

# National Water & Wastewater Conference

November 2 – 5, 2025  
Victoria Conference Centre, Victoria, BC

# Looking back at Calgary's 1950mm (78") PCCP Feeder Main Failure

November 3, 2025

Presented by:

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**Pure Technologies Ltd., a Xylem brand**



# Recent PCCP Failures in Canada



# AWWA C301 PCCP

- A prestressed wire is wrapped helically around the pipe and gives it the strength to withstand the pressure of the fluid inside.
- PCCP can range in size from 400mm (16") to 6m (20') diameter

Overall Performance of PCCP is Excellent

Large Diameter = High Risk

Technologies Available for Assessment



# Notable Evolutions to PCCP over the Years

**1952**  
AWWA C301-52 permanent standard introduced  
Initial conservatism from 1949 standard was increased. This more stringent standard led to the manufacturing of stronger pipe.

**1960s**  
Competition in PCCP manufacturing increases

**1970s**  
Competition results in shortcuts and exploitation of the manufacturing standard

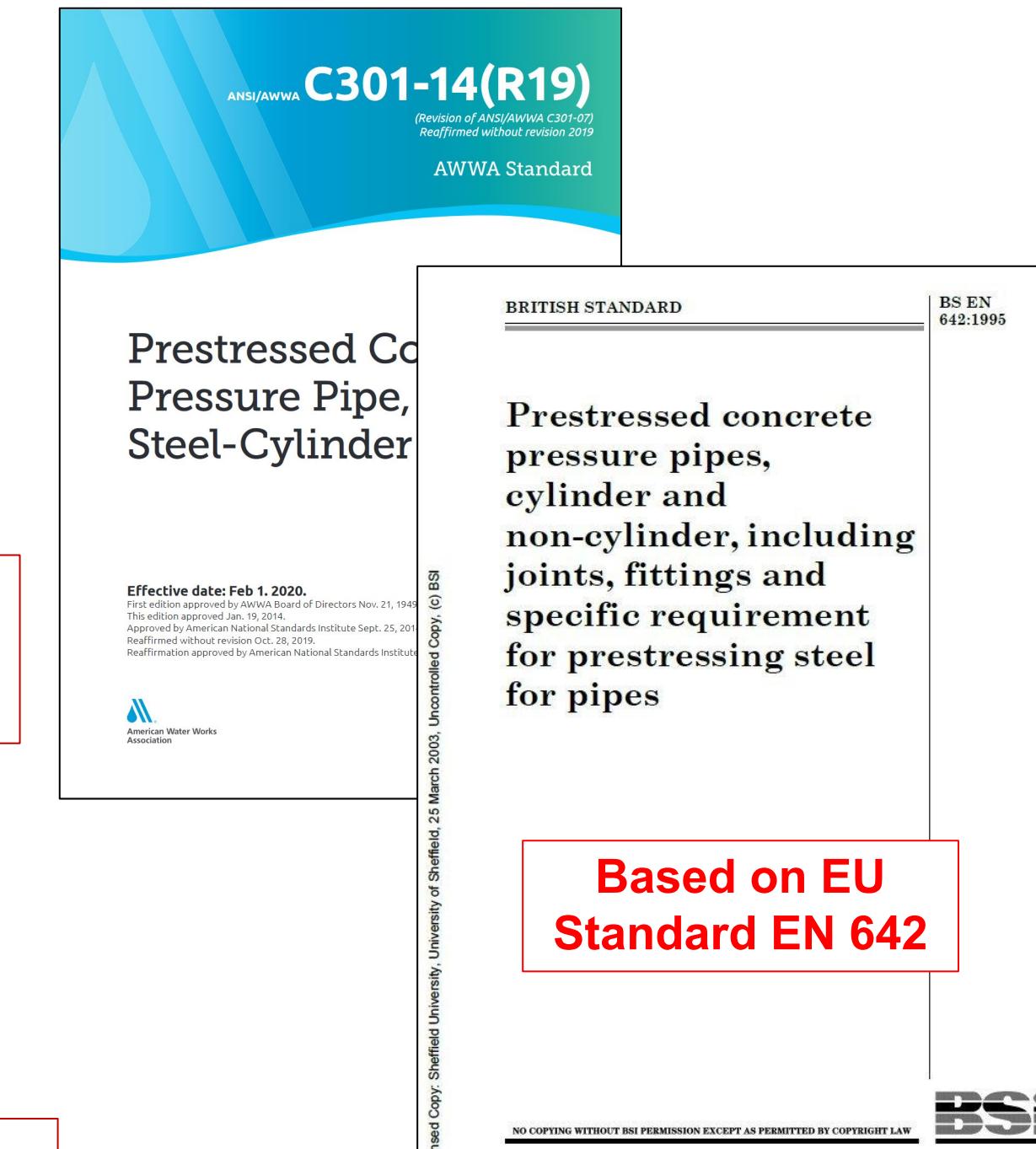
**1980s**  
Failures and loss confidence in product

**1992**  
AWWA standard C304-92 increased the design basis complexity

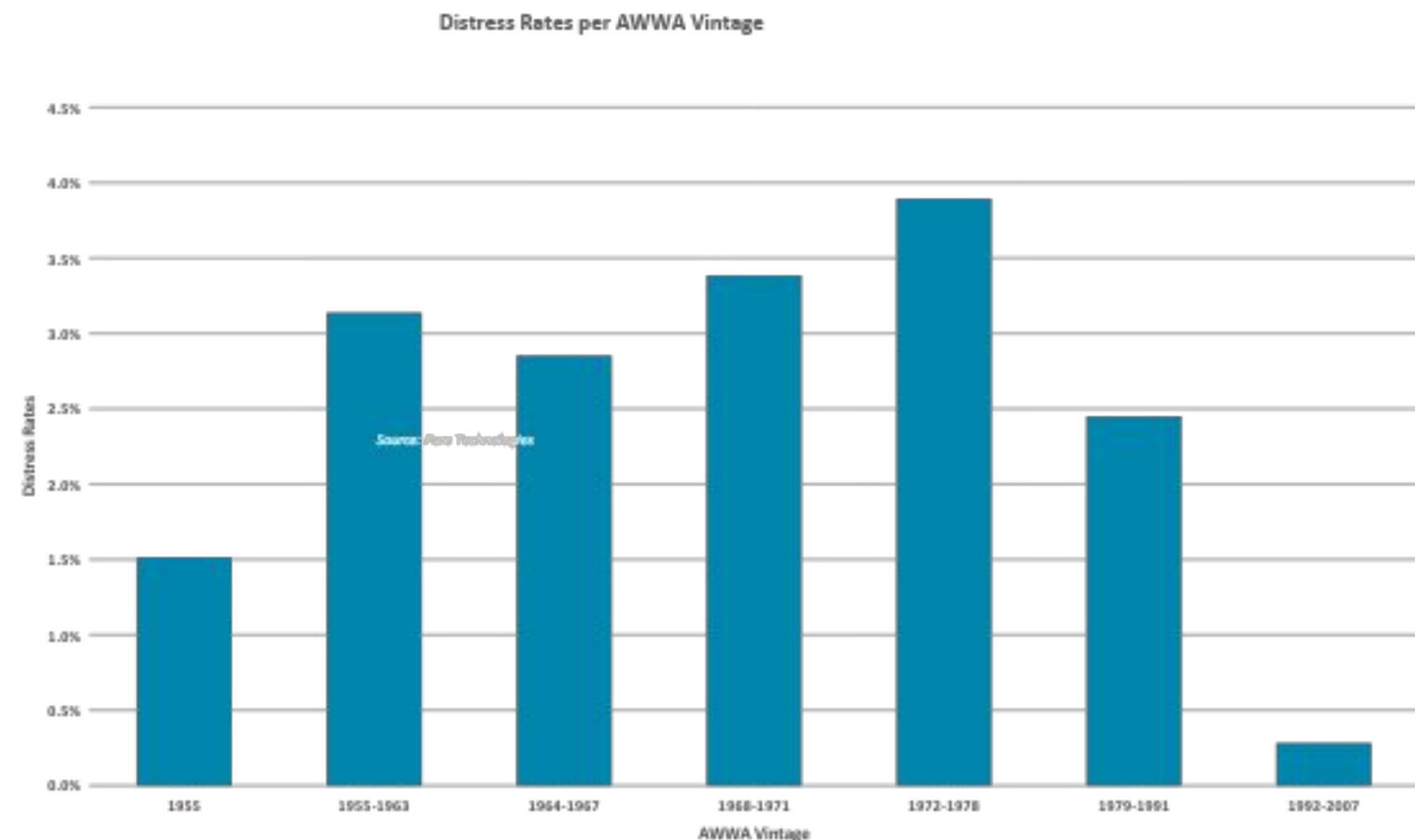
**Dramatically increased reliability of pipe manufactured from 1992**

**1997**  
Acoustic Monitoring introduced to “listen” acoustically for wire break events in PCCP

- 1942**  
First PCCP (LCP) is manufactured and installed to save steel for World War II
- 1953**  
First installation of embedded cylinder pipe (ECP)
- 1964**  
AWWA C301 standard changed to allow reduced minimum thickness and higher stress in design; enabled Class II wire.
- 1972**  
AWWA revised standard C301-72, allowing stronger steel wire; enabled Class III and Class IV wire.
- 1984**  
AWWA revised standard C301-84, ending the provision for Class IV wire
- 1995**  
British Standard BS EN 642-1995
- 1997**  
Introduced for Prestressed concrete pressure pipes, cylinder and non-cylinder Pressure Pipe Inspection Company (later Pure Technologies) develops electromagnetic inspection tools to detect broken wires in PCCP

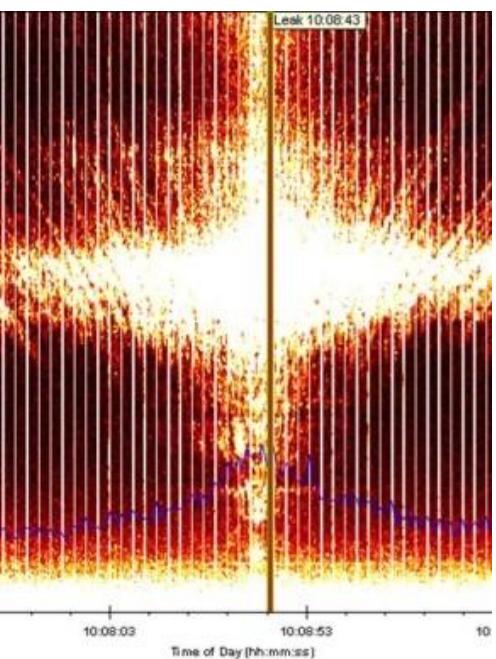


# Average PCCP distress rates

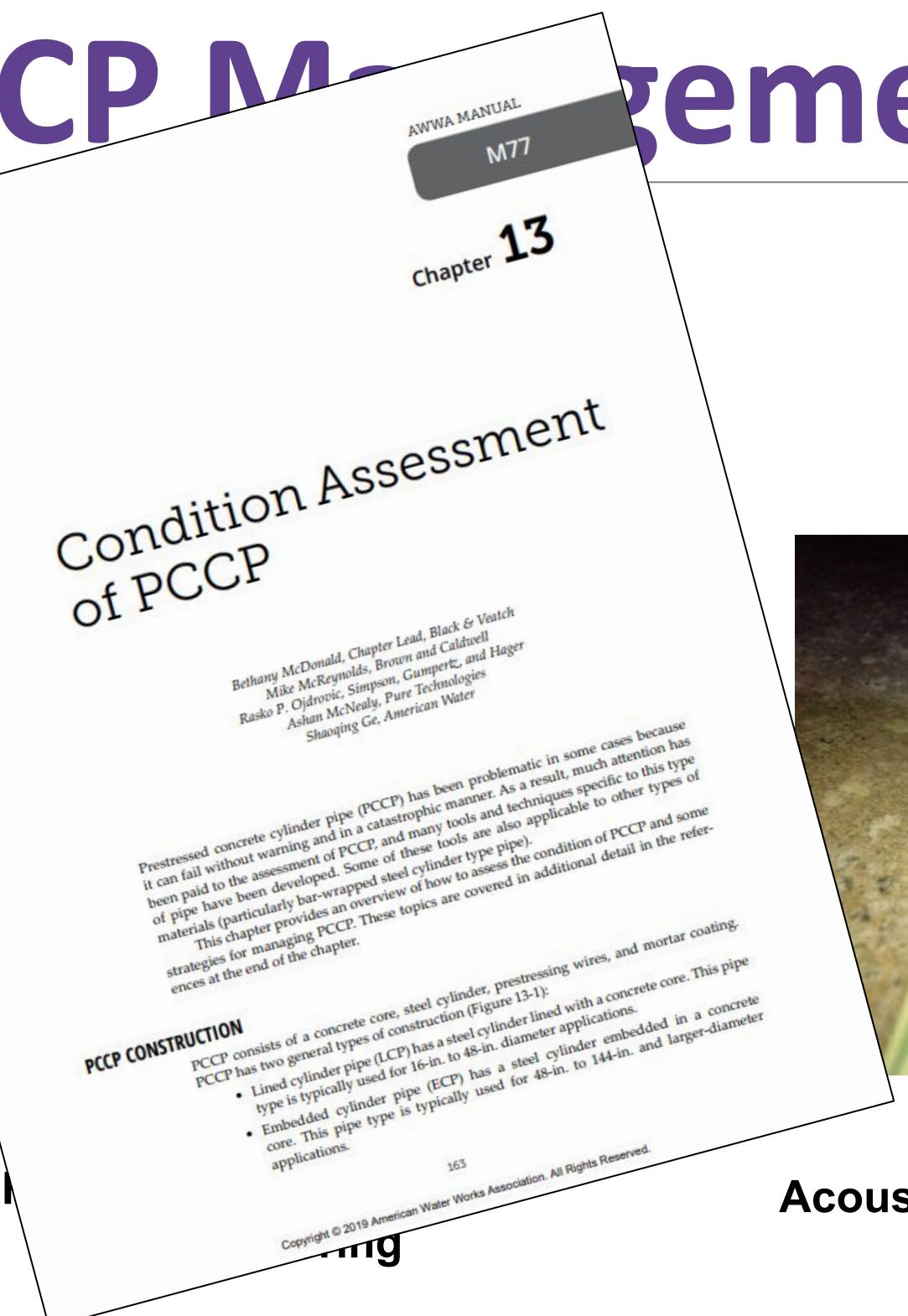
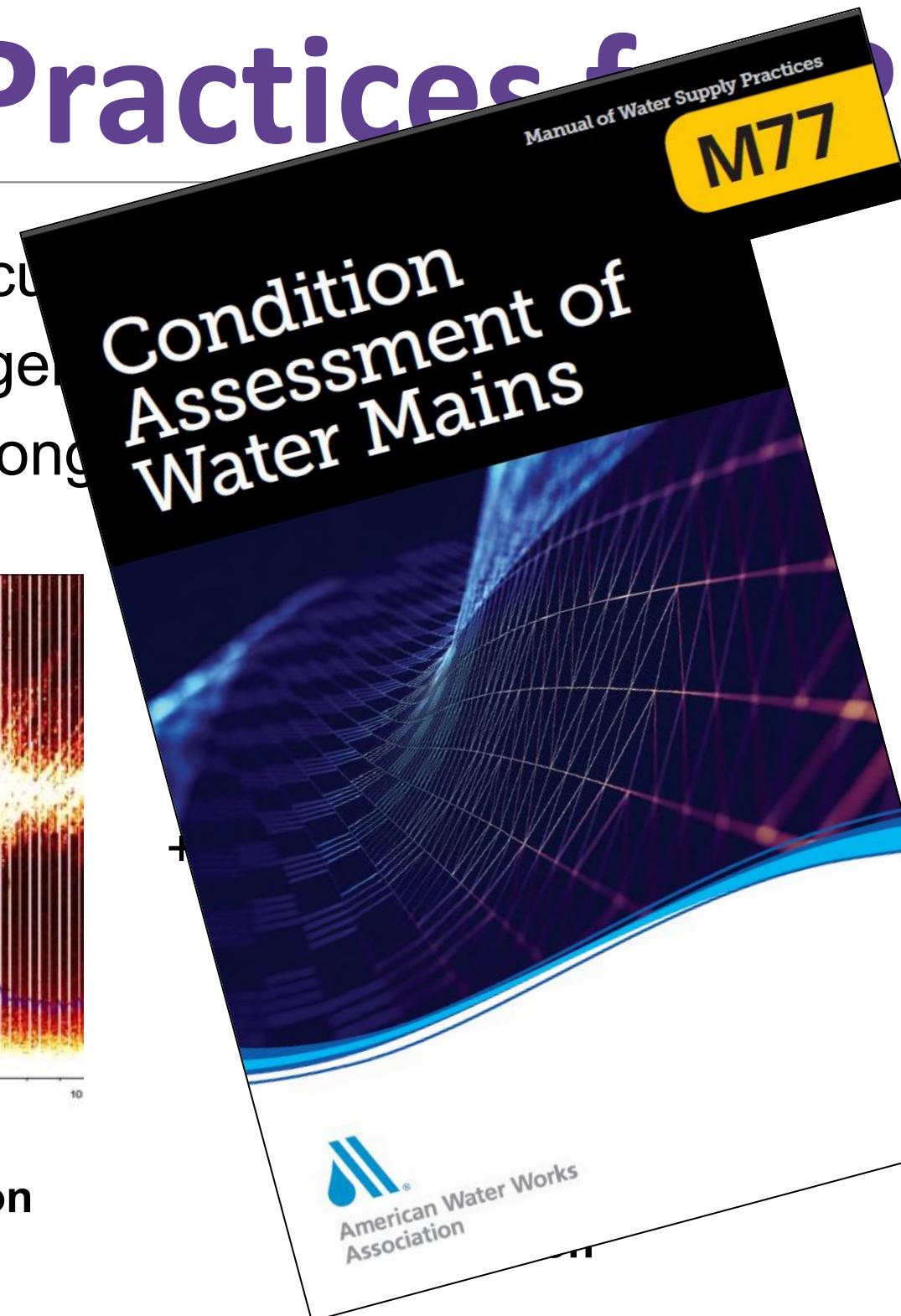


# Best Practices for PCCP Management

1. Determine current condition
2. Address urgent needs
3. Monitor for ongoing issues



Leak Detection



Prestressed concrete cylinder pipe (PCCP) has been problematic in some cases because it can fail without warning and in a catastrophic manner. As a result, much attention has been paid to the assessment of PCCP, and many tools and techniques specific to this type of pipe have been developed. Some of these tools are also applicable to other types of materials (particularly bar-wrapped steel cylinder type pipe).

This chapter provides an overview of how to assess the condition of PCCP and some strategies for managing PCCP. These topics are covered in additional detail in the references at the end of the chapter.

## PCCP CONSTRUCTION

PCCP consists of a concrete core, steel cylinder, prestressing wires, and mortar coating. PCCP has two general types of construction (Figure 13-1):

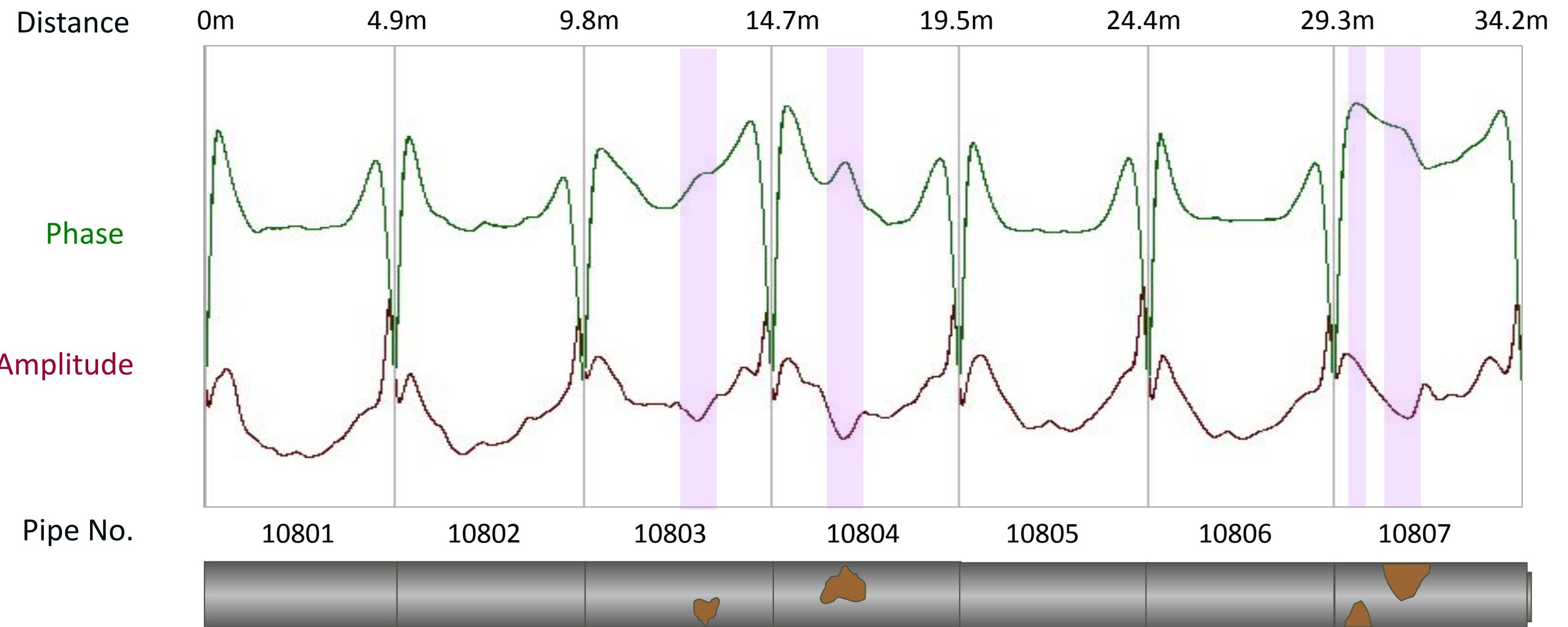
- Lined cylinder pipe (LCP) has a steel cylinder lined with a concrete core. This pipe type is typically used for 16-in. to 48-in. diameter applications.
- Embedded cylinder pipe (ECP) has a steel cylinder embedded in a concrete core. This pipe type is typically used for 48-in. to 144-in. and larger-diameter applications.

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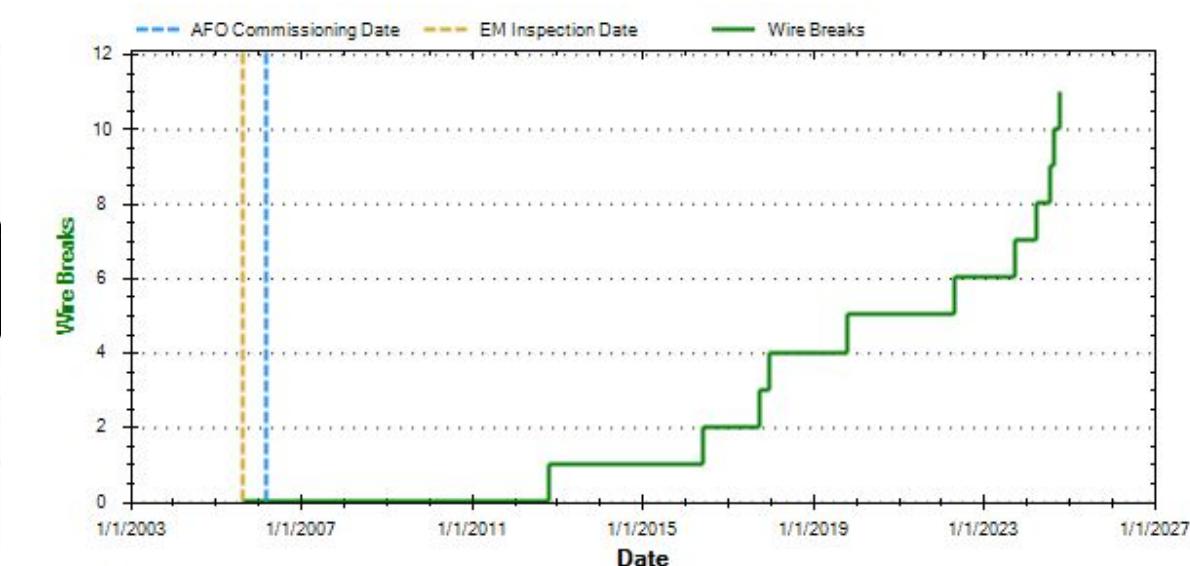
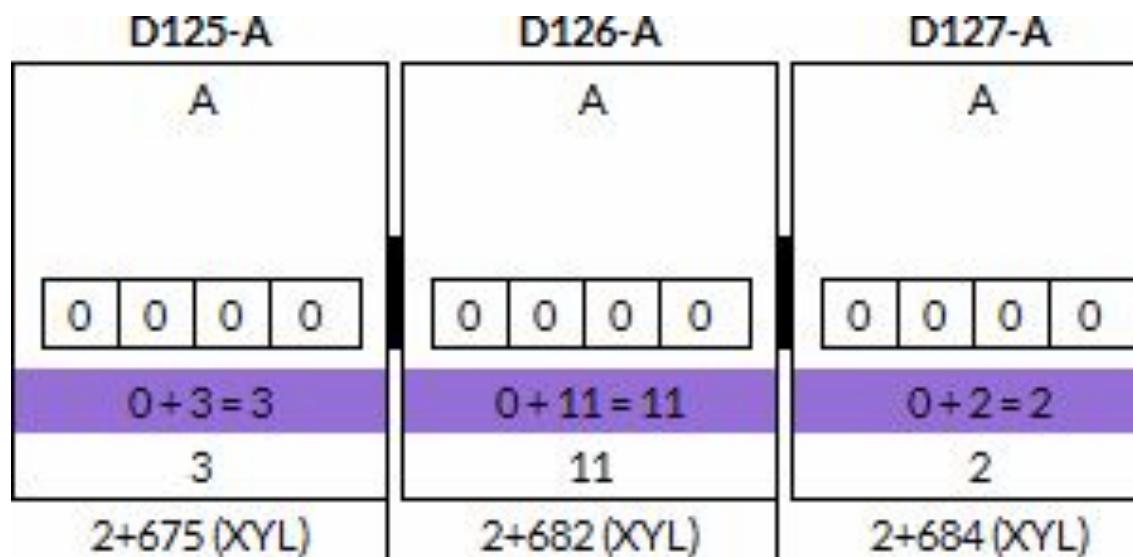
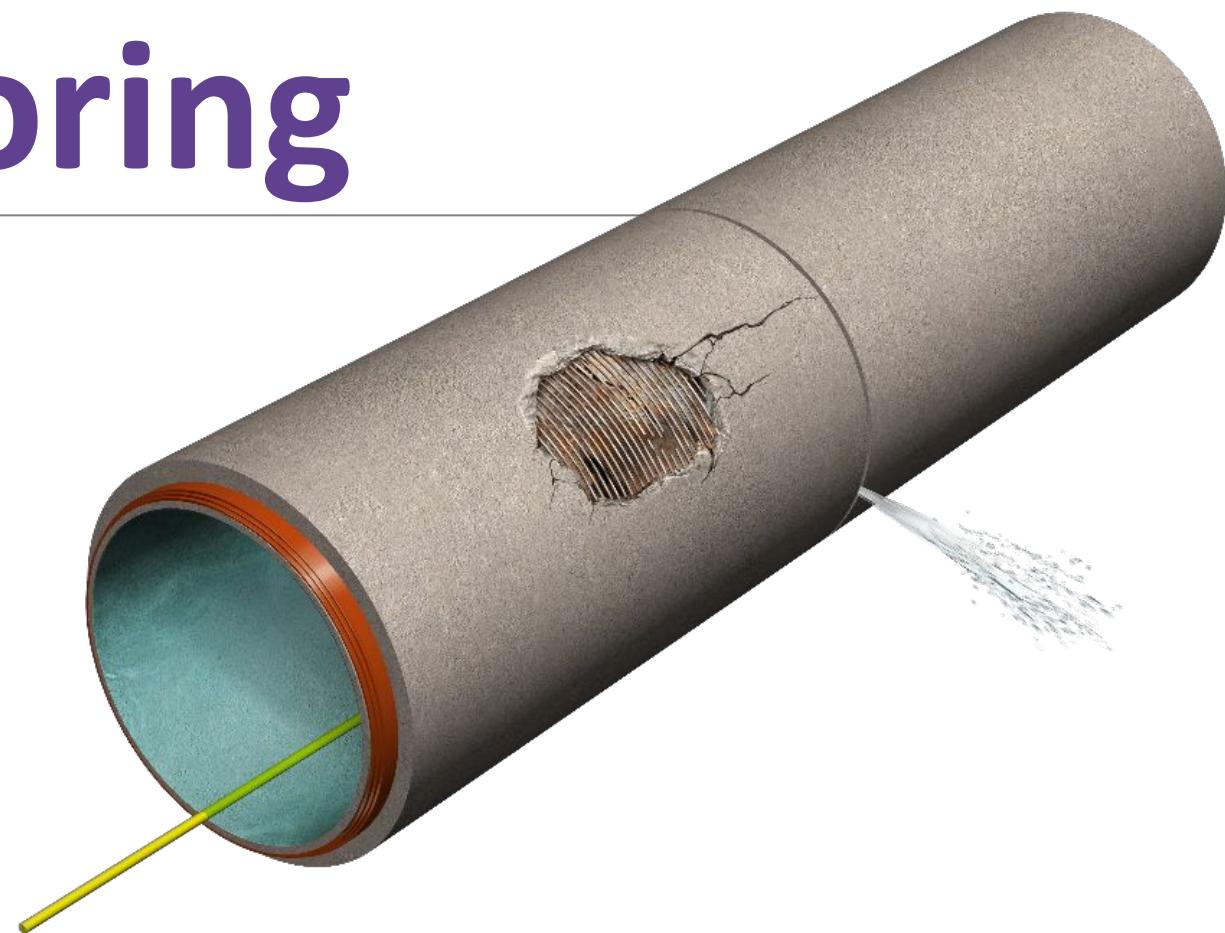
Acoustic Monitoring

# Electromagnetic Data Analysis



# Continuous Acoustic Monitoring

- Electromagnetics provide a snapshot of PCCP distress
- Acoustic Monitoring detects Wire Breaks (WBs) in real time
- Use EM to get a starting point (baseline), then keep watching it with Acoustic Monitoring



# Calgary Bearspaw South Feeder Main

Failure and Emergency Response



# 2024 Failure – Bearspaw South Feeder Main

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- On June 5, the 1950mm (78") C301-E PCCP Bearspaw South Feeder Main failed
- Supplies up to 60% of City's water – prompted Stage 4 Water Restrictions (53 days total)
- Condition assessment was scheduled for Fall 2024



# Timeline

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Robotic  
Condition  
Assessment

# What happened?

- June 5, 2024: BPSFM ca



## EMERGENCY ALERT / ALERTE D'URGENCE

2m ago

This is an Alberta Emergency Alert. The City of Calgary has issued a critical water supply alert. This alert is in effect for the city of Calgary until further notice. A water main break along 16 Avenue NW has impacted the city's water supply. Supply levels have reached a critical state, affecting the city's ability to provide water to communities and ensure adequate water is available to support emergency fire suppression. All residents and businesses must conserve water. Do not shower or bathe. Do not wash dishes, or run appliances that use water.



# What happened?

- June 5, 2024: BPSFM catastrophic failure.
- Week of June 17: failure repaired; 5 “hot spots” identified/repaired.



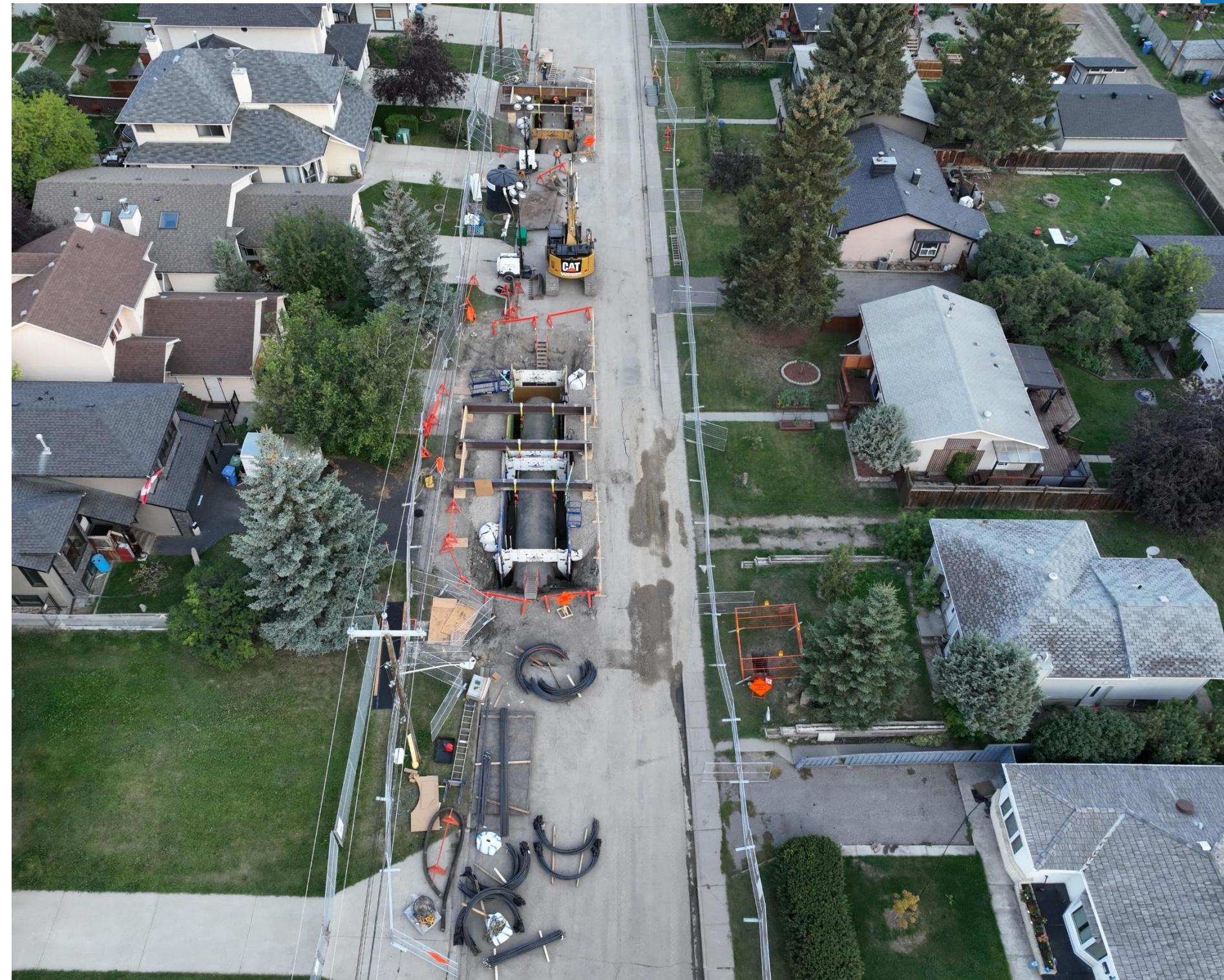
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- June 5, 2024: BPSFM catastrophic failure.
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- July 5: BPSFM brought back into service; more assessment and monitoring system installed.



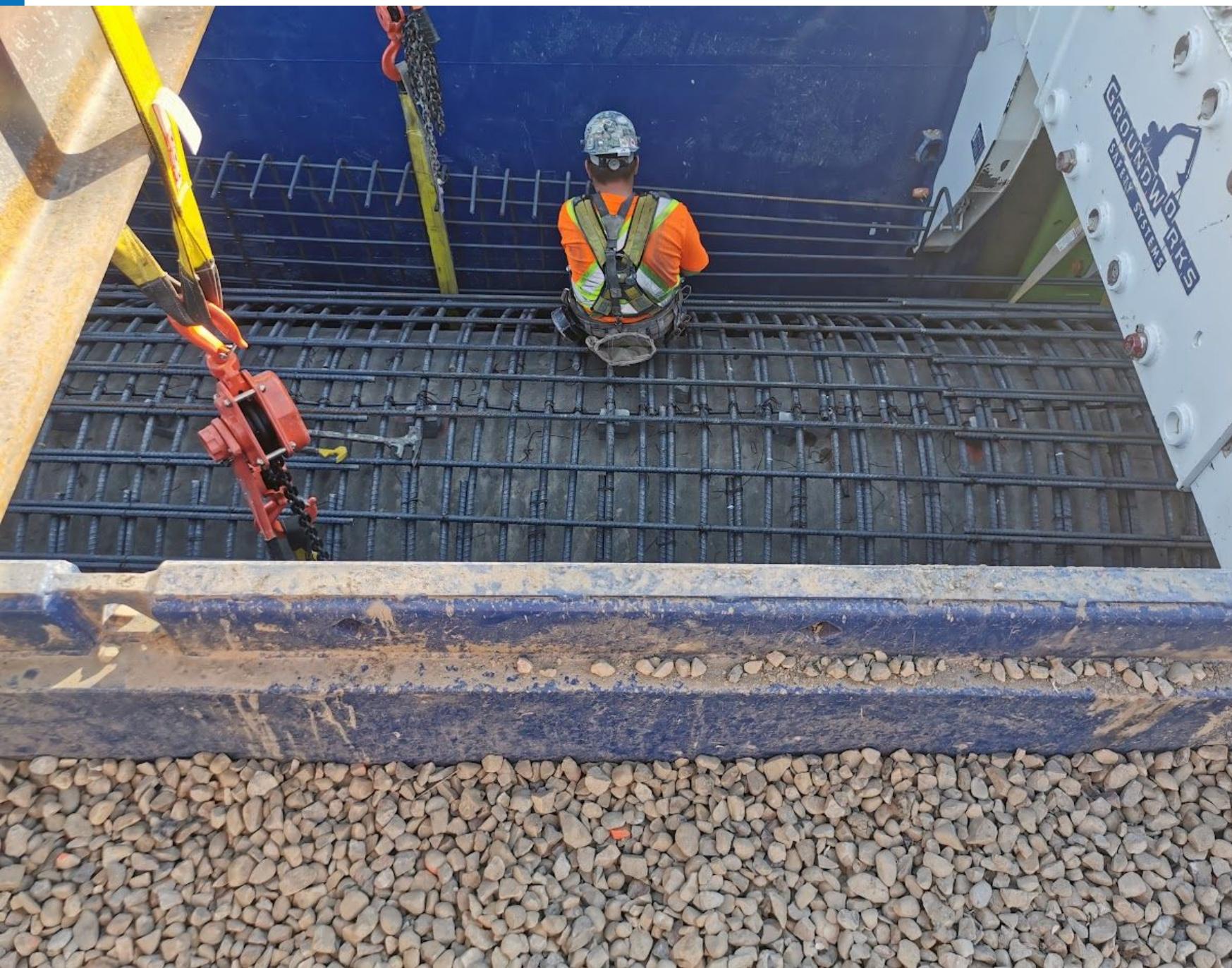
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- August/September: additional repair work on 21 segments (identified by PipeDiver).
- Mid-October: 2 additional 1500mm segments (identified by PipeDiver) repaired (29 total).



# Timeline

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Robotic  
Condition  
Assessment

PipeDiver  
Condition  
Assessment

AFO  
Monitoring  
(Stage 1)

AFO  
Monitoring  
(Stage 2)

# Going forward

- 2024 failure leads to reconsideration of inspection efforts
  - Do not get complacent
  - Effort is worth it
- Make failures an opportunity (if possible)
  - Assess/Monitor as much as possible
  - Repair as much as possible
  - Review of preparedness for future emergencies
  - Collect as much info as possible (forensics)

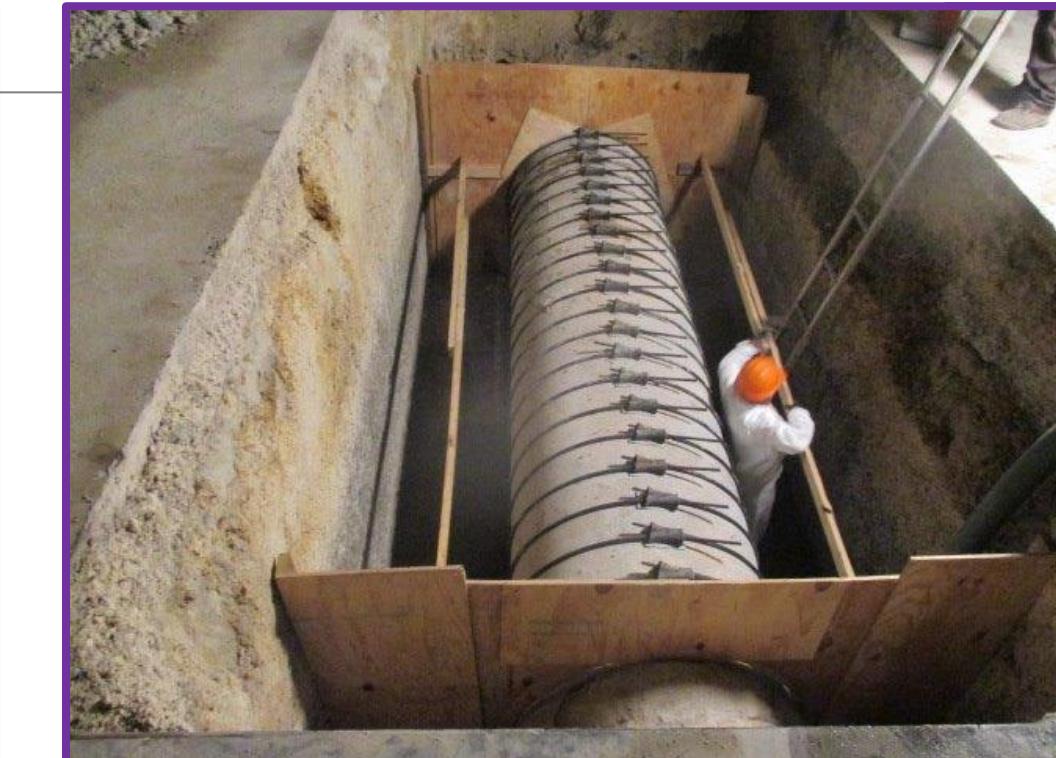
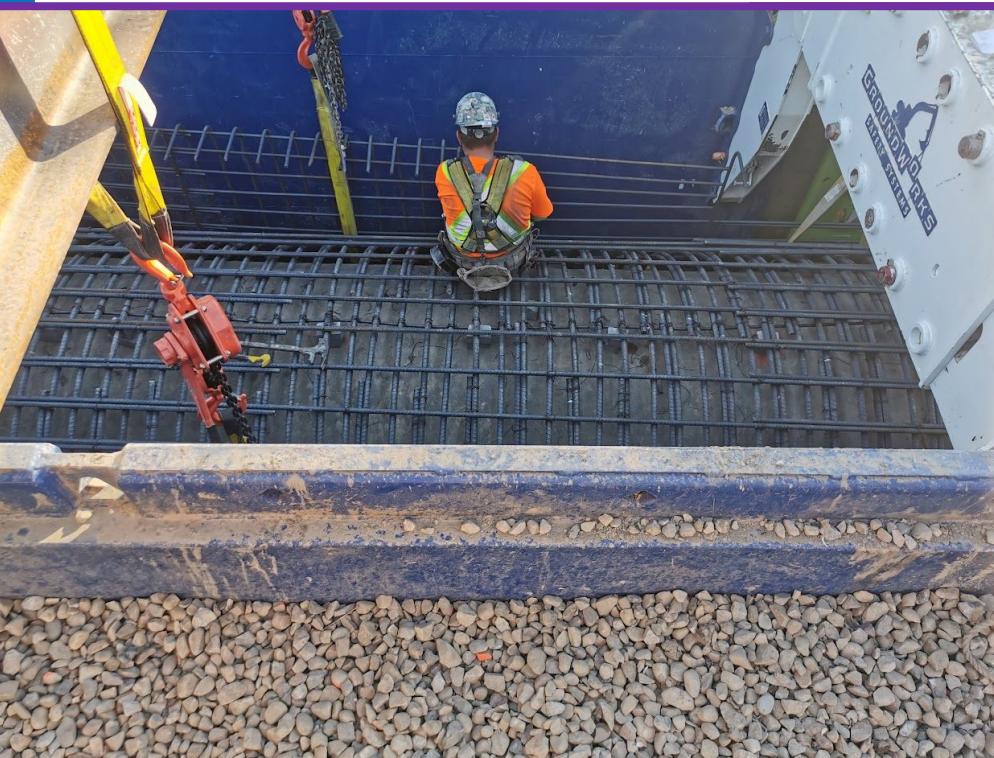


# How much?

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**23 locations**

# PCCP Repair Techniques



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