PIPE REPAIR IN AN AGING INFRASTRUCTURE: BREAKS, SPLITS, LEAKS, BELL JOINT REPAIR

December 2019
By Kevin Waugh
Utility Solutions, Inc.

GENERAL PIPE REPAIR: INTRODUCTION TO BREAKS, SPLITS, LEAKS, BELL JOINT REPAIR & TAPPING

OTCO-B13354-OM 1.0 hour

December 2019

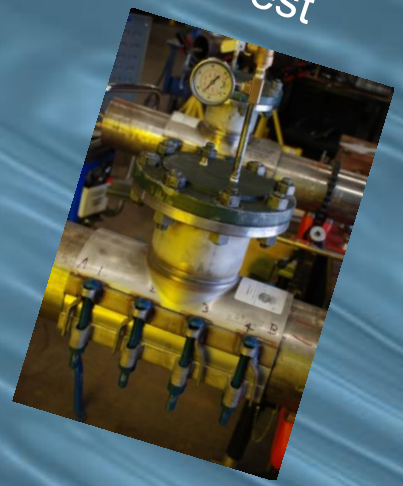
By Kevin Waugh

Utility Solutions, Inc.

TPS Manufacturing – 55,000 sq ft.

Shear

Test

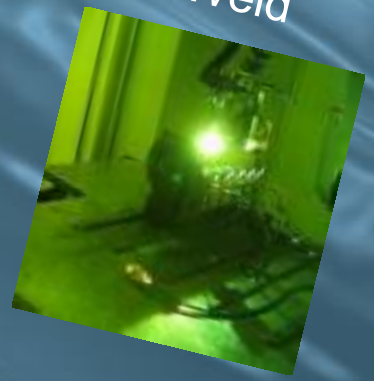


Roll

Bend

Form

Weld

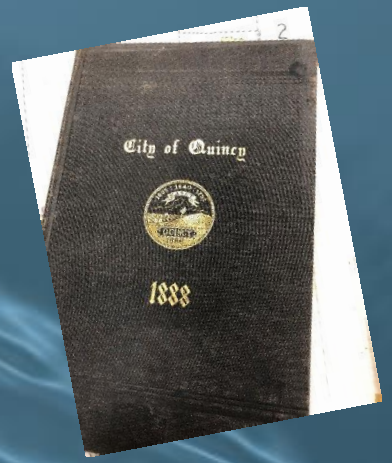


Historical Perspective of Pipe Joining and Repair in North America

- Evolution of Pipe in North America
- Pipe Joining in the Beginning

History

Cement mortar lined and coated steel pipe that was installed in 1855 in the City of St. John, New Brunswick, Canada.

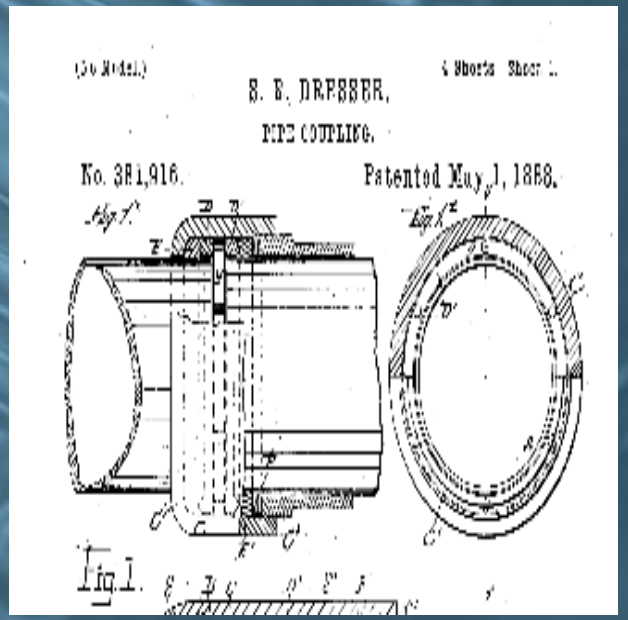


Riveted Steel Pipe – 1850 (Welded by 1930)

Horizontal Sand Cast 1660 in France, 1880 in North America

Pit Cast – 1884 Vertical Casting

Centrifugal Cast – 1918



First Patent 1880
First Coupling 1885

Pipe History

Pipe Classes and Dimensions Standardized in Great Britain in 1917

Ductile Iron-1950- present

- Asbestos Cement 1929-1980

- PVC
- C900
- C909
- 1955 to present

- HDPE 1990 to present

Need for Wide Range

Pipe Outer Diameter Chart

This chart is based on the most recent pipe standards and informaion supplied by pipe manufacturers. Always check the pipe O.D. or circumference before ordering pipe joining and repair

Pipe Type	Nominal Pipe Size (inches)																				
	1/2	3/4	1	1.25	1.5	2	2.5	3	4	5	6	8	10	12	14	15	16	18	20	24	30
Copper Tubing (C.T.S.)	0.63	0.88	1.13	1.38	1.63	2.13	2.63	3.13	4.13	5.13	6.13										
Schedule 40 Steel Pipe	0.84	1.05	1.32	1.66	1.90	2.38	2.88	3.50	4.50	5.56	6.63	8.63	10.75	12.75	14.00		16.00	18.00	20.00	24.00	30.00
PVC-STD			1.32		1.90	2.38	2.88	3.50	4.50		6.63	8.63	10.75	12.75							
PVC-C.I. Size									4.80		6.90	9.05	11.10	13.20							
Polyethylene Pipe IPS		1.05	1.32	1.66	1.90	2.38		3.50	4.50	5.56	6.63	8.63	10.75	12.75	14.00		16.00	18.00	20.00	24.00	30.00
Polyethylene Pipe DI Size									4.80		6.90	9.05	11.10	13.20			17.40	19.50	21.60	25.80	
Cast Iron Pipe	1/2	3/4	1	1¼	1½	2	2½	3	4	5	6	8	10	12	14	15	16	18	20	24	30
Class 100-250 AWWA								3.96	4.80		6.90	9.05	11.10	13.20	15.30		17.40	19.50	21.60	25.80	32.00
Class A AWWA Pit Cast						2.50		3.80	4.80		6.90	9.05	11.10	13.20	15.30		17.40	19.50	21.60	25.80	31.74
Class B AWWA Pit Cast								3.96	5.00		7.10	9.05	11.10	13.20	15.30		17.40	19.50	21.60	25.80	32.00
Class C AWWA Pit Cast								3.96	5.00		7.10	9.30	11.40	13.50	15.65		17.80	19.92	22.06	26.32	32.40
Class D AWWA Pit Cast								3.96	5.00		7.10	9.30	11.40	13.50	15.65		17.80	19.92	22.06	26.32	32.74
Class 100 Asbestos Cement Pipe	1/2	3/4	1	1¼	1½	2	2½	3	4	5	6	8	10	12	14	15	16	18	20	24	30
Machined End								3.74	4.64		6.91	9.11	11.24	13.44	15.07		17.15	19.90	22.12	26.48	33.12
Fluid-Tite Rough Barrel								3.93	5.05		7.16	9.32	11.46	13.70	15.36		17.50				
Flintite M.E.								3.74	4.64		6.91	9.11	10.89	12.99	15.07		17.15	19.90	22.12	26.48	33.12
Flintite Rough Barrel								3.94	4.90		7.13	9.33	11.30	13.42	15.45		17.60				
Ring-Tite Rough Barrel								3.95	4.92		7.19	9.39	11.47	13.74	15.51		17.65	20.44	22.68	27.12	33.80
Permaflex Rough Barrel									4.84		7.15	9.35	11.47	13.74	15.55		17.55				
Minimum Standard Rough Barrel									4.79		7.05	9.22	11.25	13.37	15.36		17.50	20.44	22.50	27.17	
Maximum Standard Rough Barrel									5.26		7.40	9.57	11.77	14.04	15.80		17.94	20.44	22.50	27.17	
Class 150 Asbestos Cement Pipe	1/2	3/4	1	1¼	1½	2	2½	3	4	5	6	8	10	12	14	15	16	18	20	24	30
Machined End								3.84	4.81		6.91	9.11	11.66	13.92	16.22		18.46	20.94	23.28	27.96	35.00
Fluid-Tite Rough Barrel								4.03	5.14		7.12	9.32	11.85	14.11	16.41		18.65				
Flintite Rough Barrel								4.04	5.01		7.13	9.33	11.88	14.14	16.48		18.72				
Ring-Tite Rough Barrel								4.13	5.07		7.17	9.37	11.92	14.18	16.48		18.72	21.30	23.64	28.32	35.42
Permaflex Rough Barrel									5.00		7.20	9.40	11.92	14.20	16.50		18.75				
Minimum Standard Rough Barrel									4.97		7.07	9.27	11.82	14.08	16.38		18.62	21.20	23.54	28.22	
Maximum Standard Rough Barrel									5.32		7.37	9.62	12.12	14.38	16.73		18.97	21.20	23.54	28.22	
Class 200 Asbestos Cement Pipe	1/2	3/4	1	1 1/4	1½	2	2½	3		5	6	8	10	12	14	15	16	18	20	24	30
Fluid-Tite Rough Barrel								4.18	5.32		7.36	9.46	11.88	14.11	16.44		18.74				
Flintite Rough Barrel								4.17	5.32		7.26	9.44	11.88	14.14	16.53		18.84				
Ring-Tite Rough Barrel								4.17	5.33		7.32	9.50	11.92	14.18	16.55		18.90	22.54	25.02	29.98	37.48
Permaflex Rough Barrel									5.32		7.26	9.50	11.95	14.20	16.55		18.90				
Minimum Standard Rough Barrel									5.22		7.26	9.39	11.77	14.03	16.44		18.74				
Maximum Standard Rough Barrel									5.57		7.60	9.79	12.12	14.38	16.88		19.19				

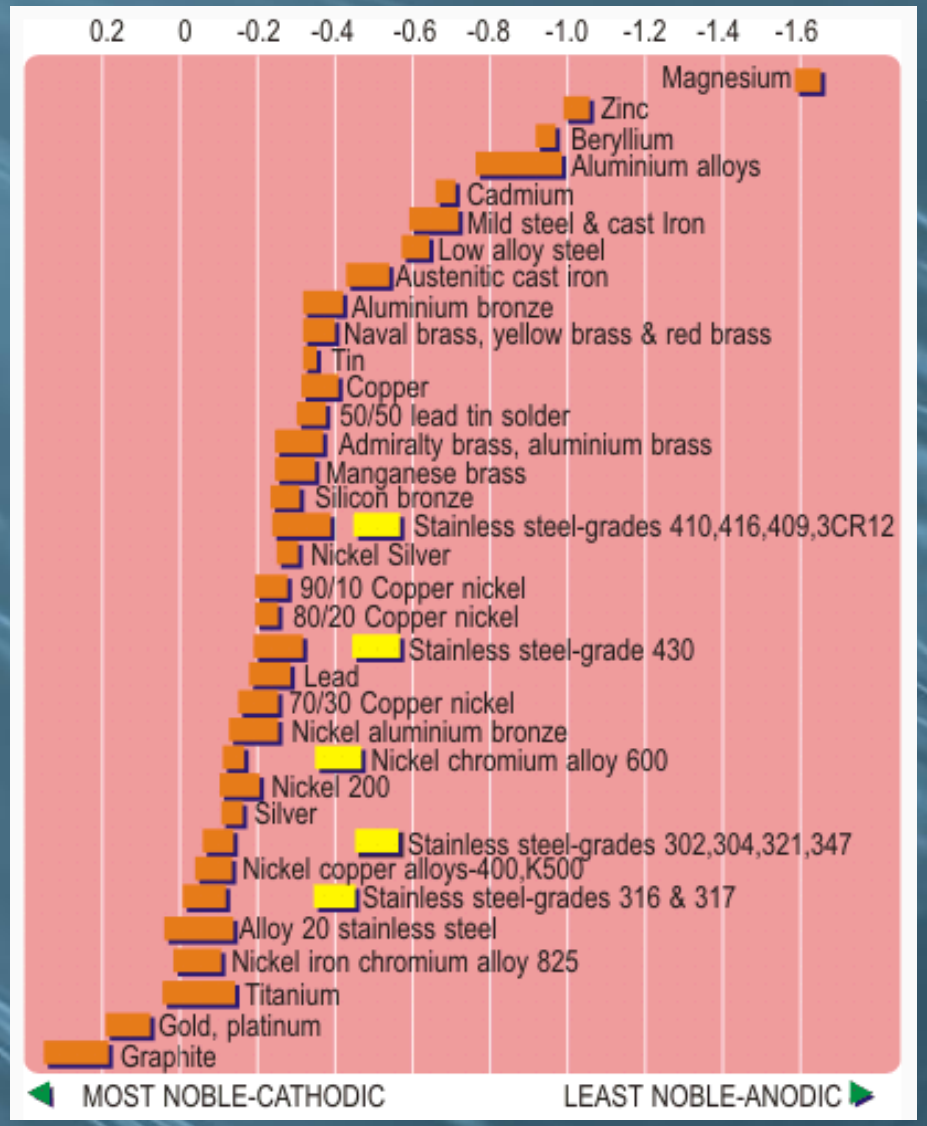
Pipeline Corrosion Represents a $50 Billion Annual Cost in North America

- Watermain Integrity:
- Protect the Main from Future Damage with Proper Materials Selection

Graphic Material Property of Total Piping Solutions, Inc.

Galvanic Series

Anodic Materials

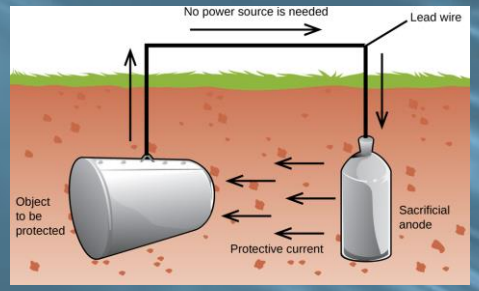


Cathodic Materials

Minimizing Galvanic Corrosion

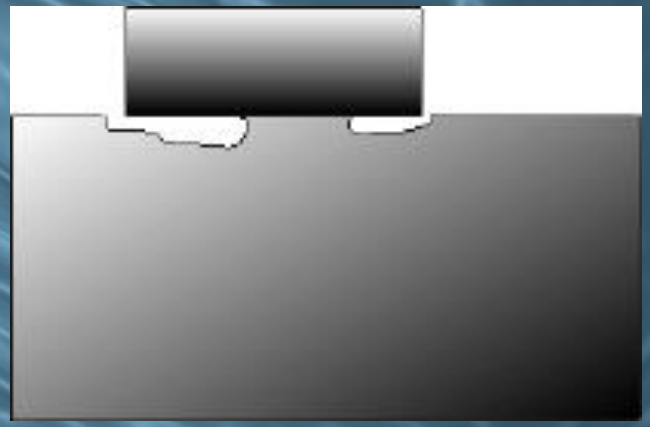
- Select metals that are as close together as possible in the galvanic series.
- Avoid combinations of metals for which the area of the less noble metal is small in comparison to the more noble metal.
- Insulate dissimilar metals, make the resistance of the electrical path connecting the two metals as high as possible.

Proper Coatings or Cathodic Protection Make a Difference



Welded Products Must be Properly Prepared to Prevent Corrosion

Poor Passivation at the Welds and Too Many Welded Components



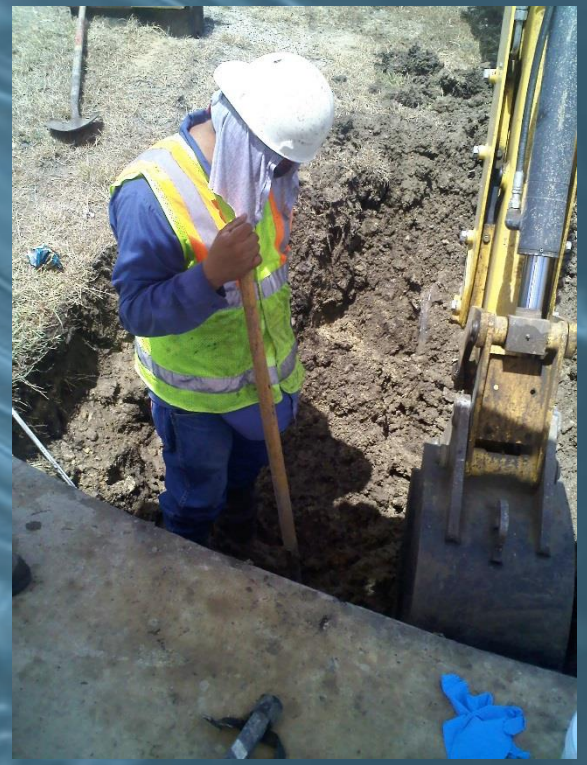
Leaving Weld Contaminants Behind can Lead to Erosion and Corrosion of the Weld

Water Main Breaks Represent a $3.5 Billion Annual Cost in North America

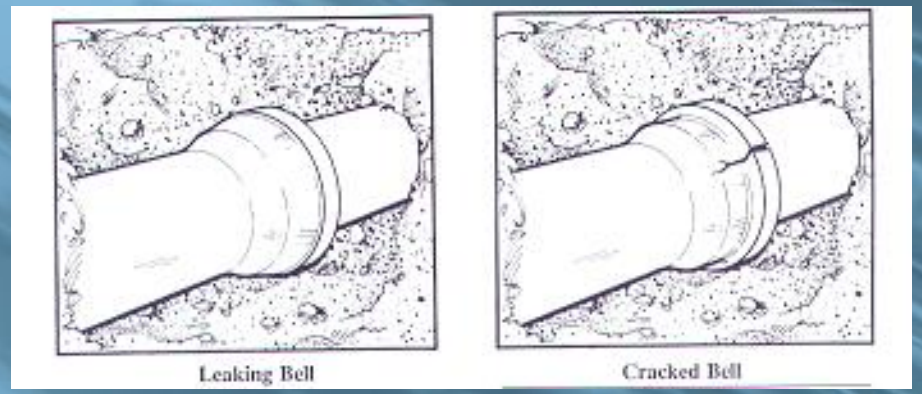
- 850 a Day in North America
- 310,000/year
- Repair Cost Range from $5000 to $9000
- Cost to Replace = $1,500,000/mile
- Cheaper to Repair

A Typical Repair Cost Structure

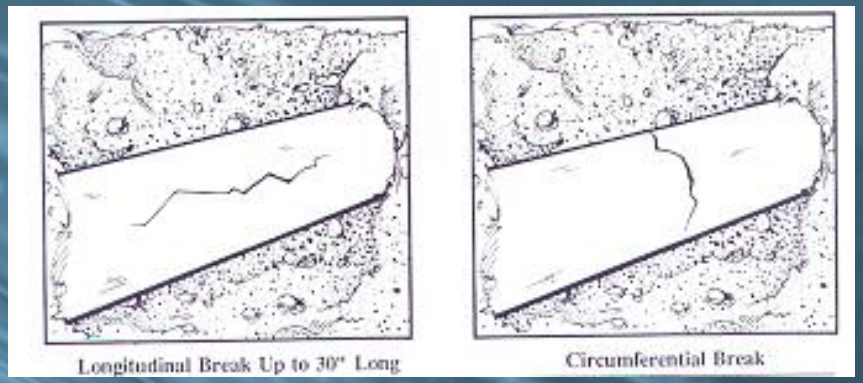
- $5000 Backhoe and pavement
- $1100 Labor
- Product = $300-600
- **Total Average Cost=$6700**
- The Cost of the Repair Product Cost is <2% of the total repair cost
- Product Cost is Negligible



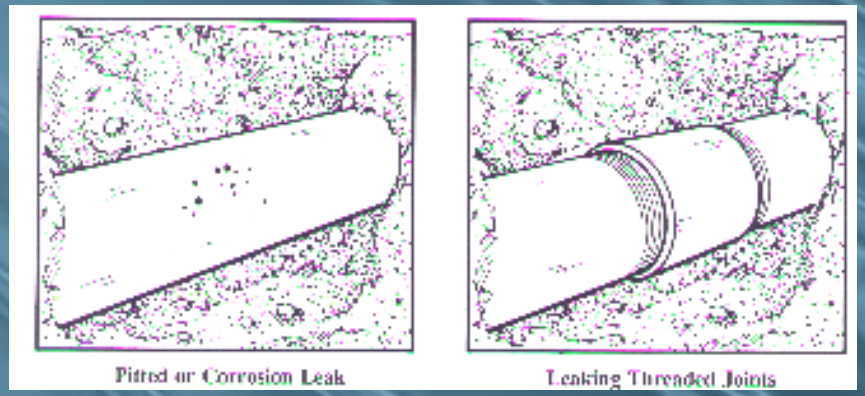
Types of Pipe Damage



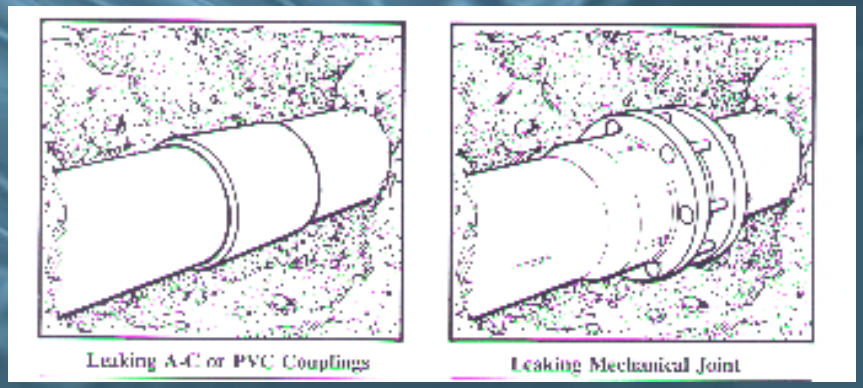
Leaking Bell Cracked Bell



Longitudinal Break Circumferential Break

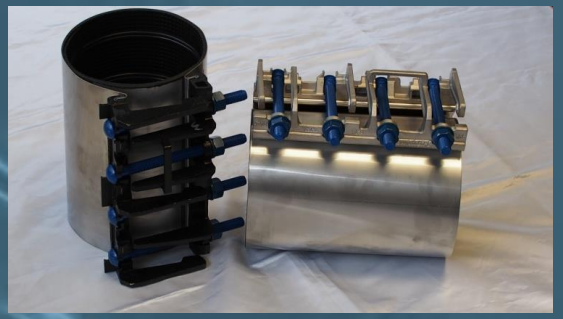


Pit Holes Leaking Threads



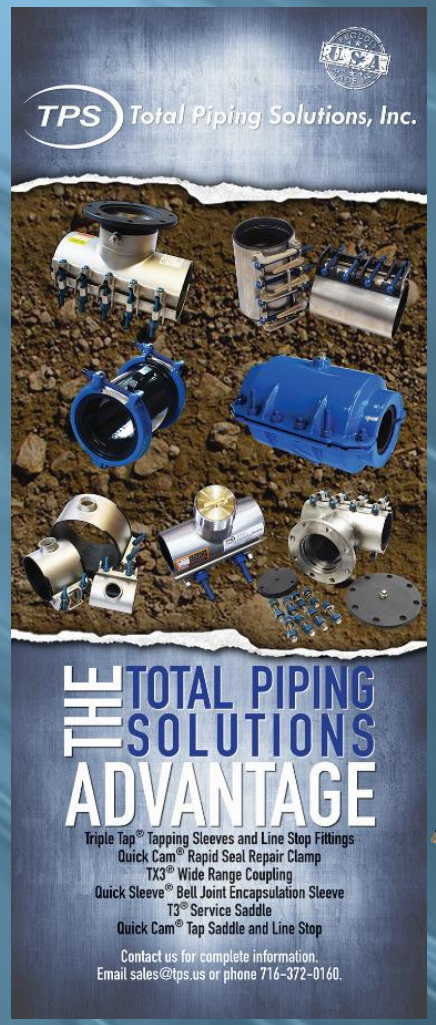
Ring Joint Leaks Coupling Leaks

Types of Repair Products



- Clamps to 54" dia. and Lay- Lengths to 36”
- Couplings to 144"
- Bell Joint Encapsulation of leaking bell joints on distribution mains to 12"
- (fabricated to larger sizes too)

For All Repairs, Follow the Manufactures Directions and Guidelines Per AWWA C 219-11, AWWA C 230-06 and C-111

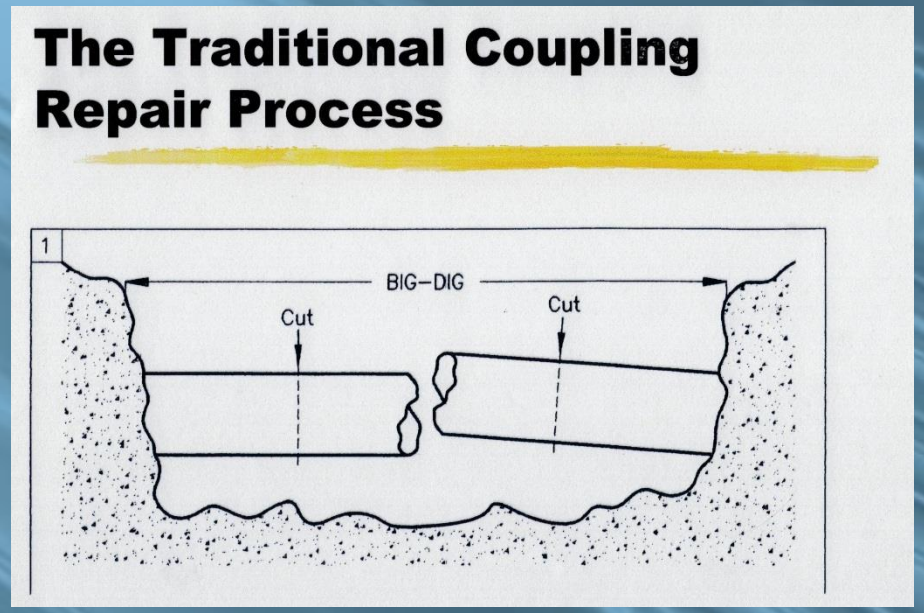


- Identify Leak Location
- Dig
- Reduce Pressure
- Decide on the Repair
- Wrap it for Repair
- Cut and Couple it for Replacement
- Encapsulate It

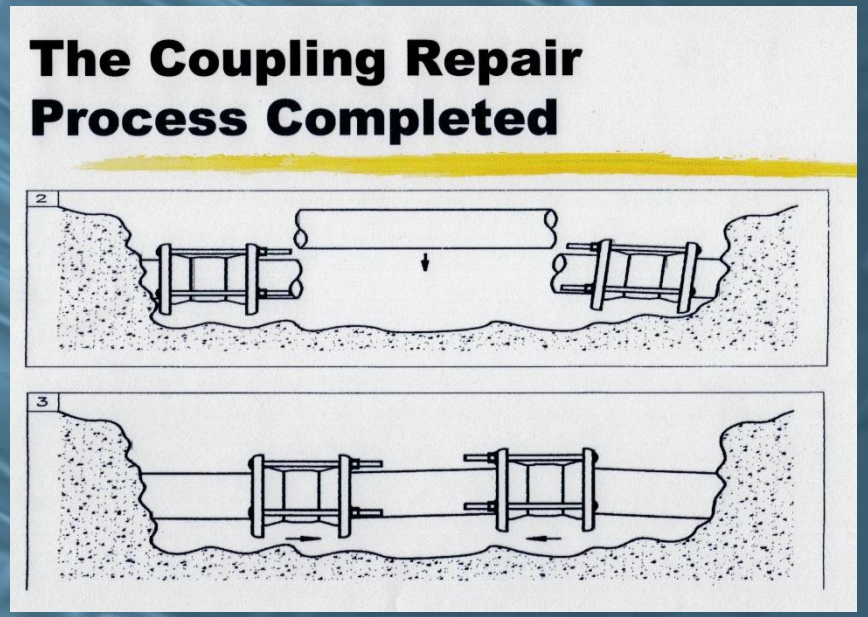
What are the Best Methods of Repair?

1. Cut and Couple
2. Encapsulate
3. Clamp

Standard Cut-In Repair



Locate and Identify the Break



Cut Section Out, Replace with New Pipe and Two Couplings

Bolted Compression Couplings AWWA C-219-17

- Types of Couplings
- Dedicated Range
- Limited Range
- Wide Range
- Repair Coupling Basics

American Water Works Association

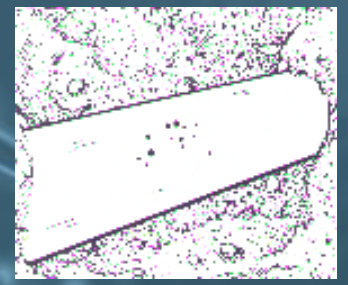
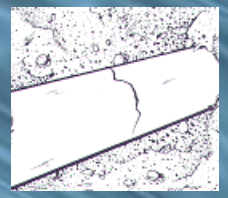
AWWA Standards Define Minimum Criteria for Performance, Material Selection, Fabrication, Testing and Design

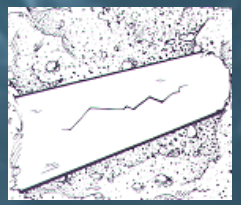
AWWA Bolted, Sleeve—Type Couplings for Plain-End Pipe Standard – C219-17

- Carbon Steel or Cast Iron Repair Couplings for Plain End Pipe
- Supported by Total Piping Solutions, Inc., Romac, Smith Blair, JCM, Ford Meter Box, Mueller, and Cascade)
- Updated every 5 years
- This Standard has been in effect since 1991

AWWA C 219 – Bolted Couplings

- Economical means of joining plain end pipe
- ½ inch to 144 inches in diameter
- Reducers, transitions, straight sleeves or flanged adapters.
- Applied use is the sole responsibility of the end user.


C-219 Materials Requirements

- Must Meet All Applicable Safe Drinking Water Requirements including NSF-61
- Center Sleeves and End Rings May be made of Cast Iron, Ductile Cast Iron, Carbon or Stainless Steel
- Coatings and Coating Test Per AWWA C213 for Fusion Bonded Epoxy
- All materials must conform to nationally recognized standards

Carbon Steel
Cast Iron
Ductile Iron

AWWA C-213 Coating Requirements

Solvent Clean
Blast Clean
12 Mil Minimum Thickness

- Ductile Iron Must be thick for Pressure retention with built in corrosion tolerance but it should be coated
- Carbon Steel is lighter, has greater impact resistance, and can withstand greater working pressures and should be coated
- Epoxy Coatings when done properly affords longer term protection on all materials

40 Year Old Grey Iron Coupling Uncoated - Failure from Corrosion

Improperly Applied Fusion Bonded Epoxy

Properly Applied FBE Coating will provide years of corrosion free service

Why the Need for a Better Coating?

Buried and Unseen Until if Fails

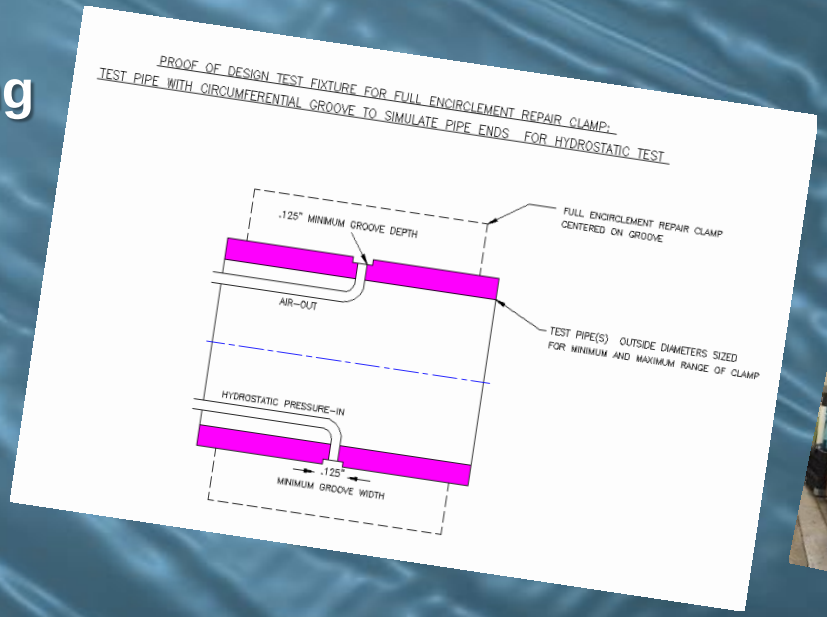
- Corrosive Soil or Stray Currents may cause:
- Cathodic disbondment
- General Corrosion
- Localized corrosion and pitting from chip of coating
- Flow assisted corrosion or erosion corrosion

AWWA C 219 Design Highlights

- **Gasket Designed To Retain Seal and control long term relaxation caused by creep**
- **Welded Products Must be cold expanded after welding or hydrostatically tested after welding**
- **Must meet pressure vessel code of AWS**

Pressures Testing

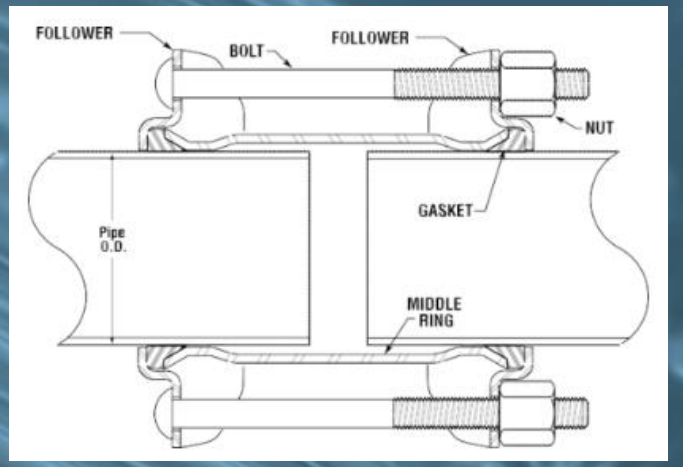
- Minimum Design Pressure of 150 psi
- Hydrostatic Pressure Test to 1.5X Rated Pressure
- Passing the test = Leak Free Seal
- Test Reports
- Production Testing

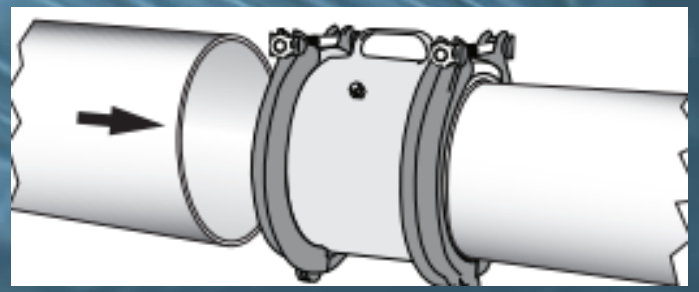


AWWA Approved Test Fixture for Test of Clamps and Couplings

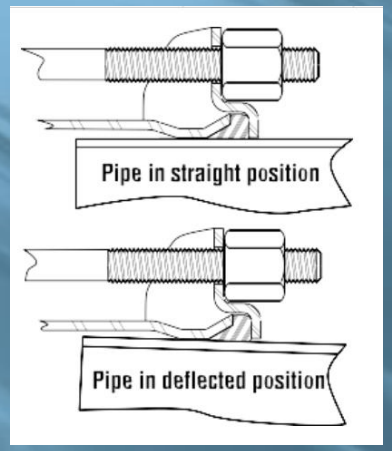
When Installing: Be Aware of “Pipe End Gap”

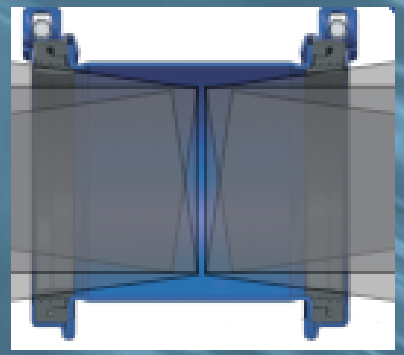
- Depends on Length of Middle Ring
- Minimum Gap ½” allows for deflection
- Maximum End Gap on 10” middle ring should not exceed 4”
- Maximum End Gap is less on short body products





Note: Allowable Movement





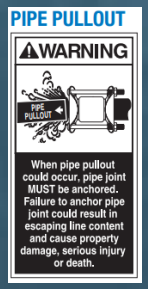
Pipe in Deflection

- Deflection: Up to 4 degrees per end
- 3/8” longitudinal movement allowed
- (equivalent to a 120 degrees temperature rise on steel pipe)

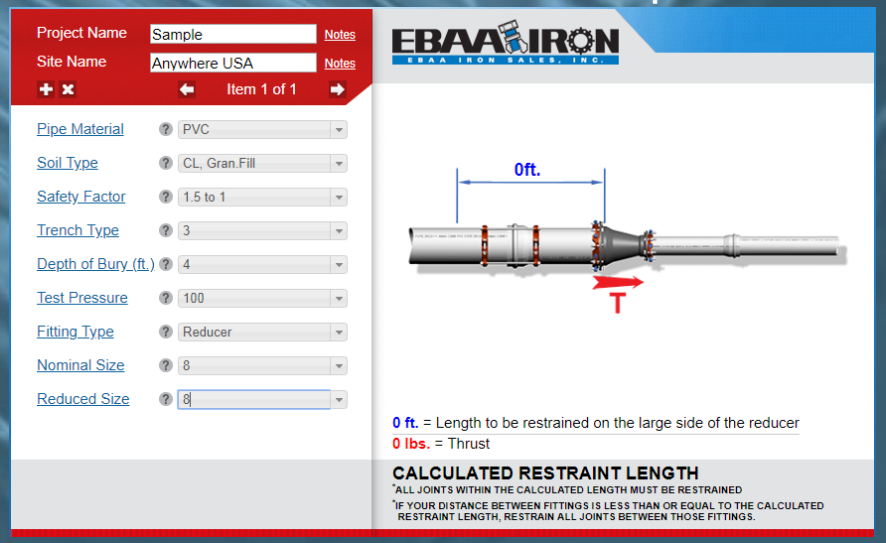
Do I Need to Restrain the Joint? Calculate the Need

- Consideration for Pipe Pull Out
- A. Above or Below Ground –
  Overburden Below Ground is a Major Factor
- B. Change of Direction
- C. Change of Diameter at Joint
  (reduction or restriction)
- Forces Vary Depending upon
  - A. Clearances
  - B. Gasket hardness
  - C. Gasket pressure (function of torque)
  - E. Condition of pipe surface
  - Bearing Resistance of the Soil (can be calculated)
  - Bearing Resistance between the fitting and the soil

- **Std. Coupling Pull Resistance is minimal**
- Always follow Manufactures Torque Recommendation
- **If Pipe is Not Buried, Anchorage should be provided**



Use any available On-Line Restraint Calculator to Determine Requirement

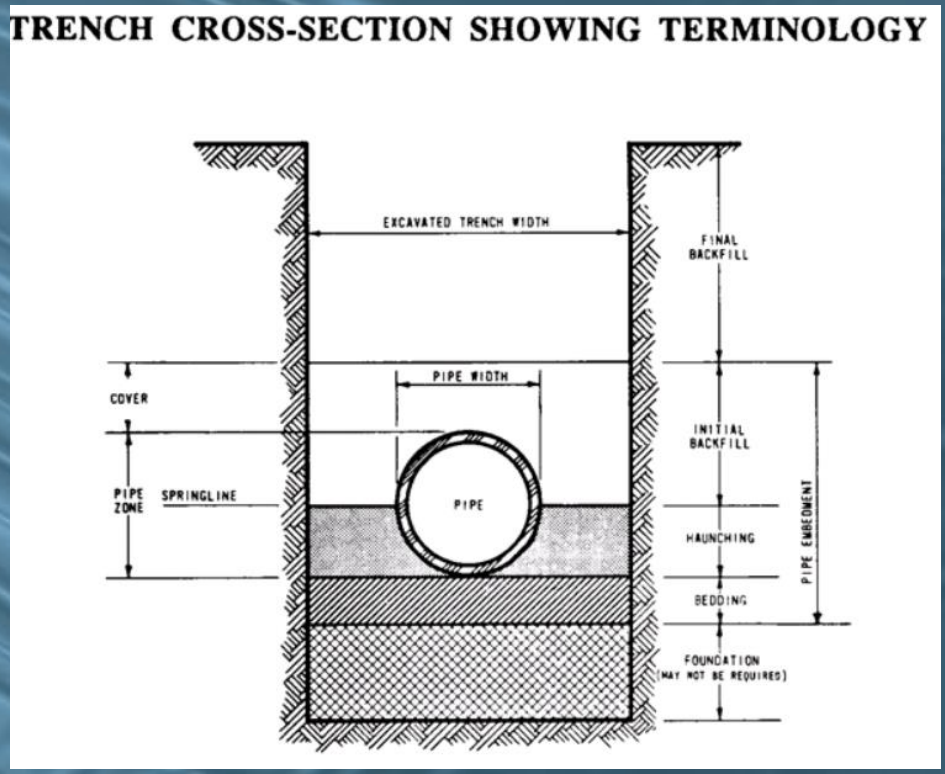


Coupling Installation Requirements

- ✓ Clean and Descale the Pipe
- ✓ Check Pipe O.D.
- ✓ Size Gasket to the O.D. on first end
- ✓ Size Gasket to Other End
- ✓ Use Soapy Water to Lubricate the Gasket and Pipe before Stabbing onto the pipe
- ✓ Tighten bolts to recommended torque
- ✓ Re-torque if Required
- ✓ Recharge the Line and Check for Leaks
- ✓ Always follow the Manufactures Directions
- ✓ Disinfect as Necessary

Backfill Considerations

- Backfill Specifications
- AWWA C900
- AWWA C600
- Specific by Municipality
- Always consider damage to any fitting with improper backfill techniques
- Typical Depth of Cover should be 3 ft or greater



Shelf Life Product

- Shelf Life
- 5-6 Years
- Protect from Ozone
- Ultra-Violet Light - Sunlight
- Heat and Humidity – Less than 75 degrees and less than 60% R.H.
- Always store products in a cool, dry environment
- Weathering factors will shorten the life of your product

Traditional: Bolted Compression Couplings

- Through/Cross Bolted Design
- Wedge Gasket
- Ductile Iron
- Carbon Steel

Modular Couplings Can Create Inventory Management Nightmares

- 2-12" Requires over 300 inventory components
- Take them apart to put them on
- Wasted Materials

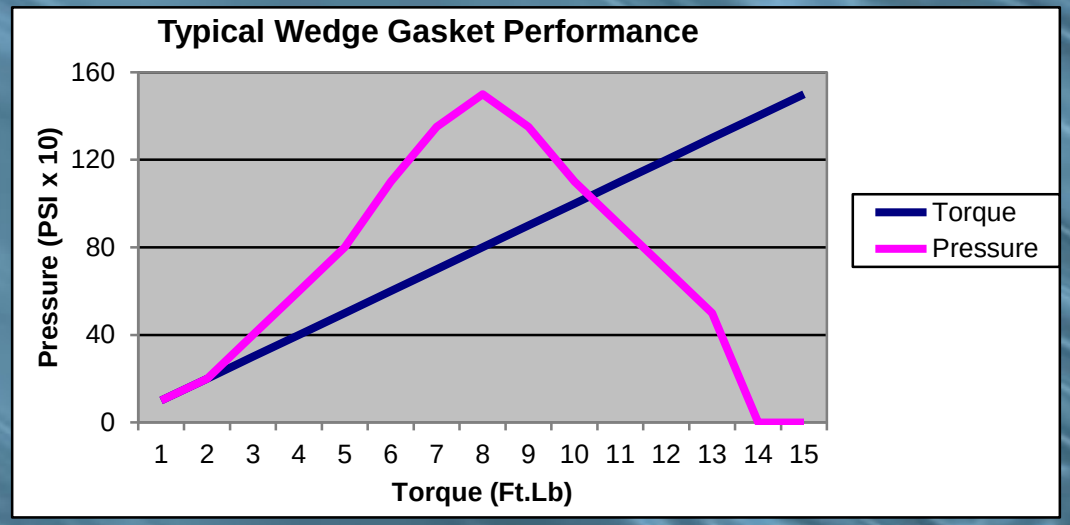
COUPLING SYSTEM O.D. CHART

Nominal Pipe Size (Inches)	Range (Inches)	Gasket & Flange Color Code	Gasket	Follower Flange	Fits Pipes of these Nominal O.D.'s (Inches): Copper Tube Size (CTS)	O.D. Steel	Schedule 40/80 Std. Steel and IPS PVC	C900 PVC	AWWA Cast Iron	Asbestos Cement Pipe: Class 100 ME	Class 100 RB	Class 150 ME	Class 150 RB	Class 200 ME	Class 200 RB
2	2.34-2.63	Blue	33827	20976			2.38	2.50							
2½	2.65-2.88	Red	33828	21366			2.88								
3	2.85-3.13	Red	34610	21368	3.13										
	3.50	Red	33829	21368			3.50								
	3.80-3.96	Blue	33830	21369				3.80	3.96		3.95	3.84		3.84	
	3.97-4.14	Blue	33831	21369									4.13		
4	4.00-4.15	Red	33809	22392	4.13	4.00									
	4.22-4.50	Red	33810	22392			4.50								
	4.46-4.88	Red	34578	22392			4.50	4.80							
	4.80-5.10	Blue	33811	21353				4.80	5.00		5.05	4.81	5.07	4.81	
	5.11-5.45	Blue	33812	21353							5.25		5.32		5.33
6	6.00-6.15	Red	33801	22393	6.13	6.00									
	6.28-6.63	Red	33802	22393			6.63								
	6.56-6.96	Red	34579	22393			6.63	6.90							
	6.90-7.22	Blue	33803	21348				6.90	7.10	6.91	7.19	6.91	7.20	6.91	
	7.25-7.65	Gray	33804	21349							7.40		7.37		7.60
8	8.00-8.16	Red	33805	22391		8.00									
	8.40-8.63	Red	33806	22394			8.63								
	8.54-9.11	Red	34580	22394			8.63	9.05							
	9.05-9.45	Blue	33846	21350				9.05		9.11	9.39	9.11	9.40	9.11	9.44
	9.05-9.30	Blue	33807	21350					9.30						
	9.46-9.85	Gray	33808	21351							9.57		9.62		9.79
10	10.00	Red	33860	21355		10.00									
	10.50-10.75	Red	33813	21355			10.75								
	11.10-11.60	Blue	33814	21356				11.10	11.40	11.24	11.47				
	11.65-11.88	Gray	33815	21357							11.77	11.66	11.88	11.66	11.88
	11.90-12.20	Gray	33816	21357									12.12		12.12
12	12.00	Red	33859	21359		12.00									
	12.50-12.75	Red	33817	21359			12.75								
	13.20-13.50	Blue	33820	21360				13.20	13.50	13.44					
	13.51-13.75	Blue	33821	21360							13.74				
	13.90-14.20	Gray	33818	21361		14.00	14.00				14.04	13.92	14.20	13.92	14.20
	14.21-14.40	Gray	33819	21361									14.38		14.3[illegible]
14	15.30-15.50	Blue	33822	21363				15.30			15.50				
	15.55-15.80	Blue	33823	21363					15.65		15.80				
	16.22	Gray	33835	21364								16.22		16.22	
	16.41-16.55	Gray	33824	21364									16.50		16.55
	16.73-16.90	Gray	33825	21364									16.73		16.8[illegible]
16	17.40-17.80	Blue	33832	21371				17.40	17.80		17.65				
	18.46-18.90	Gray	33833	21372								18.46	18.75	18.46	18.8[illegible]
	18.90-19.20	Gray	33834	21372									18.97		19.1[illegible]

Gasket Materials – Choosing A Seal That Best Suite Your Needs

- **The Original Wedge Gasket Seal or Dresser Type**
- Single Stage Static Sealing
- Buna N (NBR), SBR, EPDM
- Highly Torque Sensitive

Typical Wedge Style Gasket Showing Torque Sensitivity Why A Torque Wrench is Required



Always Use a Torque Wrench

Two Bolt Couplings

- ***Two Bolts to Tighten for Fast Installation***
- ***Wide Range for Maximum Pipe Coverage***
- **Exceeds AWWA C-219**
- **ANSI/NSF 61 Approved**
- **1.3” Overall Range**

Two Bolt Advantage
Simplifying Cut In Repairs

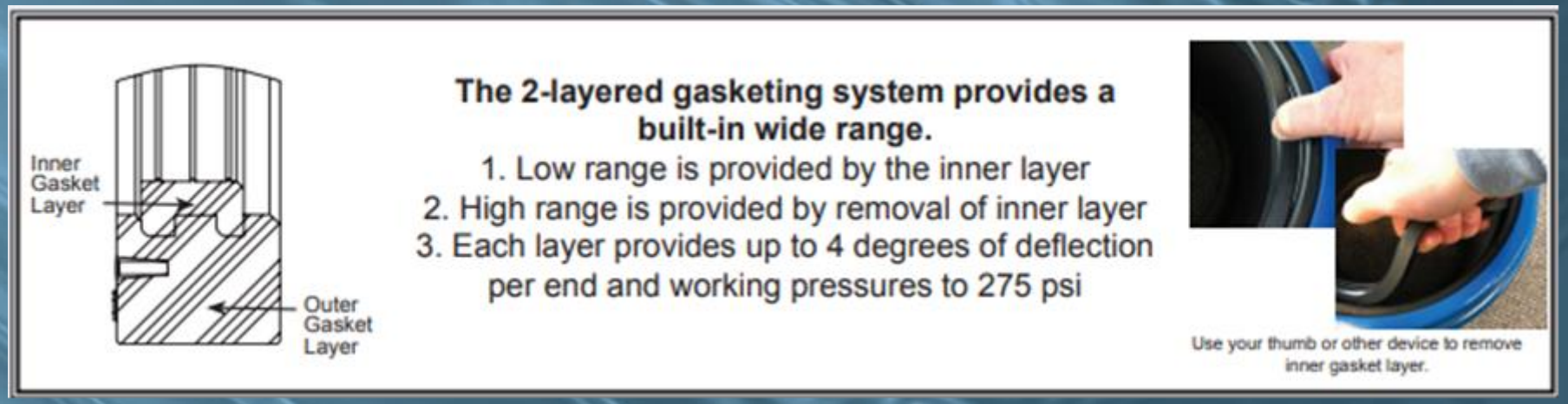
- Fewer Bolts
- Tighten From the Top
- No Extra Parts
- Premium Materials
- 304/316 Stainless Steel Hardware
- Easy to Size to the Pipe

Wide Range Replaceable Gasket

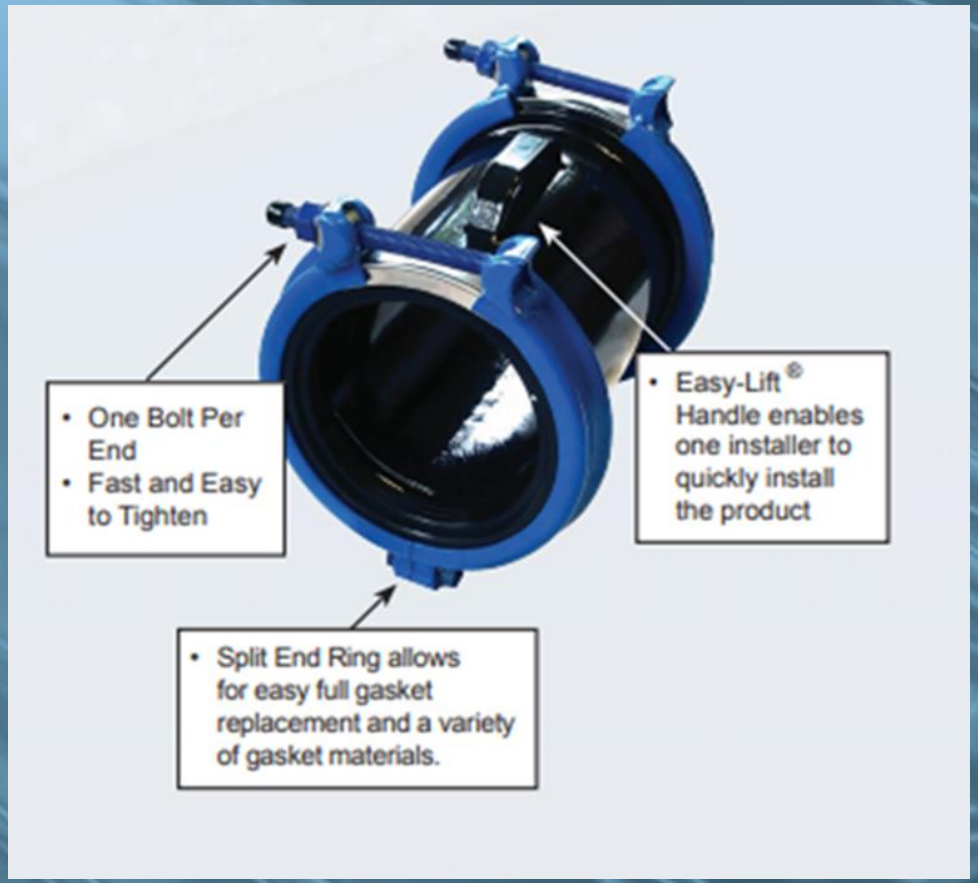
- Full 1.3” of Range
- One Gasket Does it All with built in Inner Layer
- Inner Layer may be removed and replaced
- Tested to 415 psi (275 psi continuous)
- Gasket Contained within body of coupling

For use on Ductile Iron, Cast Iron, Steel, PVC, HDPE, Asbestos Cement

Next Gen 2 Layered Gasket Provides Built in Range Hydraulic Pressure Assisted May be Used on HDPE



Heavy Duty TX3® – Made in the USA



NBR - Broad Spectrum Chemical Resistance for water, Sewer, oil, hydrocarbon contact

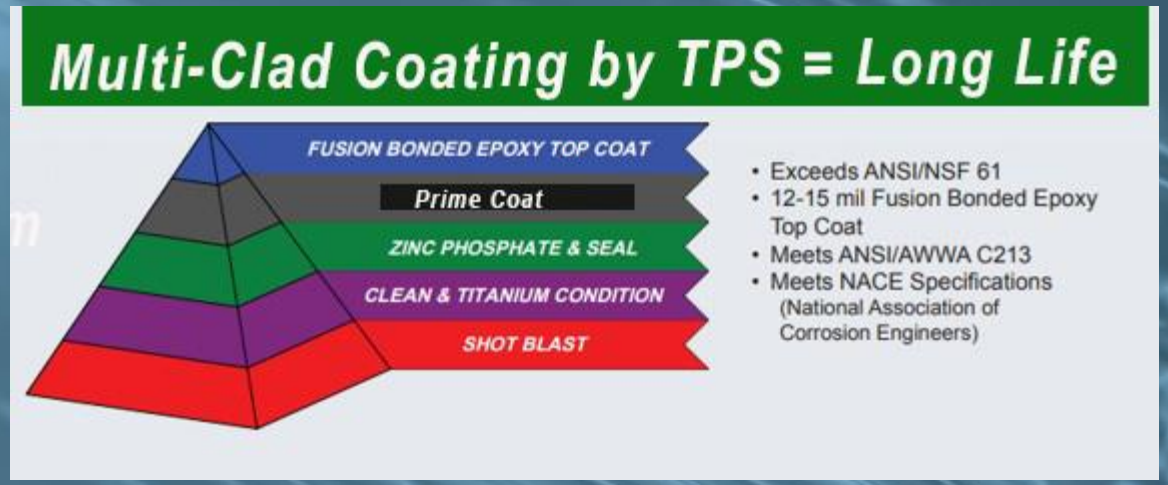
Meets NSF-372 **and NSF 61**

1” of end Movement and 4 Degrees Deflection

Dynamic Sealing Under all Conditions

Responds to torque and water pressure

Longer Life Coating



- Multi-Clad Layered Coating System 12-15 mils FBE Top Coat
- 13 Step Process
- Meets NACE Specs
- Exceeds ANSI/AWWA 213

Non-Galling 304 s.s. Nuts, Bolts and Washers

- Standard Water Works Threads
- 1-1/16” nut size
- Fluorocarbon Coating Provides Gall Resistance
- Low torque due to non-galling surfaces
- All other hardware 304 s.s. for long life
- Bolts Meets ASTM A193 Grade B

304 Stainless with Fluoroelastomer Coated

Joint and Fitting Leakage

Approximately 85% of the pipe leakage occurs in the 4, 6, 8, 10 and 12 inch diameter ranges.

Between 20 and 25% of leaks occur at the pipe joint (Up to 75,000 Bell Joint Leaks a Year)

What Leaks?

- Leaking collars on asbestos cement pipe

- Lead-Calk and Leadite

- Old Couplings and Old Repair Clamps
- MJ Fittings

Typical Joints that Leak

Universal Cast

Leadite Joint

Ductile Iron Push-On Joint

PVC Push On Joint

JOINT REPAIR METHODS

Bell Joint Encapsulation

The Repair of Split, Cracked and Leaking Bell Joints on Ductile, Cast Iron (Lead Calk Joints) and PVC

April 2019

AWWA C110, C111, C227

- Mechanical Joint Sleeves must meet dimensional requirements of C110/111
- C227 Split Joint Mechanical Coupling
- Coatings and Gasketing to be Compliant with NSF 61
- Coatings Must Meet ANSI/AWWA C-213

Joint Repair Methods

- Coupling and a repair pipe section
- Bell joint harness repair, exterior gasket replacement
- Complete encapsulation of the joint.
- Make the Repair Fast, and do not interrupt service

Cut In Repair (Removing the Joint)

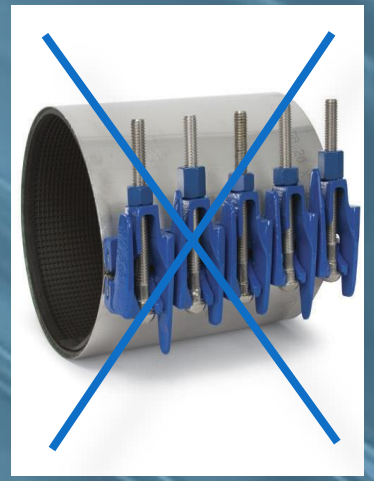
- Requires (2) AWWA C-219 style couplings, plus a new section of repair piping
- Shut down, large excavation, 2 to3 hours of time and labor on a 6” main
- Requires boil notice and disinfection of the line and components, and Sampling after the repair



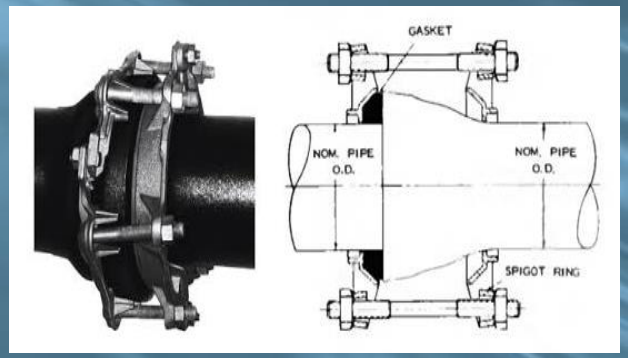


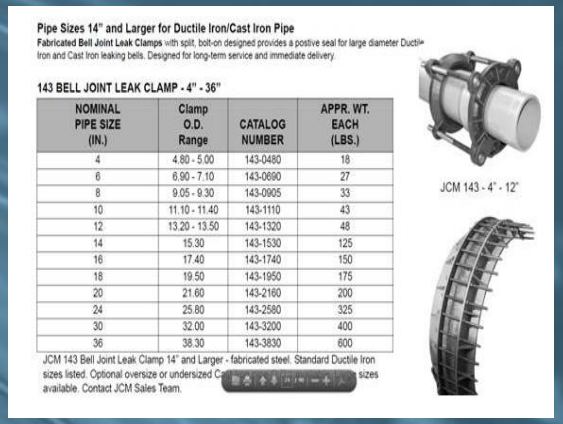
Joint Repair- Use of a repair clamp???

- Repair Clamps per AWWA C-230
- Would a device like this ever be used to repair a leaking bell.
- Not likely….they are not stepped to go over or around the bell, they do not couple and they are temporary



Bell Joint Harness = Temporary at Best





Pipe Sizes 14" and Larger for Ductile Iron/Cast Iron Pipe

Fabricated Bell Joint Leak Clamps with split, bolt-on designed provides a postive seal for large diameter Ductile Iron and Cast Iron leaking bells. Designed for long-term service and immediate delivery.

143 BELL JOINT LEAK CLAMP - 4" - 36"

NOMINAL PIPE SIZE (IN.)	Clamp O.D. Range	CATALOG NUMBER	APPR. WT. EACH (LBS.)
4	4.80 - 5.00	143-0480	18
6	6.90 - 7.10	143-0690	27
8	9.05 - 9.30	143-0905	33
10	11.10 - 11.40	143-1110	43
12	13.20 - 13.50	143-1320	48
14	15.30	143-1530	125
16	17.40	143-1740	150
18	19.50	143-1950	175
20	21.60	143-2160	200
24	25.80	143-2580	325
30	32.00	143-3200	400
36	38.30	143-3830	600

JCM 143 Bell Joint Leak Clamp 14" and Larger - fabricated steel. Standard Ductile Iron sizes listed. Optional oversize or undersized C sizes available. Contact JCM Sales Team.

JCM 143 - 4" - 12"

- Bell Joint Leak/Harness Assemblies
- Lots of components to assemble
- Inexpensive and Labor Intensive
- Not Permanent: Short term repair
- Requires Calk, Grout, Packing to be removed or repaired before installation of the bell harness
- Dresser, Ford Meter, Romac, Smith Blair, JCM

Why Consider Encapsulation of the Joint or Bell?

- **Eliminate potential Contamination from Open Cut Repair**

- **Latest AWWA Standard on Disinfection (AWWA C-651-14)**

- ***"When cutting into a pipe4.11.3 Selection of Disinfection Procedure. The disinfection procedure selected should be determined by the conditions and severity of the main break. Many leaks or breaks can be repaired under controlled conditions without depressurizing the water main, such as when applying a clamp to a small crack or hole, thus preventing contaminants from entering the water system. In most other situations, the water main can be maintained pressurized until the break site is secured and the pipe is fully exposed. Some circumstances (e.g., severe erosion of the local environment, icing of the roadway) that impact public safety may require that water pressure be substantially reduced prior to exposing the pipe in the area of the leak. In some cases, situations become catastrophic where there is a pipe blowout and a loss of water pressure prior to shutdown, requiring disinfection procedures equivalent to those of a new main installation."***

Disinfection Of Repaired Line to 12” Diameter AWWA C-651-14

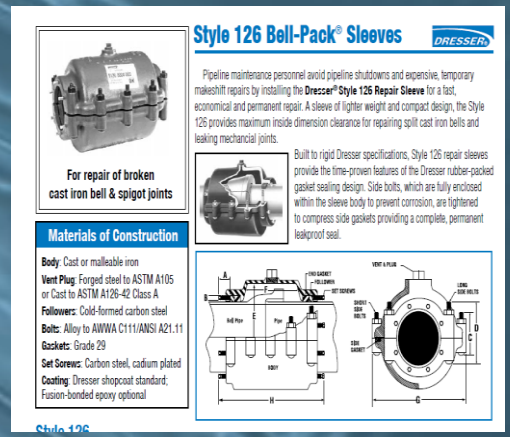
- **Controlled Repair without Depressurization (Clamp)**
- A. Flush Until Clear and Normal Residual (3 turn overs)
- B. No Testing Required

- **Controlled Open Cut Repair with Depressurization (Coupling)**
- A. Use at least a 1% Chlorine Solution (swab the pipe)
- B. Flushing Until Clear
- C. Bacteriological Sample through corporation cock

- **Uncontrolled Open Cut Repair (Coupling or Other Method)**
- A. 4 mg/L Chlorine for 16 hours (remove debris and swab)
- B. Alternate: 300 mg/L for 15 minutes
- C. Scour Flush until clear and residuals are normal
- D. Boil Notice to Public
- E. Biological Sampling through corporation cock
- F. Lab Results (48 hours)

Bell Repair sleeve® product History

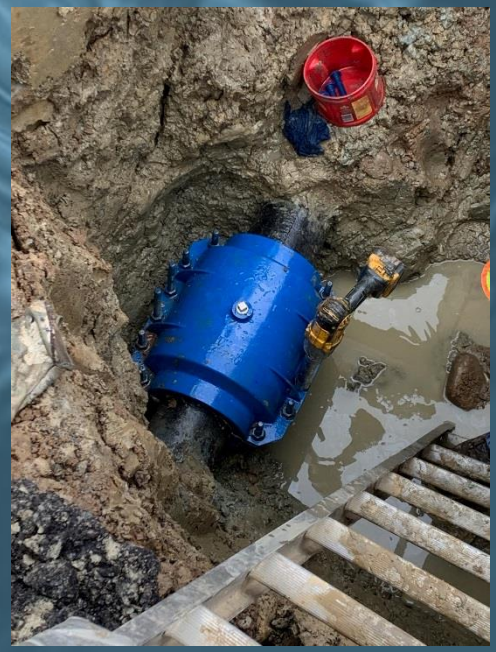
- Cast Split Sleeve Repair Invented in the early 1920's
- Fabricated Sleeves in the 1980's
- Heavy Iron Castings or Steel Fabrications
- Long Lead Time
- Expensive
- Many Bolts on End Seal
- Size Specific
- No Range to Product
- Fell out of favor due to cost and availability



Imagine Repairing A Leaking Joint in 30 Minutes or Less! Encapsulate the Leak and Go

Why Shut it Down?
Why Use 2 Couplings and Repair Pipe Segment?
The Need to Disinfect
2 Hour Minimum

No Shut Down
One Product
Smaller Excavation
Save Labor
Save Time

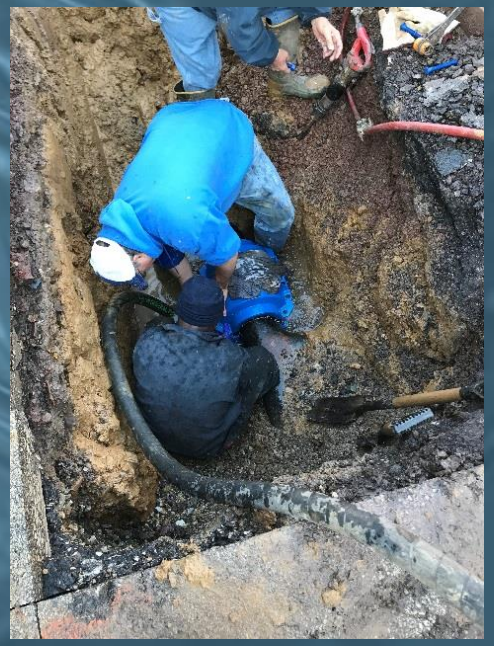


A 30 Minute Repair that is:

- **Competitive** – Slightly more than the cost of two couplings and repair pipe section or less than other sleeves
- **Easy to install** and minimize labor and excavation
- **Wide Range** to allow for one product to cover multiple repairs

Where to Use It

- **Joint Leaks** on CIP, DIP, PVC, AC, HDPE
- **Large hole** like a repair clamp
- **Leaking repair fitting** (old clamp or coupling)
- Use on round, out of round or flat pipe sections
- Asbestos Cement Collars if it fits the range
- Is more than cost effective

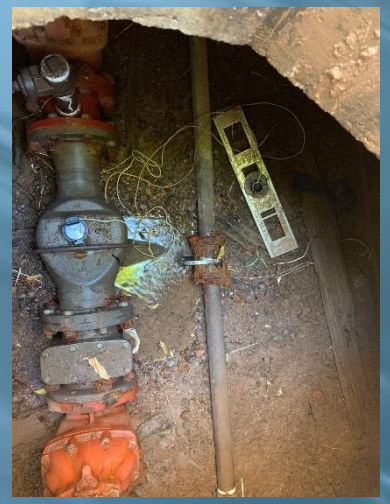


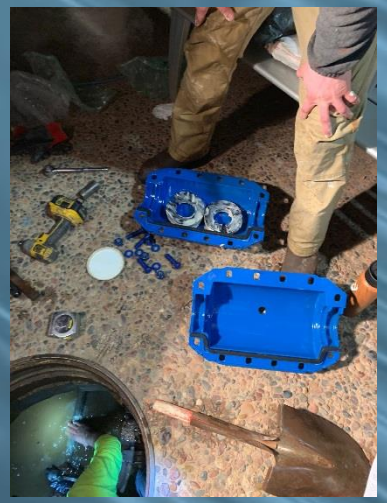
Product Specifications for a 30 Minute Bell Joint Repair

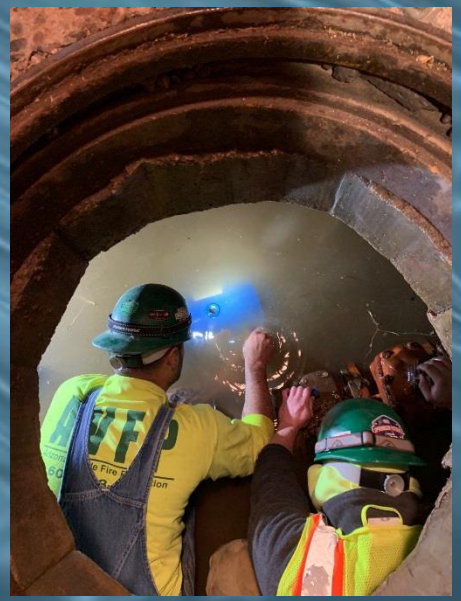
- **Working Pressure Rating – 200-250 psi**
- Test Pressure Rating – 325-375 psi
- 2-12” Wide Range – one size will
- NBR Gaskets
- Bolting: 304 Stainless Steel coated with anti-seize)
- Fusion Bonded Epoxy – 10-12 mil min.
- 3-4 degrees of Pipe Deflection per end
- Shell Halves – vented with ¾” IP Thread Port to allow for pressure reduction during installation
- Bolts – 5/8” Nuts – 1-1/16th” (or M16)
- NSF Certification

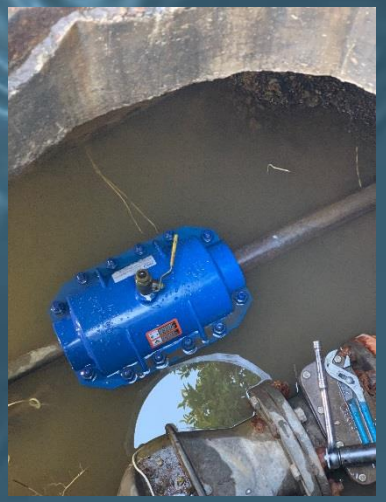
Maintaining Flow At All Times

Scottsdale, Arizona - Leak in a Vault









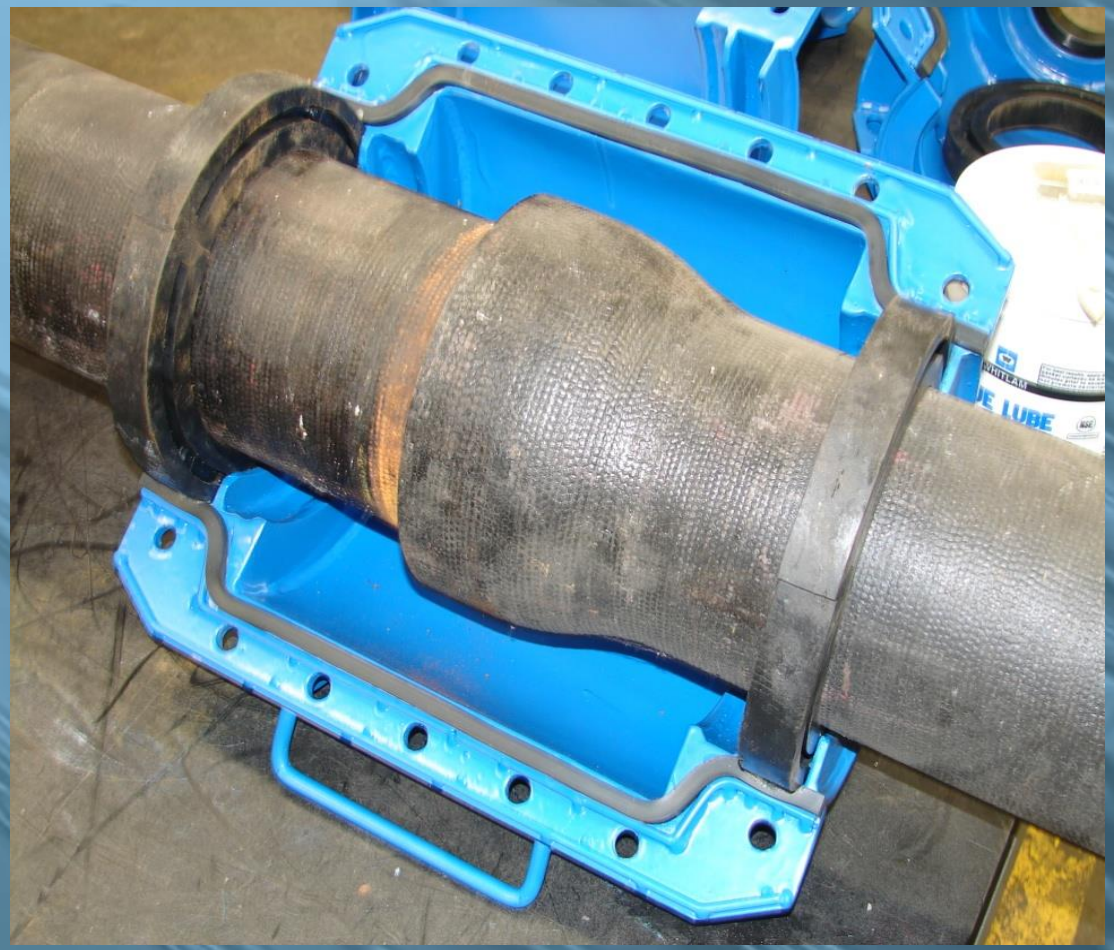
KCWA, Warwick, RI – Leak Under Bridge

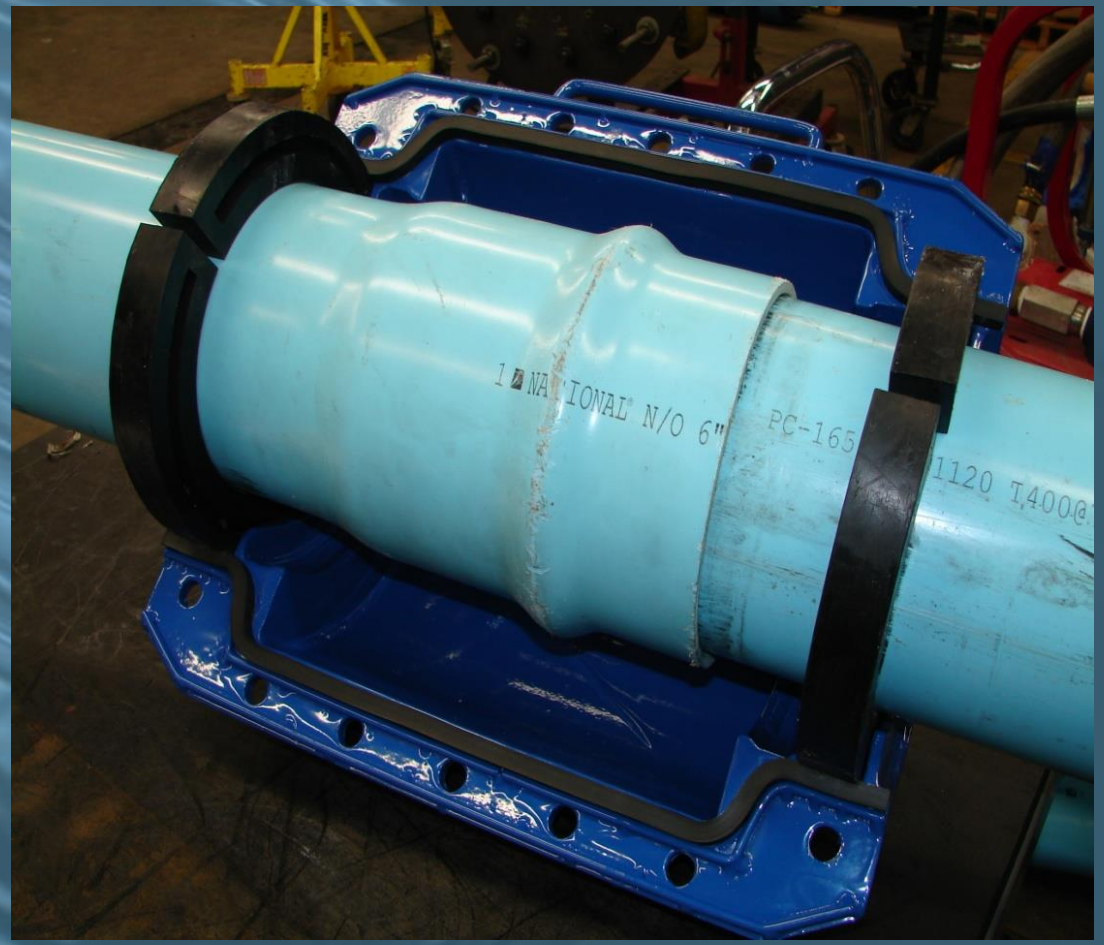
Lead Calk Bell on Old Cast Iron Pipe

Encapsulation of Flange

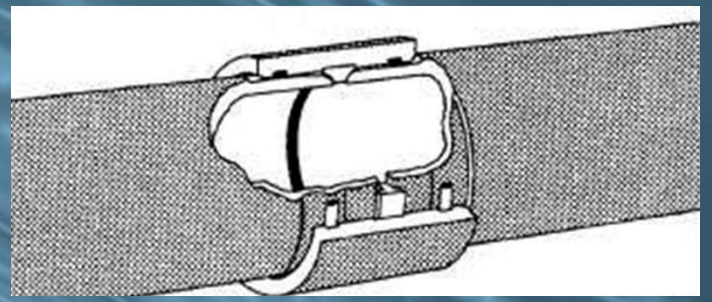
Completed Encapsulation and Insulation of Flange to Prevent Freezing

Bell Encapsulation for DIP,CIP, PVC





Asbestos Cement – Common Leak on the Collar



Ultra-Sleeve Max for AC Collars and All other Joints

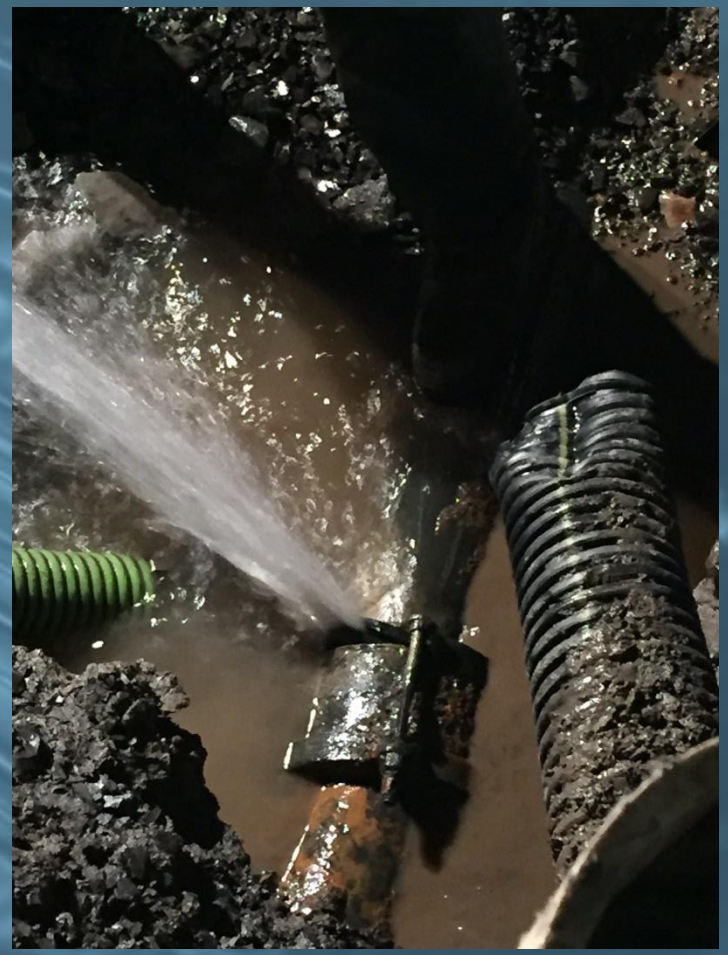
- Covers Asbestos Cement Pipe Collars
  All Bells
  Couplings
- Clamps
- Flanges
- Universal Cast
- Many MJ Fittings
- Currently Available in 6 and 8” Sizes

Leak on an Old Coupling?

No Problem

Encapsulate it With

Ultra-Sleeve® Max



Can’t Stop the Leak on an old repair clamp? Ultra-Sleeve it!

Spraying Leak on Clamp
Can’t always be Stopped

Installing an Encapsulation Sleeve

- Simplifies the repair method
- Cost Effective
- Provides Labor savings
- Takes Less time
- More Performance
- High Quality

Key Installation Points for Bell Encapsulation Sleeve

- Clean and Prep the Pipe

- Lubricate all gasketed surfaces

- Fully lubricate the rubber rings inside and outside

- Fully lubricate all around the pipe surface where the gaskets are going to be placed

Key Installation Tips

- Insert the rubbers on the pipe making sure the split is opposite the case split
- The gasket gap must be placed opposite where the two halves meet (at 90° from the case split) with colored dots to the outside
- Align Gasket Rings to Slots in Upper Half of case and place case on pipe by pushing it down into place.
- Slide lower half of the fitting under the pipe and push it upward, attach and tighten long starter bolts, finish with balance of bolts by torquing to 80 ft lbs.

Repair Clamps
AWWA C 230-16

UNDERSTANDING THE ROLE OF AWWA AND IMPORTANCE OF STANDARDS

April 2019

Why the Need for a Repair Clamp Standard

- 2%-3% of all clamps leak with-in 48 hours of installation
- There is a cost Associated with These Failures
- AWWA C230

AWWA Stainless Steel Repair Clamp Standard – C230-16

- Why a Standard?
- Many users of full encirclement stainless steel repair clamps requested a standard.
- AWWA C230 (Chair Person and First Draft by D.M. Piontek of Total Piping Solutions, Inc.(supported by Romac, Smith Blair, JCM, Ford Meter Box)

Full Encirclement Stainless Steel Repair Clamps AWWA C-230-16

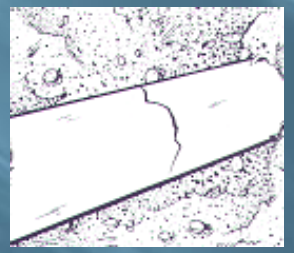
- Covers Various Types of Clamps from 3-12” Diameters
- Dedicated Range
- Limited Range
- Wide Range

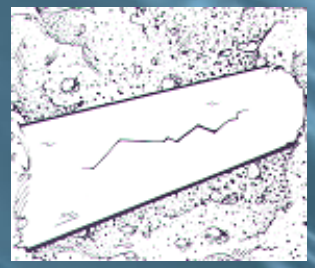
Design Criteria

- **Must Provide Full 360° Sealing**
  - **No allowable contact between the band and any ferrous pipe materials**
  - **Tapping Outlets may be offered**
  - **Outlets shall be internally threaded with NPT or CC (AWWA) threads. External threading or flanging shall be specified by the end user.**

AWWA Standards Define Minimum Criteria for Performance, Material, Fabrication and Design

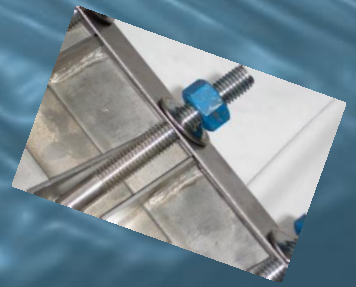
- Simple and economical means of repairing holes, cracks or breaks
- Allow for Service Renewals from ½ inch to 3 inches in diameter





AWWA C 230-16 Allows for Various Materials and Designs

- Stainless Steel Band
- Fabricated Finger Lug
- Cast Ductile Iron Lugs - ASTM A536
- Stainless Steel Cast Lugs ASTM A351
- NSF 61 compliance



Fasteners, Lugs, Gaskets

- Selected to minimize galvanic corrosion
- Stainless bolts should have an anti-seize coating
- Where coatings are utilized, they must conform to AWWA C-213 for fusion bonded epoxy
- Gaskets Material shall be of new, virgin natural or synthetic rubber compound. Reclaimed rubber material may not be used.

Applicable AWWA Clamp Standards

Applicable Standards:

ASTM A380-06 Standard Practice for Cleaning, Descaling and Passivation of Stainless Steel parts, Equipment and Systems

ASTM A967-05 Standard Specification for Chemical Passivation Treatments for Stainless Steel Parts

ANSI/AWWA C230-11 Standard for Full Encirclement Repair Clamps

NSF/ANSI Standard 61 Drinking Water System Components

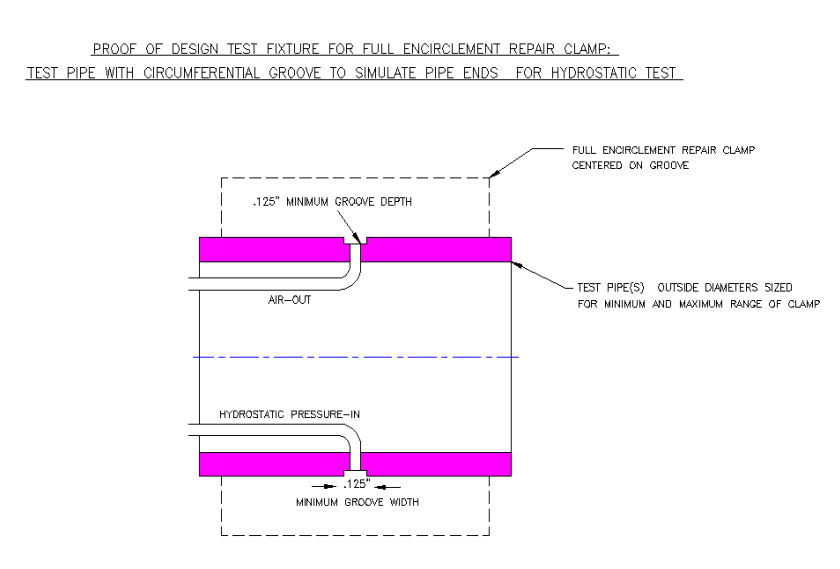
ASTM D2000-12 Standard Classification Systems for Rubber Products

ASTM A351 Standard Specification for Grade 304 Stainless Steel

ASTM A536 Standard Specification for Ductile Iron

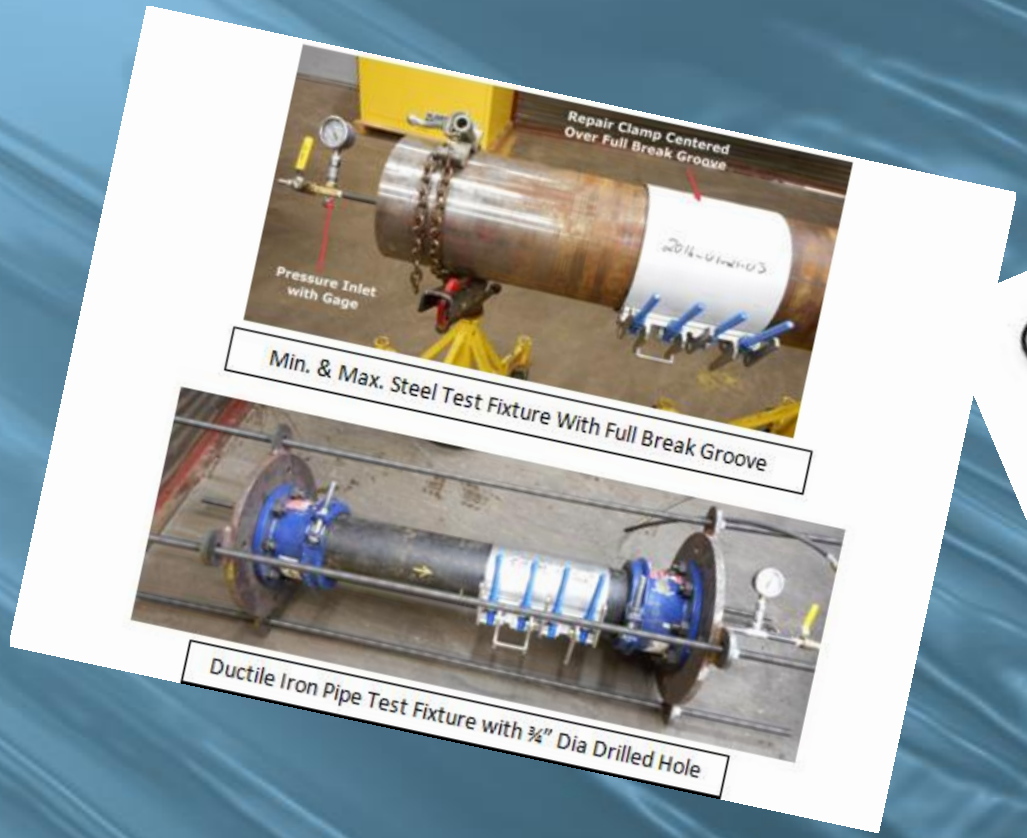
AWWA C230-16 Pressure Testing Requirement

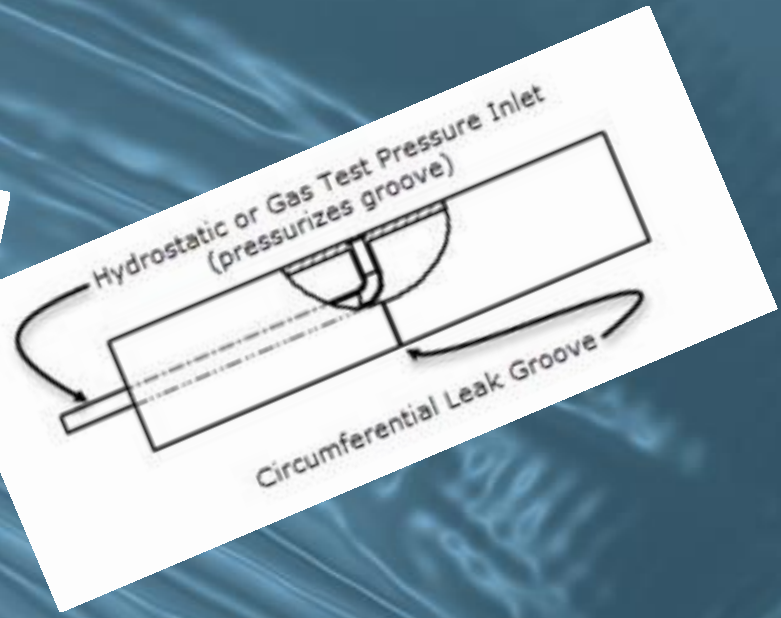
- **AWWA Proof of Design is 50 PSI**
  - **Test: 1.5X Working Pressure Rating of System**
  - **Utility Must Specify the Working Pressure Required**



5.3.1.1 Test pressures. The minimum hydrostatic proof of design test pressure shall be 50 psi (345 kPa). For full-encirclement repair clamps where the purchaser has designated a rated pressure, the hydrostatic proof of design test pressure shall be 150 percent of the maximum rated pressure.

Testing per AWWA C-230-16





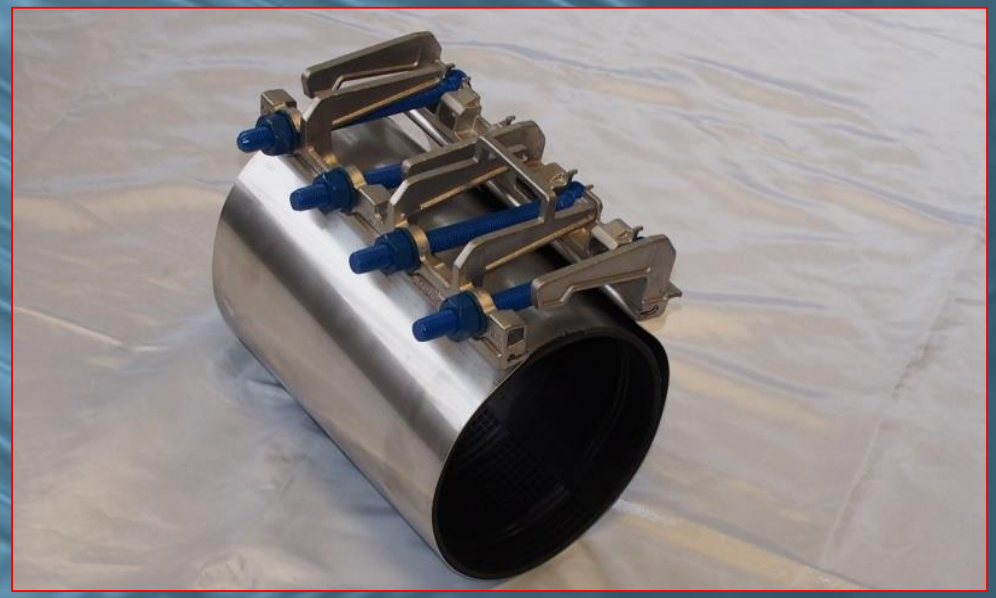
8 Inch Nominal Size Repair Clamp Range - 8.54 to 9.44 In. Pipe Diameter					
8 Inch Nominal	Steel	8.54 In. Min Dia.	Water	300	Pass
8 Inch Nominal	Steel	9.44 In. Max Dia.	Water	300	Pass
8 Inch Nominal	Steel	8.54 In. Min Dia.	Gas	190	Pass
8 Inch Nominal	Steel	9.44 In. Max Dia.	Gas	190	Pass

Three Levels of Performance

- Good

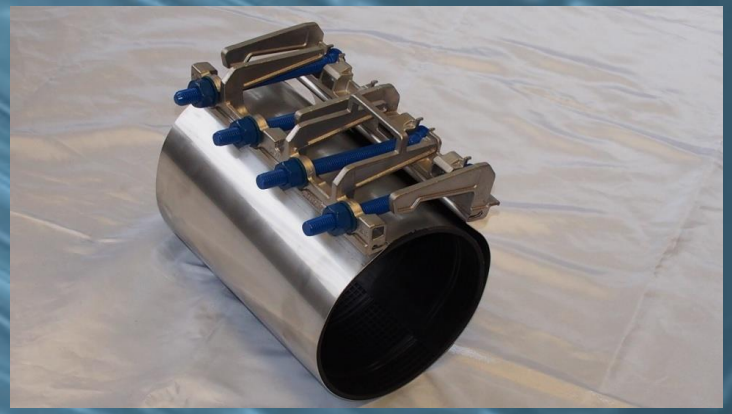
- Better

- Best



Permanent Repair Solution
100% Stainless Steel
Non-Welded

- Corrosion Resistant 304 Stainless Steel
- Pressure Rated Design
- Chloramine Resistant Long Life NBR Gasket with multi-stage sealing
- Non-welded for Maximum Band Strength and minimum corrosion
- Stainless Steel Lug System
- No-gall -Nuts and Bolts



Traditional Repair Clamps

- 2 –12 inches diameter (28 to 32 sizes to stock per width)
- .4” Range Means Many Sizes
- Mat gasket design
- Lifter bar
- Loose nuts/bolts or Stud Welded bolts
- All weld stainless or ductile lug design
- Limited Range
- Must conform to AWWA C 230-11

Desirable Clamp Features

- Pressure Rating
- ANSI/NSF- 61 Approved NBR Rubber
- Handle for ease of installation
- Non-Welded Design Eliminate Corrosion Issues
- Works on All Pipe Material Including HDPE

Cut Inventory
Reduce Installation Time

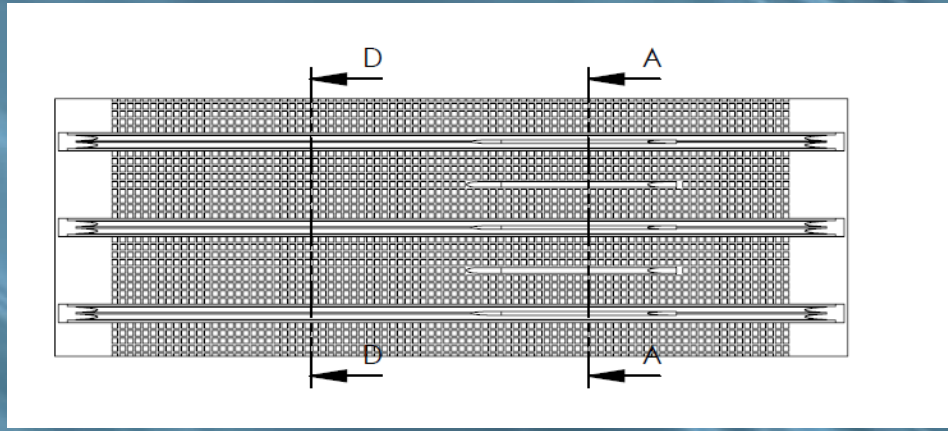
- **Wide Range: Nine Tenths (.9”)**
- **Eliminates double panel clamp designs**
- **Decrease Inventory**

The Old Way
Limited Range Double Panel
Twice the Bolts

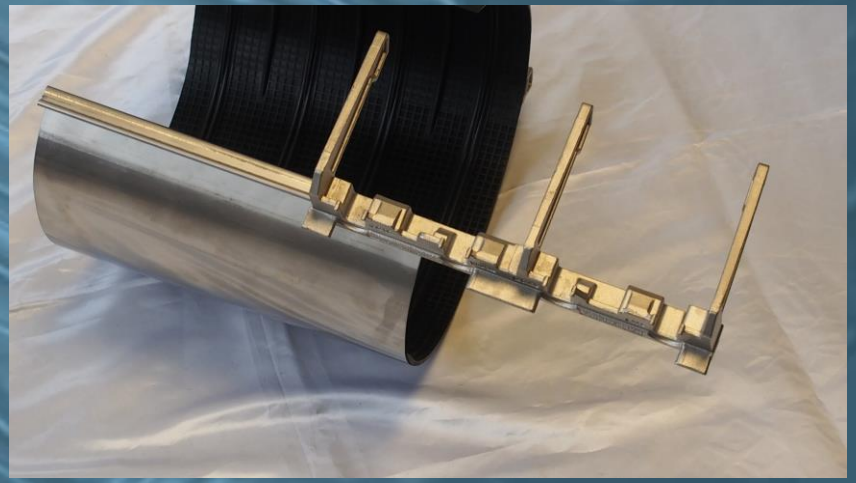
Wide Range
½ the Bolts
1 Panel
½ the Time

Removeable Lug System
High Pressure Gasket

200 psi Rated Gasket



Allows For Installation in Tight Spaces



- **NBR For water, sewer, natural gas and other petroleum based line content**

When Selecting a Clamp: Nominal Band Lay Lengths

- **Minimum Band Length for 1/4 inch wide beam break gap**

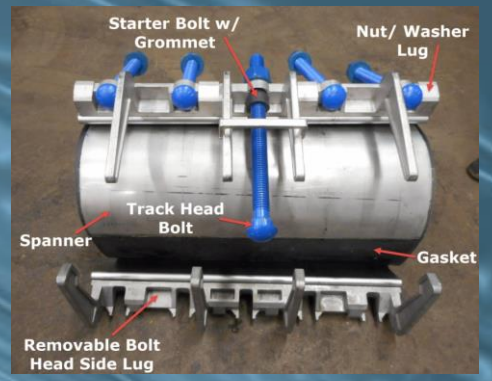
Pipe Size Range	Band Length
2 inch thru 3 inch diameter	9 inch
4 inch thru 6 inch diameter	9 inch
8 inch diameter	12 inch
10 inch thru 12 inch diameter	15 inch
14 inch thru 18 inch diameter (Multi-panel)	24 inch
20 inch thru 24 inch diameter (Multi-panel)	24 Inch
30 thru inch diameter (Multi-panel)	24 inch
Greater than 36 inch diameter	24 inch or longer

General Clamp Installation

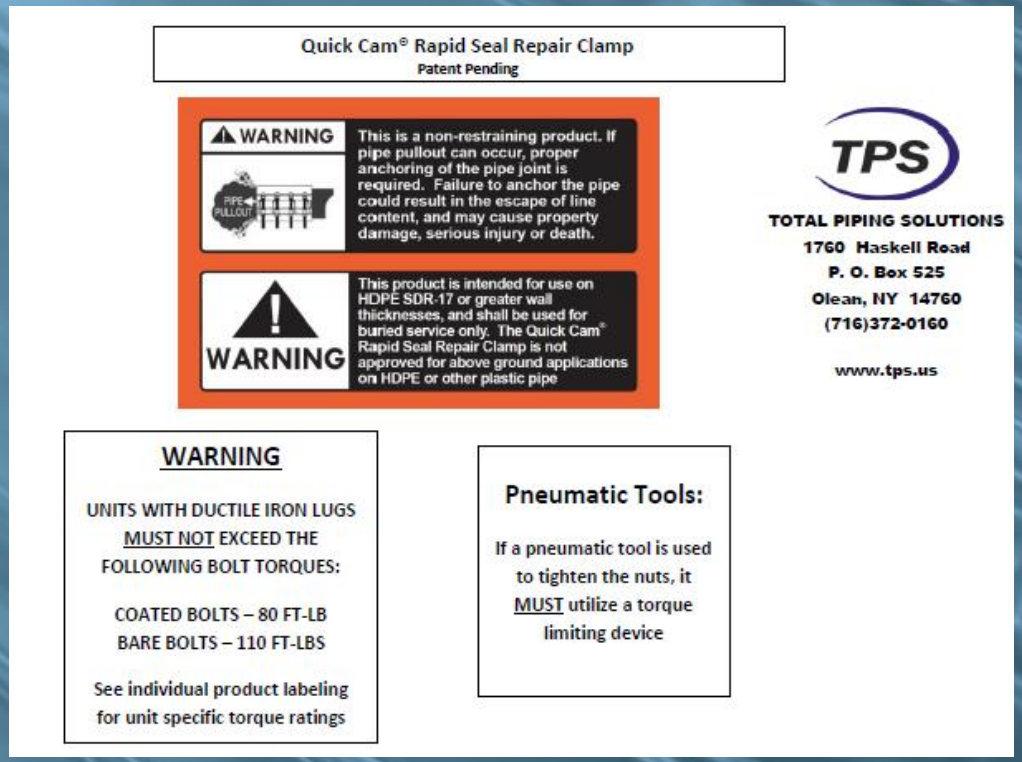
- Pressure Reduce
- Measure Pipe
- Select Product
- Lubricate Gasket
- Wrap Around Pipe

General Clamp Installation

- Use Starter Bolt
- Tighten Nuts and Bolts to Required Torque
- Use a Torque Wrench
- Always follow the Manufactures Directions



Follow Directions On Product Labeling



DUCTILE IRON LUG MAXIMUM TORQUE

COATED BOLTS—80 FT LBS

BARE BOLTS—110 FT LBS

Larger Diameter Options

Graphic Material Property of Total Piping Solutions, Inc.

Large Diameter Repair Clamp Options (above 12”o.d.)

- Made to Order Sizes to 36”
- Emergency Repair Box
- Easy to Assemble Large Diameter Multi-Panel
- Quick-Cam Repair Clamp

EMERGENCY KIT
PANEL COMBINATION CHART

		LOWER RANGE	UPPER RANGE	PANELS REQUIRED					AWWA 3230 BEAM BREAK WORKING PRESSURE**	AWWA 3230 BEAM BREAK TEST PRESSURE
14	DOUBLE PANEL	14.75	16.24	# 1	# 4	--	--	--	150	225
14 OS		15.87	17.37	# 2	# 4	--	--	--	150	225
16		16.80	18.30	# 1	# 6	--	--	--	150	225
16 OS		17.92	19.42	# 2	# 6	--	--	--	150	225
18 US		18.86	20.35	#3	# 7	--	--	--	125	190
18		19.89	21.38	# 2	# 8	--	--	--	125	190
18 OS		20.99	22.49	# 5	# 7	--	--	--	125	190
20		21.87	23.36	# 4	# 8	--	--	--	90	135
20 OS		22.65	24.15	# 6	# 7	--	--	--	90	135
24 US		23.27	24.77	# 5	# 9	--	--	--	90	135
24		24.94	26.43	# 6	# 9	--	--	--	90	135
24 OS		25.88	27.38	# 8	# 8	--	--	--	90	135
30 US	TRIPLE PANEL	27.45	29.70	# 2	# 5	# 6	--	--	60	75
30		29.03	31.28	# 2	# 4	# 8	--	--	60	75
30 OS		31.79	34.03	# 5	# 5	# 8	--	--	60	75
36		35.42	37.66	# 5	# 8	# 8	--	--	60	75
36 OS		36.84	39.08	# 6	# 7	# 9	--	--	60	75
42	4-PANEL	43.68	46.67	# 5	# 5	# 7	# 8	--	N/A	N/A
48		48.98	51.97	# 6	# 7	# 8	# 8	--	N/A	N/A
54	5 PANEL	56.99	60.73	#3	#5	#8	#8	#9	N/A	N/A

3/28/2019

PANEL RE-ORDER PART NUMBERS

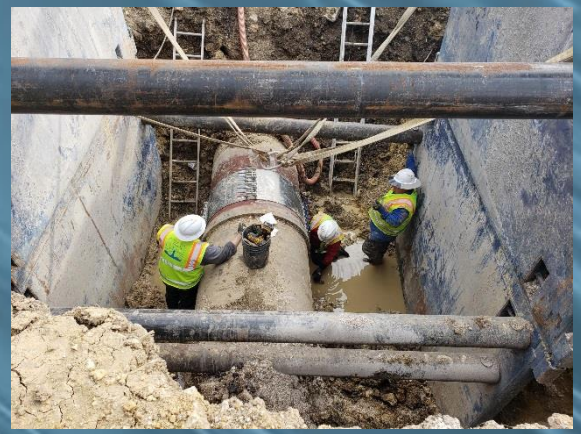
PANEL #	PART #
#1	QCRS2 40620 10000 KIT
#2	QCRS2 40742 10000 KIT
#3	QCRS2 40765 10000 KIT
#4	QCRS2 40944 10000 KIT
#5	QCRS2 40984 10000 KIT
#6	QCRS2 41146 10000 KIT
#7	QCRS2 41216 10000 KIT
#8	QCRS2 41356 10000 KIT
#9	QCRS2 41442 10000 KIT

NOTES:

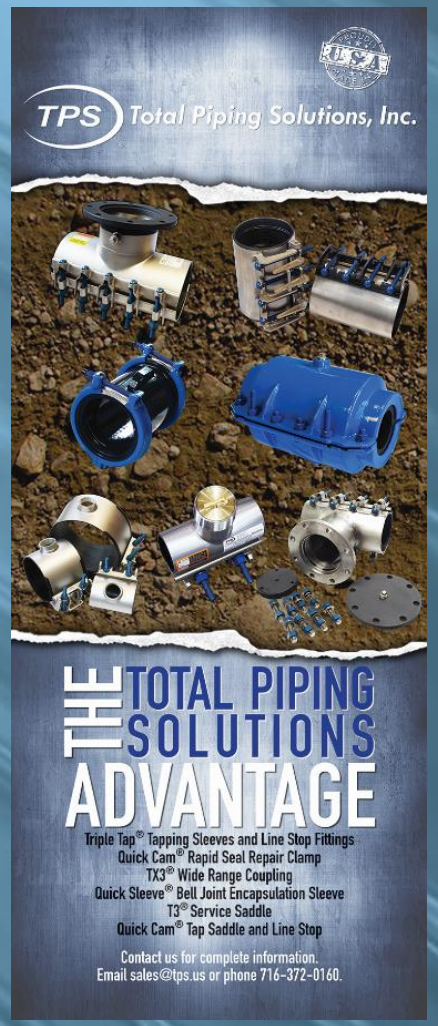
PANELS ARE MADE FROM HEAVY 14 GAGE MATERIAL FOR PREMIUM PERFORMANCE

THIS KIT INCLUDES ENOUGH PANELS TO CREATE ANY OF THE LISTED CLAMPS TO THE LEFT AT ANY GIVEN TIME. IF A PANEL IS USED, VERIFY THAT YOU WILL HAVE THE REQUIRED PANELS FOR ANY FURURE CLAMPS NEEDS.

IF A REPLACEMENT PANEL IS NEEDED, CONTACT TPS.



Call Total Piping Solutions, Inc. for you Piping Repair Requirements



Couplings 2-12”
Clamps 1/2–54”
Bell Encapsulation 2–12”
Tapping Sleeves 2 – 30”
Service Connections ¾ to 36”
Line Stopping Products to 30”
Specialty Fabrications

- When in Doubt Call:
- For use on thin wall pipe
- For Use on HDPE – DR17 or thicker, and for buried service only
- Do not Use Water Couplings on Natural Gas Service
- Most Couplings are Non-restraining products, anchoring of the pipe is required if danger from pipe pullout can occur
- In certain Corrosive Environments poly-wrap or cathodic protection may be recommended