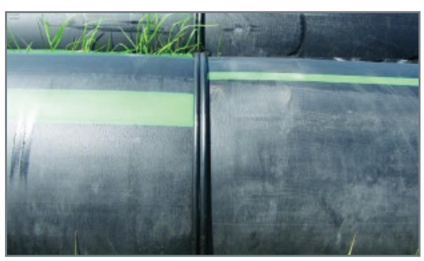
DI pipe is made from strong, long-lasting iron that can withstand rough handling.

JOINT PERFORMANCE AND FLOW OBSTRUCTION

Criticism of minor gaps in DI pipe joints is unfounded. These joints, if deflected, may collect minimal silt — but not enough to affect performance.

DI pipe is made from strong, long-lasting iron that can withstand rough handling.

HDPE joints, however, have significant internal and external lips from butt fusion. These can be 1/2-inch to 1-inch high and create real flow obstructions — especially problematic in sanitary sewer systems where solids may catch, leading to backups.



HDPE utilizes a butt-welded system that leaves a distinct lip inside and outside the pipeline.

The inside of HDPE pipe has "lips" where it was butt-welded together.

The inside of HDPE pipe has "lips" where it was butt-welded together.

SUMMARY: WHY DUCTILE IRON PIPE IS THE SMART CHOICE

Choosing pipe material is about more than initial cost. As we've seen, Ductile iron pipe consistently outperforms HDPE in:

- Structural strength
- Hydraulic efficiency
- Temperature stability
- Installation ease
- Longevity and life-cycle cost
- Environmental resilience
- Fitting and joint reliability
- Resistance to fire and contaminants

DI pipe handles high-pressure, high-load conditions with ease and lasts for over a century. HDPE, while flexible and lightweight, presents long-term concerns in durability, performance and cost.

LOOKING AHEAD

At McWane Ductile, we support our partners in making the best long-term choices for water and wastewater systems. While HDPE may be appropriate in specific scenarios, Ductile iron pipe is rarely an unsuitable choice — offering proven value and reliability across a wide range of installations. Many of our team members have managed small and large water utility systems and served in engineering consulting firms. They bring decades of experience solving field issues involving pipeline construction and operation. From design to submittal to installation, we strive to educate and assist water professionals throughout the water and wastewater industry. And be sure to watch our insightful video on DI pipe versus HDPE at YouTube.com/watch?v=-1jCNXObatM and download our handy comparison tip sheet.

PROJECT PROFILES

West

PROJECT PROFILE

Goodyear, Arizona, is one of the nation's fastest-growing cities, and McWane Ductile was proud to help facilitate the ever-growing GSQ area. GSQ, or Goodyear Square, is a new development that includes Goodyear City Hall, Civic Square Park, and the Globe's GEN1 Class A office building and parking garage. Eventually, the mixed-use, walkable urban center will consist of popular restaurants currently under construction, new entertainment venues, new shops and modern residential space. DCS Contracting is the contractor providing the underground utilities installation for this project.

DCS has been a part of the Arizona underground scene for over 30 years, having completed hundreds of projects. The company continues to be a proud partner with our distributor and has some of the most skilled pipe-installing crews in the industry. This specific project installation is located just east of GSQ, near McDowell Road and Bullard Avenue, and will support the growing population of the Greater Phoenix area. This project has made Goodyear, Arizona, #IronStrong for generations to come, and we are proud to call it home.

Sales Region: West
Sales Representative: Ben Johnson
Project Location: Goodyear, AZ
Project Name: Goodyear Regional Center PH2
Project Owner/Utility: City of Goodyear — Liberty Utilities
Project Contractor: DCS Contracting
Project Distributor: Core & Main

Types of Ductile iron pipe used on the project:

DIAMETER	JOINT	CLASS	FOOTAGE
6″	Tyton®	350	702
12″	Tyton®	350	3,708

PROJECT PROFILE

Midwest

Sales Region: Midwest
Sales Representative: Naomi Loveless
Project Location: Kansas City, MO
Project Name: Broadway Boulevard–6th Street to 12th Street
Project Owner/Utility: Kansas City Water Services
Project Engineer: Tetra Tech, Inc.
Project Contractor: Kissick Construction Company
Project Distributor: Kansas City Winwater

Types of Ductile iron pipe used on the project:

DIAMETER	JOINT	CLASS	FOOTAGE
6″	Tyton®	52	2,900
8″	Tyton®	52	3,900
10″	Tyton®	52	690
12″	Tyton®	52	5,300

Kissick Construction Company is managing another demanding downtown water main project with the expertise of Project Manager Brian Ross, Senior Superintendent Chris Oxford and Superintendent Scott Martin. The challenges began with the cold and wet December weather and continue today with navigating the buried cast-iron pipes (1880–1904) and trolley tracks underneath the asphalt. Now that the weather has improved, Brian stated, "They are on track and proceeding well." As they usually do, this Kissick utility crew puts safety first and has forged a healthy relationship with Kansas City Water Services' Project Manager Davis McDonald-MacLin and Inspector Dwayne Everett.

According to the Kansas City Water Service website, the project was necessary to improve the reliability of the distribution system, increase hydraulic conveyance capacity and support fire protection by replacing aging cast-iron water mains with new Ductile iron pipes. The work will also include transferring customers' water service connections from existing water mains to new water mains. The amount of this contract is $6,105,404.

Northeast

PROJECT PROFILE

Highlander Construction, Inc. of Memphis, New York, was selected as the low bidder for a $16 million water infrastructure project for the city of Rome, New York. With over 30 years of experience, Highlander is well equipped to manage this significant undertaking, and McWane Ductile is proud to partner with the company in supplying durable, American-made Ductile iron pipe.

Located at the historic starting point of the Erie Canal — completed in 1825 — the city of Rome continues its commitment to improving its infrastructure with this modern water transmission and distribution upgrade. The city sources its water from Fish Creek, and this project will ensure a more reliable and efficient delivery system for years to come.

The scope of work includes installing approximately 29,000 feet of 16-inch transmission main, which will carry water from Fish Creek to a storage tank.

In addition, new 12-inch and 8-inch distribution lines will replace aging 6-inch lines, significantly increasing flow capacity and system resilience.

Notably, 8,600 feet of 16-inch and 12-inch pipe will be installed side by side in the same trench, optimizing installation efficiency and minimizing surface disruption. All Ductile iron pipe used in this project is enhanced with V-Bio® enhanced polyethylene encasement, a proven technology that provides added protection against corrosion, helping extend the service life of the pipe even further. This project exemplifies how strategic investments in water infrastructure can preserve historic communities while preparing them for a more sustainable future.

Sales Region: Northeast
Sales Representative: Mike Palermo
Project Location: Rome, NY
Project Name: Water System Improvements
Project Owner/Utility: City of Rome
Project Engineer: Dodson & Associates
Project Contractor: Highlander Construction, Inc.

Types of Ductile iron pipe used on the project:

DIAMETER	JOINT	CLASS	FOOTAGE
8″	Tyton®	52	8,245
12″	Tyton®	52	23,305
16″	Tyton®	52	29,305
30″	Tyton®	52	162

Sales Region: South
Sales Representative: Hayden Beyer
Project Location: Winder, GA
Project Name: Park 53 North Water Main Extension
Project Owner/Utility: Barrow County Board of Commissioners
Project Engineer: Precision Planning, Inc.
Project Contractor: W.L. Griffin Company

Types of Ductile iron pipe used on the project:

DIAMETER	JOINT	CLASS	FOOTAGE
12"	Tyton®	350	18
16"	Tyton®	350	6,907

Barrow County, Georgia, is a growing county situated east of Atlanta, between Lawrenceville and Athens, with a current population of over 92,000 and an anticipated population of over 145,000 by 2030. Barrow County has a majority of residents that reside in unincorporated areas and experienced a 20% increase in population from 2010 to 2020. The location is right in the sweet spot of exponential growth and ever-growing demand for water and sewer services. Precision Planning, Inc. designed the 16-inch water main extension to service the future development of the area for residence and the proposed Park 53 Industrial & Technology Complex South. The current site features a natural layout of mixed open and forested land adjacent to a busy highway, with development planned to bring economic growth to the area.

"Installing line work in an area like this allows us the opportunity to perform at the highest standard without much risk," said Thomas Brown of W.L. Griffin Company. Jack and bore locations were required to pass under the busy highway and a future roundabout location. W.L. Griffin opted to use our 16-inch Sure Stop 350 Gaskets instead of our TR Flex® restrained joint to restrain the water main in these jack and bore locations. The installation of the 16-inch water main via jack and bore was performed flawlessly, thereby expediting the project schedule. The 16-inch Ductile iron pipe water main was successfully tested and will provide clean drinking water and fire suppression for future residences and businesses for many decades to come.

PROJECT PROFILE

South

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