

# U.S. Pipe & Foundry Company and Ductile Iron Pipe Research Association

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Present

**NEW PRODUCTS**

And

**CERTIFICATIONS**




What's **NEW** From DIPRA?

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# SMaRT<sup>®</sup> Certification!





**Through the efforts of the Ductile Iron Pipe Research Association (“DIPRA”) Ductile Iron Pipe is the second buried infrastructure Industry product to earn the coveted Institute for Market Transformation to Sustainability (“MTS”) Gold rating.**

**SMaRT<sup>®</sup> Certification**

# SMaRT<sup>®</sup> Certification

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MTS awarded ductile iron pipe its esteemed prime Gold/EPP SMaRT<sup>®</sup> certification rating for the product's rankings in:

- ✓ Product being Safe for Public Health and Environment
- ✓ Use of Renewable Energy & Energy Reduction efforts
- ✓ Use of Bio-based or Recycled Materials
- ✓ Meeting Facility and/or Company Requirements
- ✓ Product's Reclamation, Sustainable Reuse and End Life Management
- ✓ Innovation in Product Manufacturing

# SMaRT<sup>®</sup> Certification

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Ductile iron pipe earned high marks for use of recycled material (**up to 95% ferrous scrap**), the products long life, (**from AWWA publication, *Buried No Longer*, an average of 105 years**), end of life management (**ductile iron pipe is 100% recyclable**) and the industry's commitment to conserving energy and water resources while controlling emissions.

Additionally the certification recognizes the industry commitment to ensuring the health and safety of employees and the public.

# SMaRT<sup>®</sup> Certification

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DIPRA member companies constantly work to improve their products and processes. Through advanced research and providing technical expertise to utilities and engineers, they strive to improve the durability and reliability of ductile iron pipe while searching ways to increase value to consumers by helping reduce water utility bills and our carbon footprint.

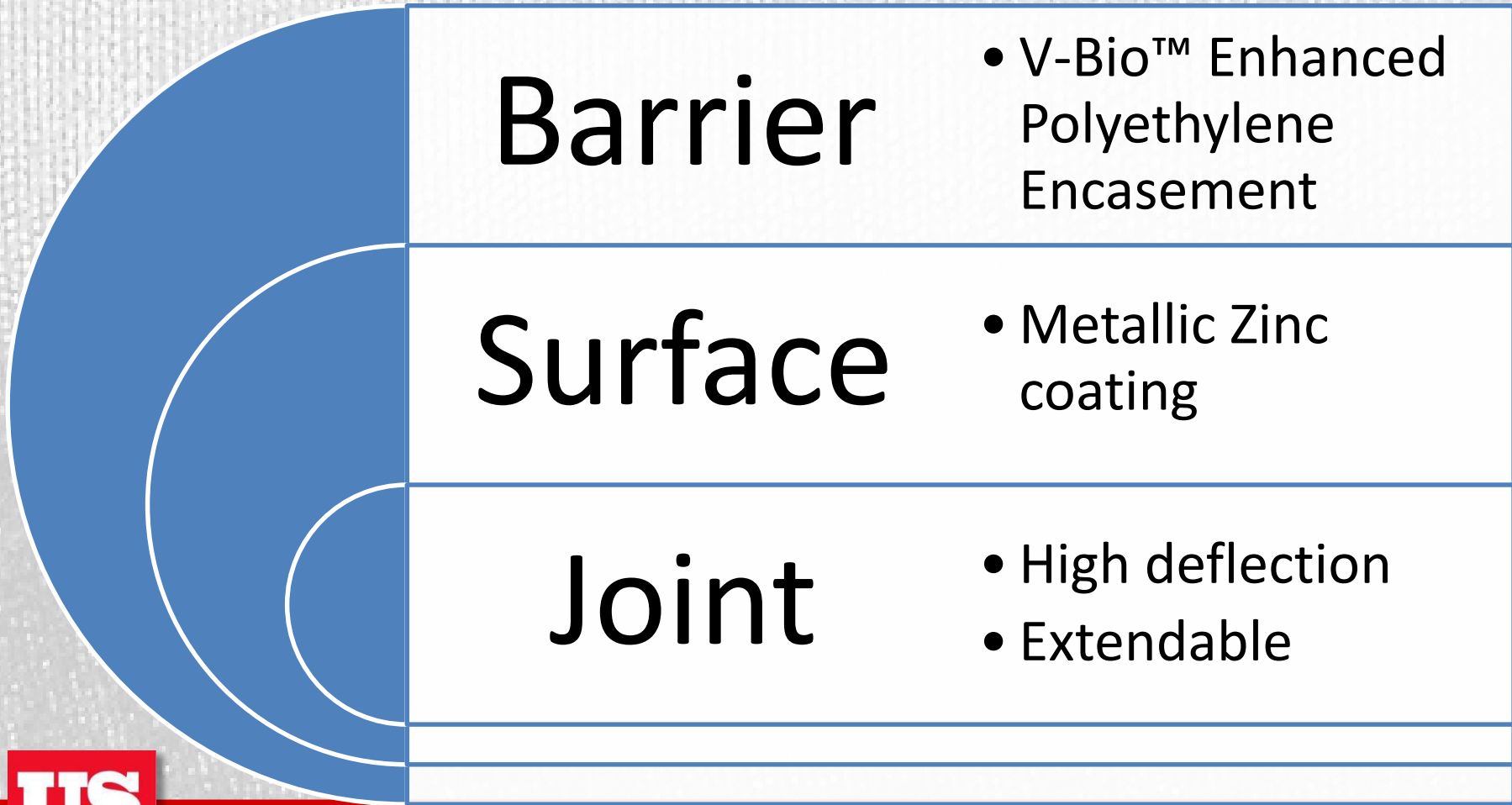
# SMaRT<sup>®</sup> Certification

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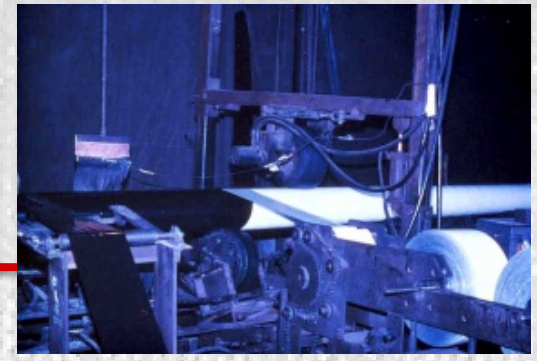
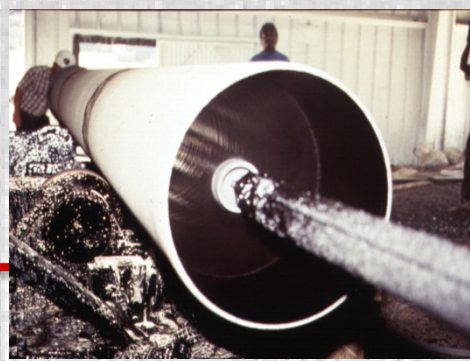
Ductile Iron Pipe qualifies for Federal Procurement under Public Law No.94-580, Section 6002, known as the Resource Recovery Act of 1976, since, due to modern technology, recycled iron and steel scrap are the primary raw materials used in the production of our Ductile-Iron pipe

# What is New from U.S. Pipe?

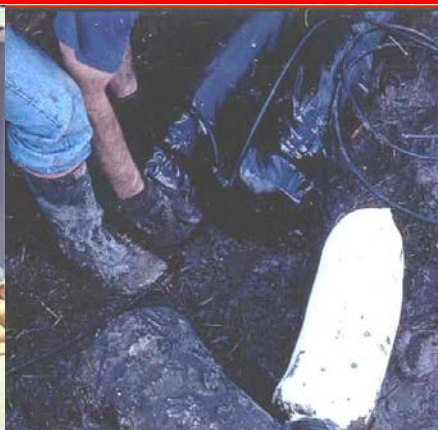
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Since 1899, USP has evaluated many different types of coatings, linings, and corrosion control systems for the protection of iron pipe, valves, & fittings.



# USP TEST SITES

## Everglades City, FL & Absecon, NJ



1957

2000

# Florida Everglades!!

One of the most corrosive environments in the USA



# Florida Everglades Corrosion Test Site

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- Saturated Resistivity: 140 to 240 ohm-cm
- Redox Potential : -100 to -200 mV
- pH: 6.8 to 7.4
- Sulfides: Positive Reaction
- Moisture: Saturated with fluctuating tidal action
- “Uniquely Severe Environment” as defined by ANSI/AWWA C105/A21.5

# Florida Everglades Corrosion Test Site

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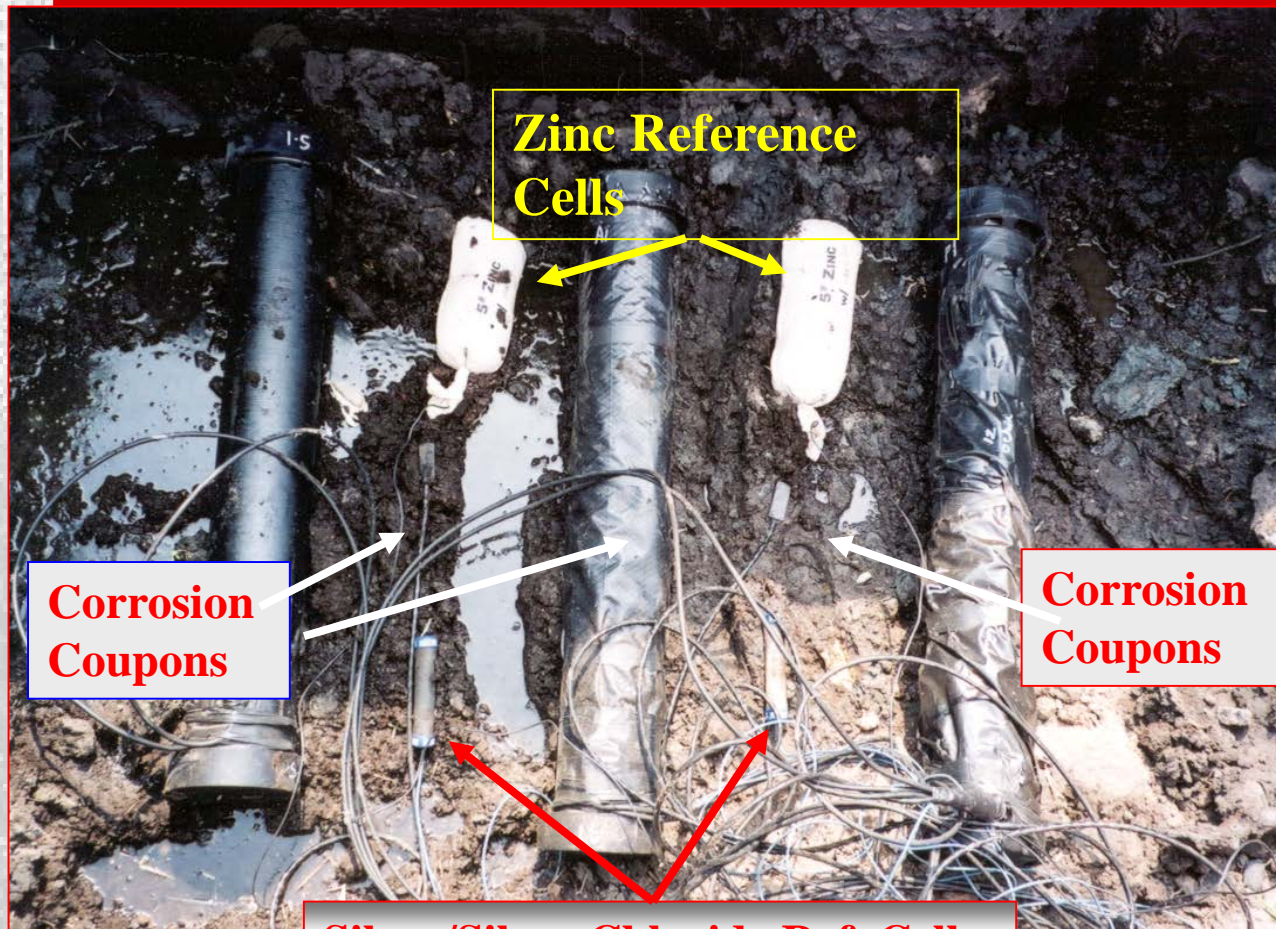
- Aerobic Bacteria: > 1,000/ml
- Acid Producers: > 1,000/ml
- Low Nutrient Bacteria: > 1,000/ml
- Sulphur Reducing Bacteria: 100 – 1,000/ml
- Iron Related Bacteria: 10 – 100/ml
- High Propensity for MIC\*

\*Microbiologically Influenced Corrosion

“Uniquely Severe Environment” has been shown to corrode through a 0.20” thick Unprotected DIP in less than 5 years.



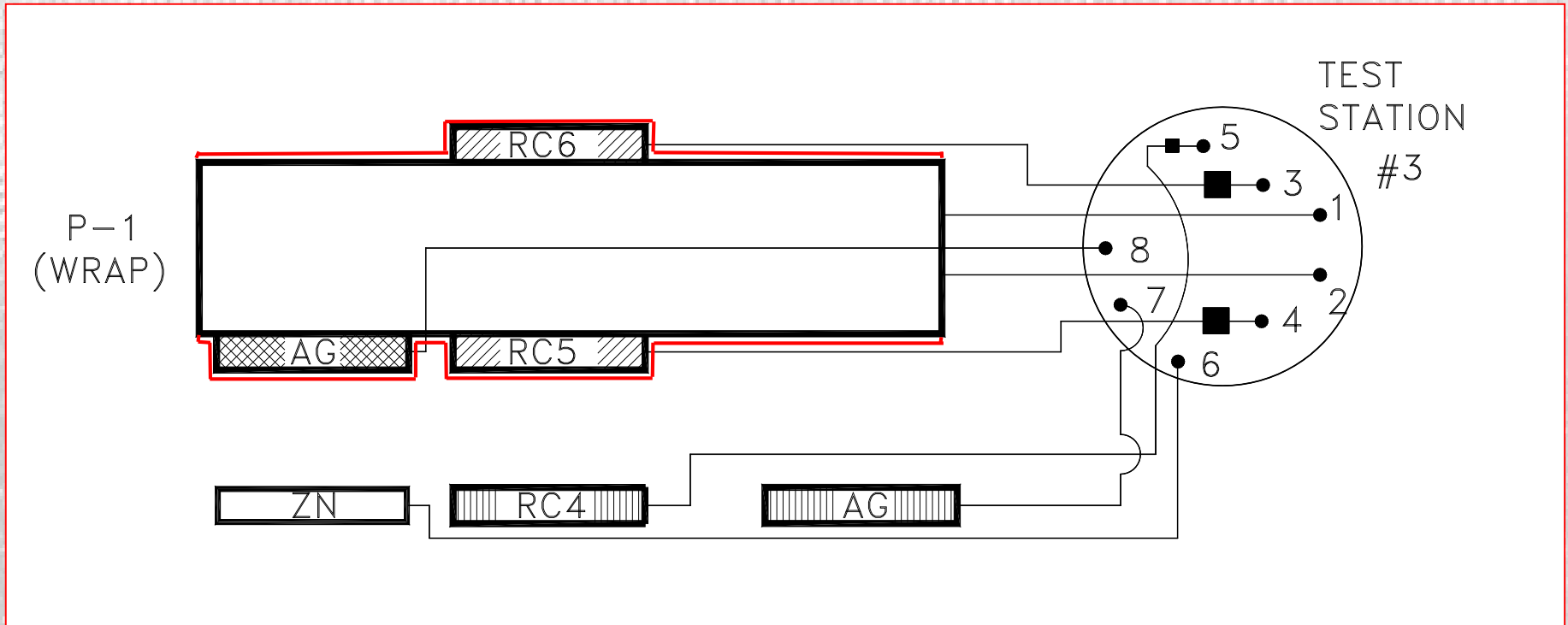
# USP Florida Everglades Corrosion Testing



**US  
PIPE**

**Silver/Silver Chloride Ref. Cells**

# Florida Everglades Corrosion Testing (above ground monitoring)





# Advancements in Corrosion Protection

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- From the effort of Continuous Improvement we now offer:
  - V-BIO<sup>TM</sup> Enhanced Polyethylene Encasement
  - Zinc Exterior Coating

# History of Polyethylene Encasement

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- 1951 – First testing conducted
- 1958 – First Commercial Application
- 1972 – ANSI/AWWA C105/A21.5 Adopted
- 1985 – ISO 8180 Standard Issued
- 1993 – 4-mil High – Density Cross Laminated polyethylene material accepted into ANSI/AWWA C105/A21.5
- **2013 – V-BIO™ Enhanced Polyethylene Encasement introduced**

# V-BIO™ Enhanced Polyethylene Encasement

- Outer UV resistant layer
- Thick middle layer
- Advanced Inner layer:
  - Biocide to mitigate Microbiologically Influenced Corrosion (MIC)
  - Volatile Corrosion Inhibitor (VCI) to neutralize galvanic corrosion
- Meets all requirements for AWWA C105

**U.S.  
PIPE**

**U.S.  
PIPE**

## VBIO™ ENHANCED POLYWRAP FOR DUCTILE IRON PIPE

Revolutionary Co-Extruded 3-Layer Polyethylene Film Technology

**Outer Layer:** Linear Low Density Polyethylene (LLDPE) - Light color for UV resistance

**Intermediate Layer:** Thick, impermeable middle layer for toughness and enhancement of inner biocide layer

**Inner Layer:** LLDPE Enhanced with a Corrosion Inhibitor and a Biocide to Address Anaerobic Bacteria Associated with MIC, Microbiologically Influenced Corrosion.

*Advanced Active Corrosion Control Technology begins where Conventional Passive Polywrap Systems End*

*VBIO™ Enhanced Polywrap Meets or Exceeds These Standards for Polyethylene Encasement Film:*

- ANSI/AWWA C105/A21.5
- ASTM A674
- ISO 8180

**DUCTILE IRON PIPE**

RESEARCH ASSOCIATION

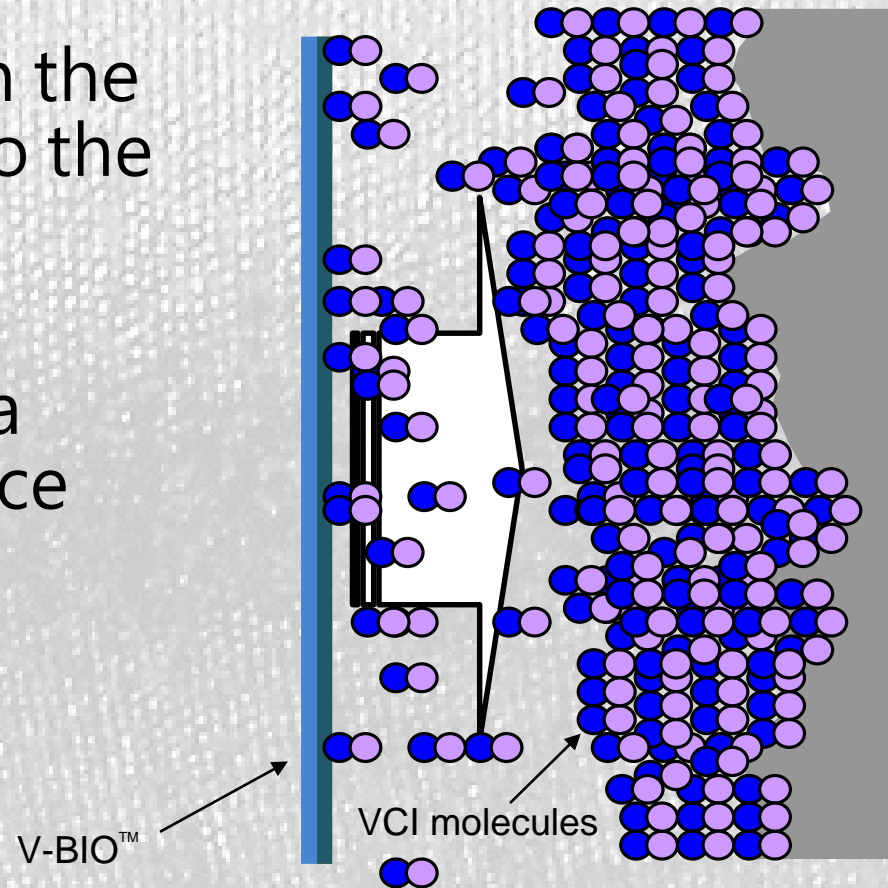
# V-BIO™ - Biocide

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- Biocide attacks bacteria cell membrane
- Biocide is infused into inner polyethylene layer
- Biocide is safe for indirect contact with food.  
Used for:
  - Cutting boards
  - Toothpaste
  - Playroom equipment

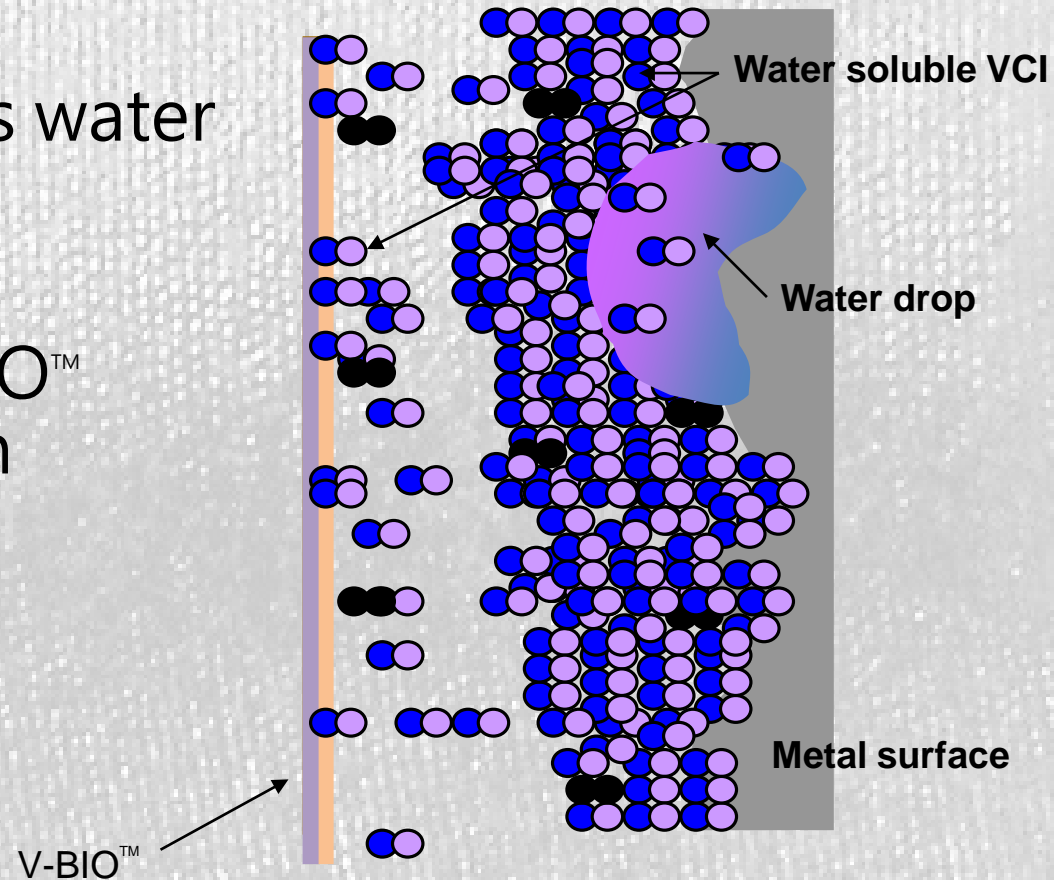
# V-BIO™ - Corrosion Inhibitor

- Corrosion inhibitor polar molecules infused within the polywrap are attracted to the pipe surface.
- These molecules create a barrier on the pipe surface that prevents oxidation



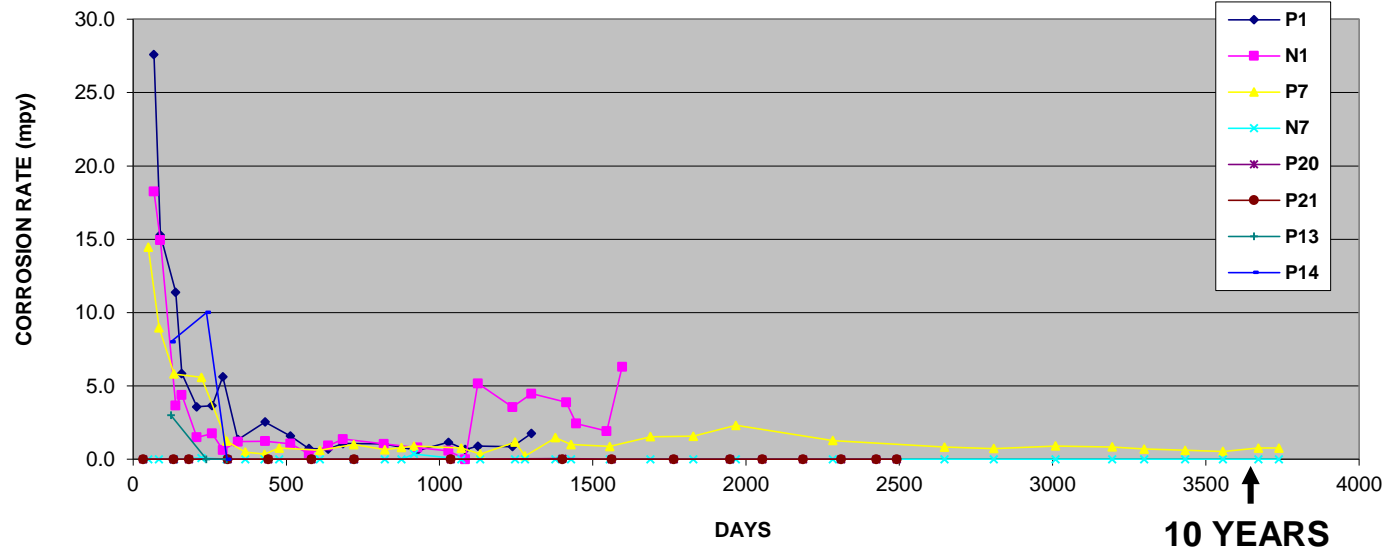
# V-BIO™ - Corrosion Inhibitor

- Corrosion inhibitor is water soluble
- Moisture inside V-BIO™ becomes a corrosion inhibiting solution

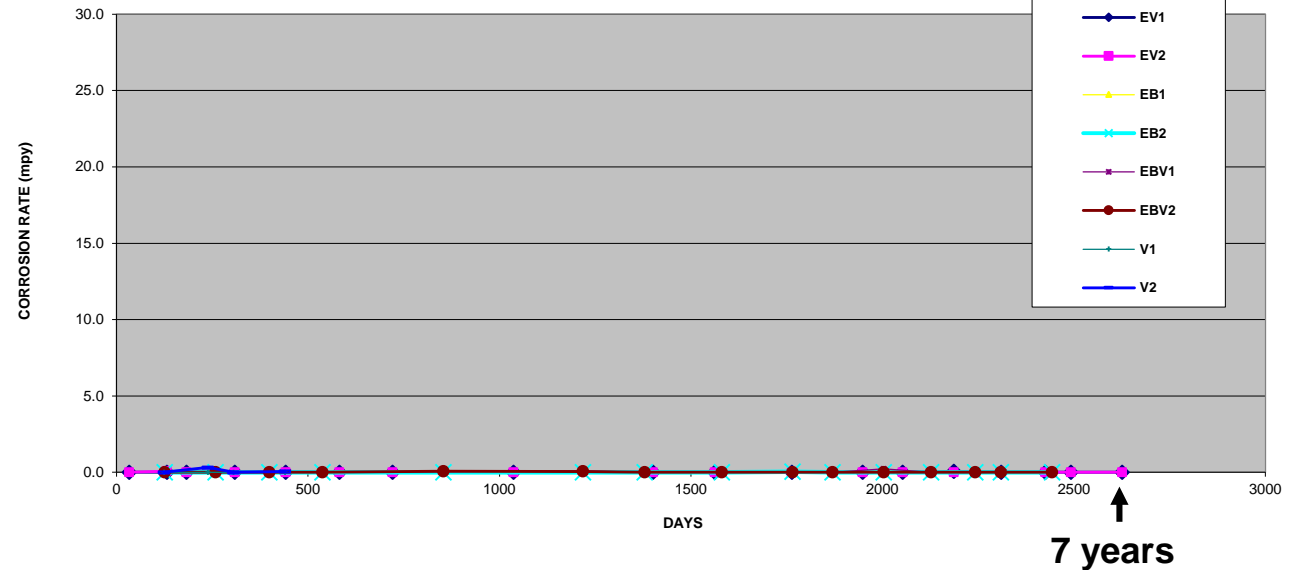


# V-BIO™ Case Study

**CORROSION RATE - PROBES UNDER STANDARD  
POLY @ 6 O'CLOCK - EVERGLADES, FL**

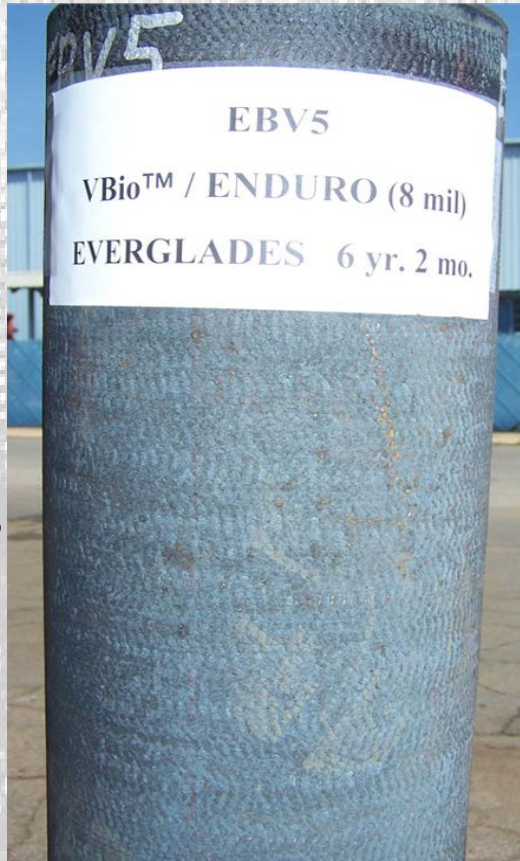


**CORROSION RATE OF PROBES UNDER  
V-BIO POLY @ 6 O'CLOCK - EVERGLADES, FL**



# V-BIO™ – Case Study

V-Bio™  
Protection  
in  
Everglades  
After 6  
years



No  
Protection  
in  
Everglades  
after 3  
years



# Zinc Coating

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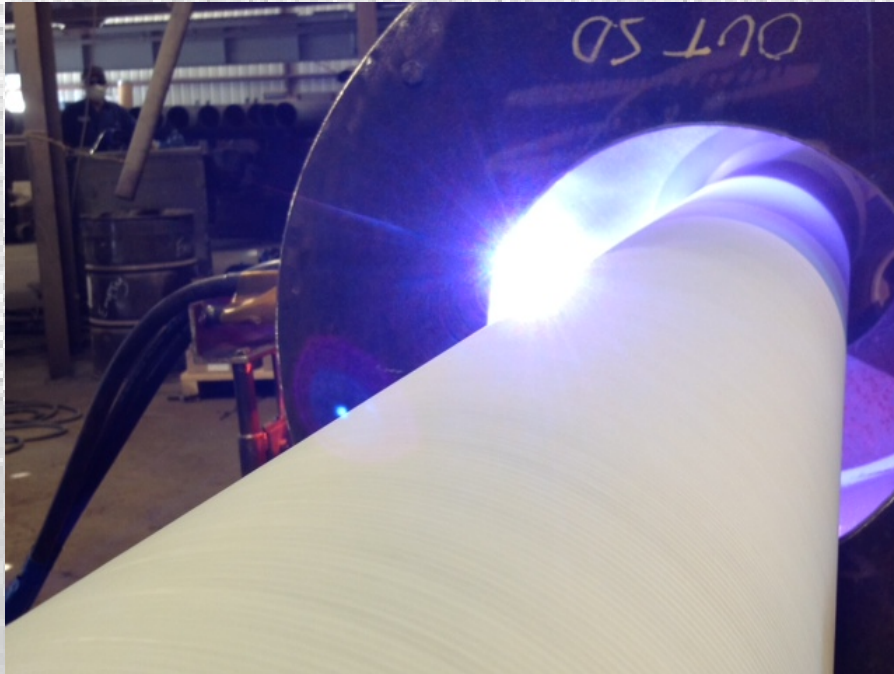
- Proven corrosion protection, used extensively throughout the world
- Layer of zinc is thermal arc sprayed on pipe surface, acting as sacrificial cathodic protection
- Asphalt or epoxy coat is applied after zinc coat
- Zinc is often used in sacrificial anodes for standard cathodic protection

# Zinc Coating

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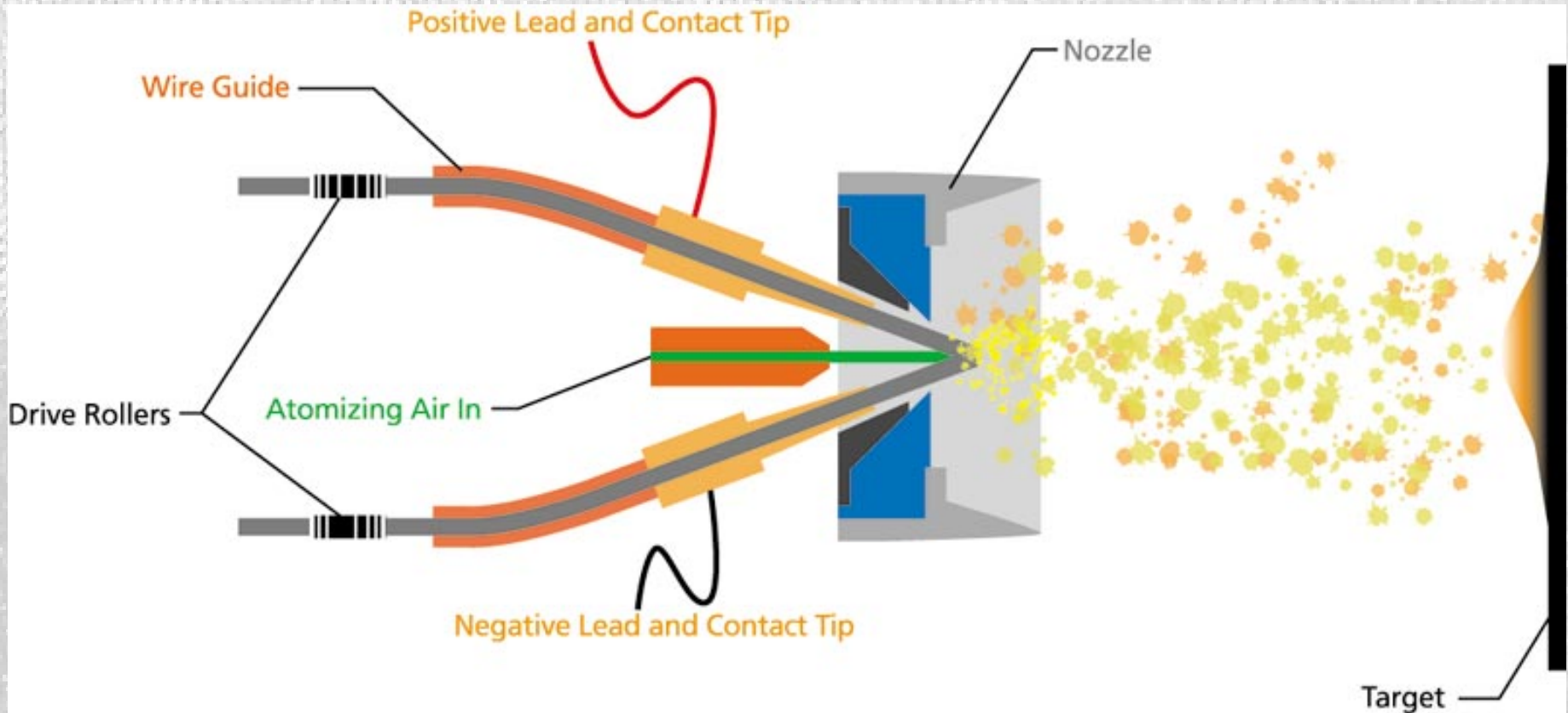
- 1938 – First Evaluation of Zinc on Cast Iron Pipe in Europe
- 1958 - Metallic Zinc on Iron Pipe Commercially Available
- 1985 - ISO 8179 Standard Issued
- 1986 - U. S. Pipe begins application of Zinc for International Market
- 2013 – First In-Line application equipment installed on a U. S. Pipe processing run

# Zinc Coating Process



- 99.99% pure zinc is applied to pipe surface per ISO standards
- Process is called metallic zinc arc spray
- U.S. Pipe has capabilities for zinc coating with inline production

# ARC SPRAY METALLIC ZINC



# Zinc Coated Pipe

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# Zinc Coating Behavior

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- Zinc is sacrificed in areas where corrosion would occur
- As zinc is sacrificed, it creates a zinc oxide in these areas. This oxide provides a protective barrier.
- Zinc coating is 'self-healing' for any scratches to bare metal from handling of pipe
- Scratched areas become cathodically protected by zinc coating and zinc molecules slowly build up over these areas to protect pipe from corrosion

# Galvanic Series

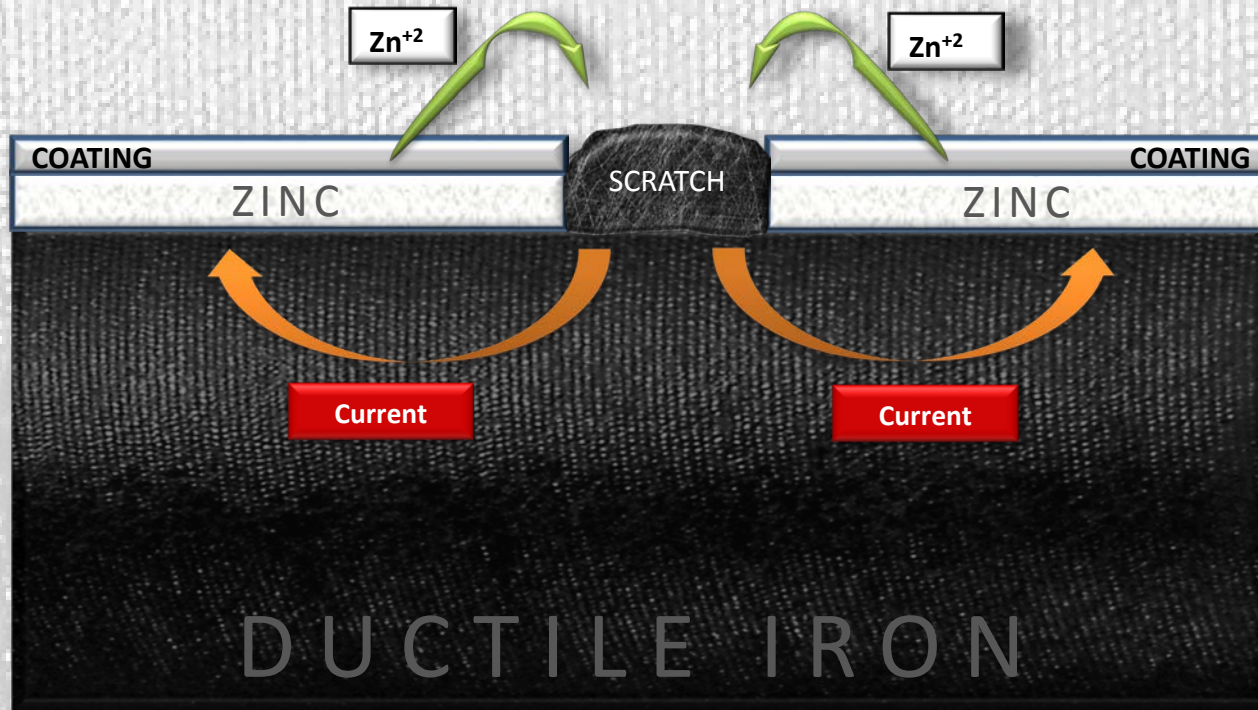
Anode (Most Active)	Magnesium
	Zinc
	Aluminum (2S)
	Cadmium
	Aluminum (175T)
	Steel or Iron
	Cast Iron
	Lead - Tin solder
	Lead
	Nickel
	Brass
	Copper
	Bronze
	Stainless Steel (304)
	Monel Metal
	Stainless Steel (316)
	Silver
	Graphite
Cathode (Least Active)	Gold



- Zinc is anodic to Iron

# Zinc Self Healing

## ZINC COMPOUNDS





# U.S. Pipe & Foundry Company

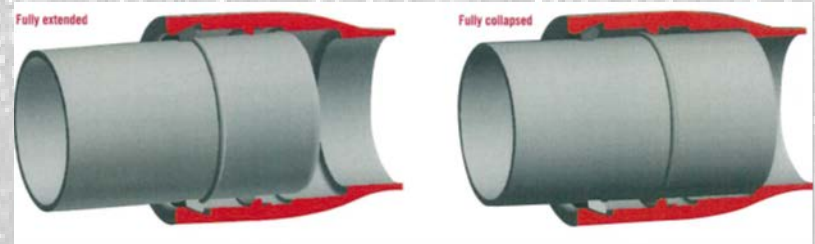
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- A History of Innovation Since 1899
  - 1923 Centrifugal Casting
  - 1926 "Anthony" Mechanical Joint
  - 1956 Modern day push-on TYTON JOINT®
  - 1979 First TR FLEX® Restrained push-on joint
  - 1983 First FIELD LOK® Restrained gasket
  - 2003 HP LOK®, 350 psi rating for 30" through 64"
  - 2014 TR EXTREME®



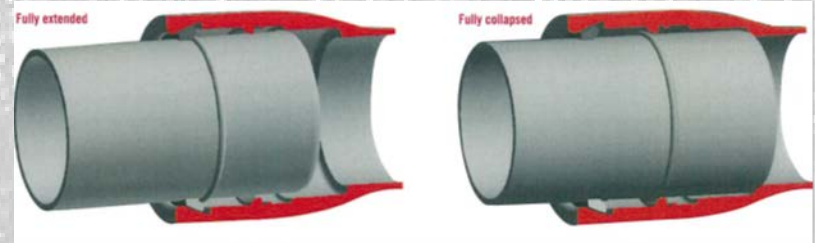
# TR XTREME™

- In 2015 the TR XTREME™ was introduced for seismic applications. The joint has a working pressure rating of 350 psi providing a joint deflection of up to 4° and 2.9" of extension to accommodate ground settlement and soil liquefaction during earthquakes.



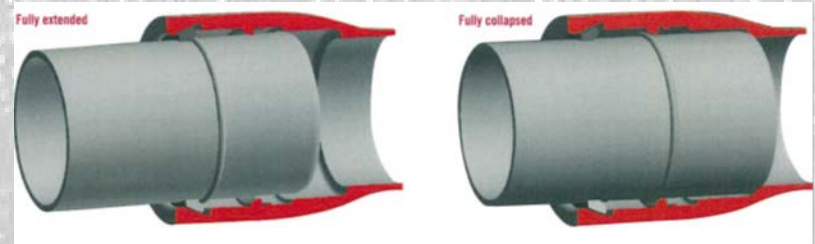
# TR XTREME™

- The TR XTREME™ incorporates technology U. S. Pipe has compiled from almost 60 years experience with Rubber-Gasket joints and over 40 years of restrained joint design and application. The sealing mechanism is the tried and true TYTON JOINT® Gasket and the security of the TR FLEX® Restrained Joint system.



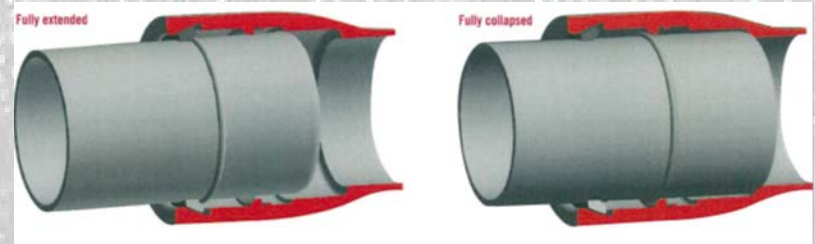
# TR EXTREME™

- These features help ensure that a water system can be placed back in service quickly after a seismic event. To augment the ability of the TR EXTREME™ to serve in seismically active areas and other unstable soil conditions it can be augmented with TR FLEX® Fittings, TR FLEX® Telescoping Sleeves, and XTRA FLEX® Couplings.



# TR EXTREME™

- The TR EXTREME™ is currently available in Nominal 18 foot lengths in diameters 6-inch, 8-inch, 12-inch, and 16-inch



# Design Infrastructure that can last Forever

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TR XTREME™ Restrained Joint

Zinc Exterior Coating

V-Bio™ Polyethylene Encasement

# Questions?

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