UCT UNDERGROUND CONSTRUCTION TECHNOLOGY
The Underground Utilities Event | July 13-15, 2021 | Music City Center | Nashville, TN

Trenchless Reconditioning of Natural Gas Pipelines via CIPL

Process Overview and Work Efficiencies

PPM PROGRESSIVE PIPELINE MANAGEMENT
THE INFRASTRUCTURE RENEWAL SPECIALISTS

Components of a Composite Pipeline

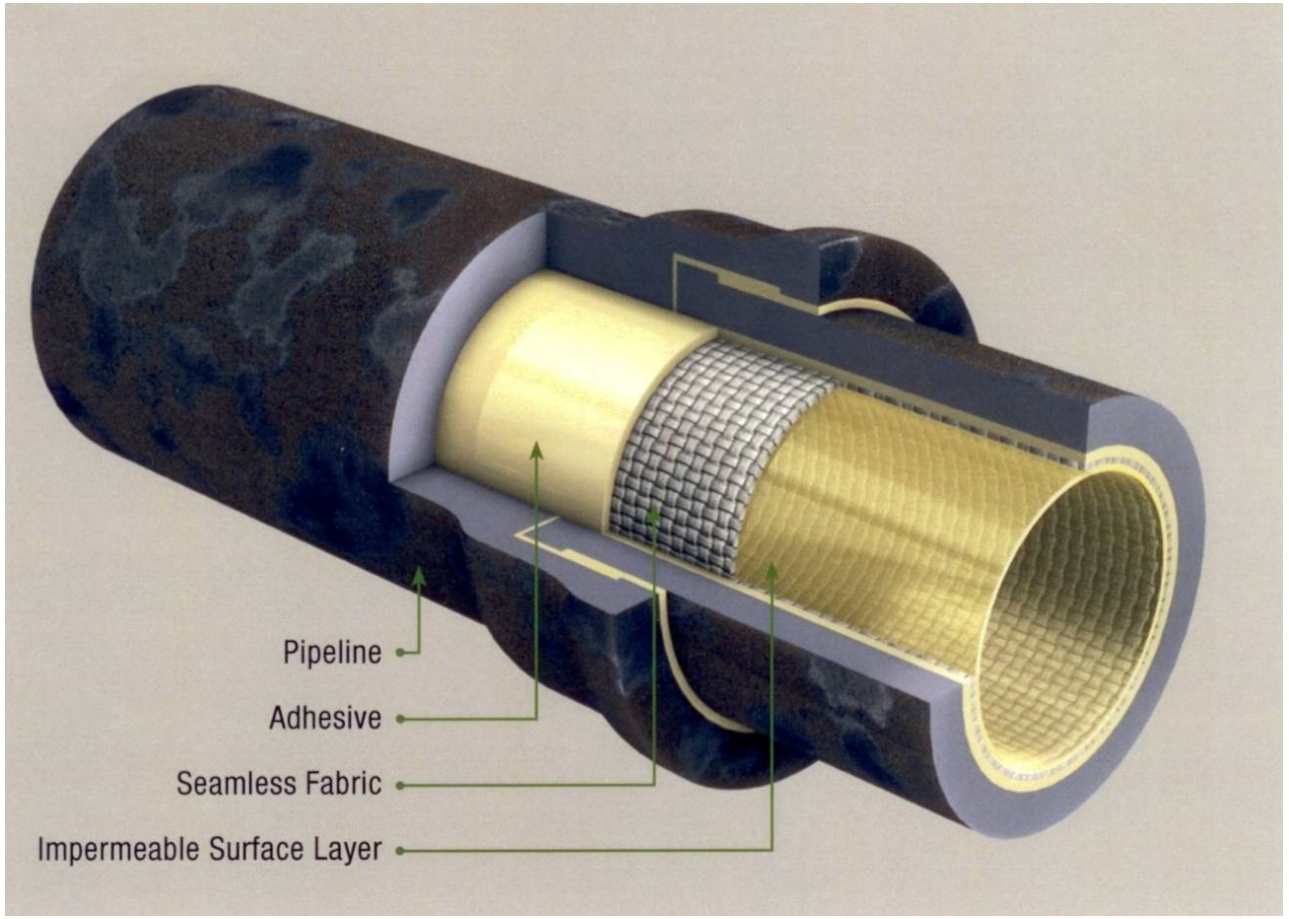
1. Seamless Circular Woven fabric made of Polyester Yarns

2. polyurethane Non- Permeable Inner Skin

3. Solvent Free 2-part Epoxy Adhesive

4. Host Pipe

5. Collectively a Composite Pipeline



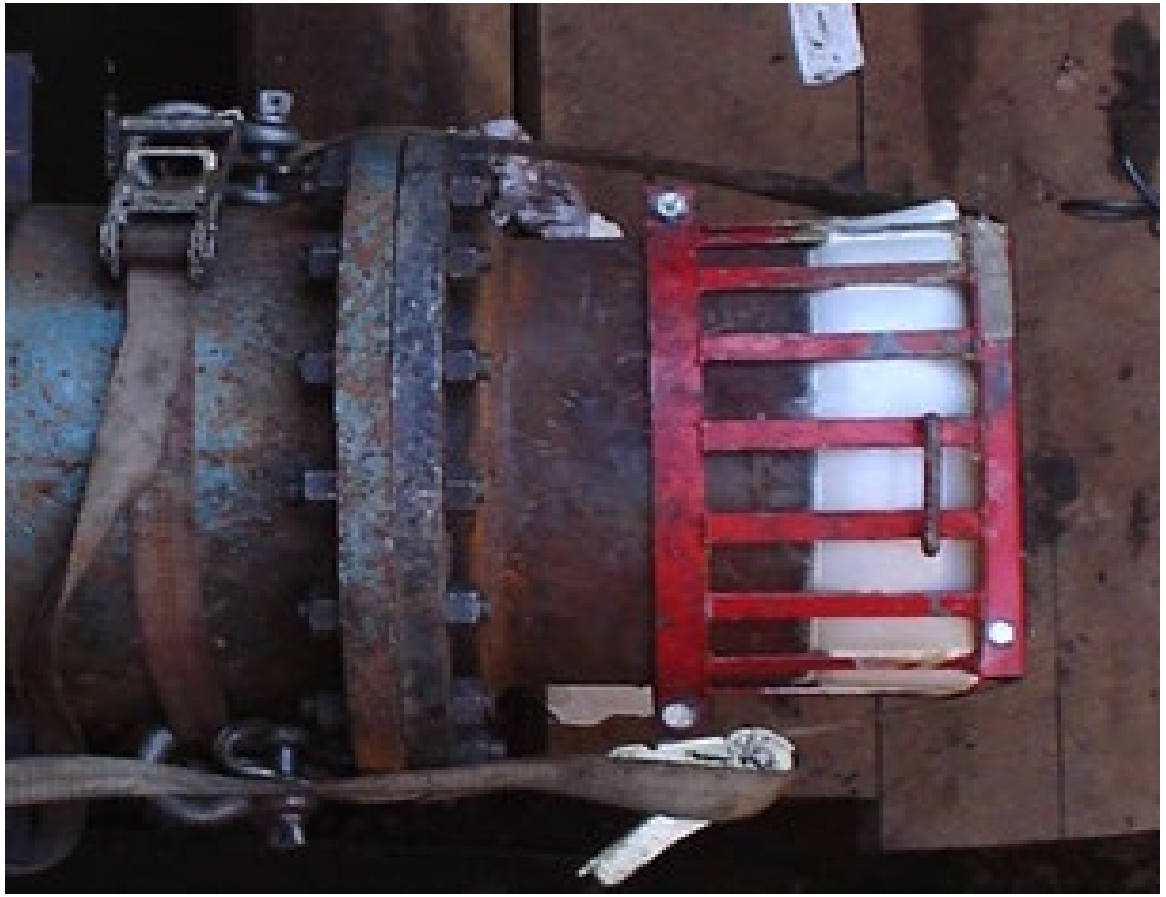
LINING PROCESS

SURFACE PREPARATION PHASE

- Initial CCTV Inspection (Identify any anomalies)
- Proprietary “Abrasive Blast” cleaning process
- Simultaneous vacuum recovery of cleaning waste
- Post-cleaning CCTV Inspection
- Identification of service taps

LINER "WET-OUT" AND "INVERSION"

- Hand-mix 2 component Epoxy adhesive (Non-Haz)
- Add adhesive to liner (rollers ensure 100% saturation)
- Load liner into pressure drum
- "Invert" liner into cleaned pipe with air pressure
- Begin curing process



CIPL Work Efficiencies

- **Longer Distances Between Pits**
  a. Improved Sandblasting Equipment
  b. Larger Pressure Drum & Improved Robotics
  c. Improved Adhesive Pot Life

- **Remote Pressure Monitoring**
  a. Minimizes Crew Participation
  b. Minimizes Traffic Control Requirements

- **Carbon Fiber Reinforcements**
  a. Bridge Abutment Walls
  b. Drip Pot Standpipe Removal & Bridge Construction
  c. Lateral Abandonment

CIPL Work Efficiencies

- **Service Transfer**
  a. Robotic Service Locator
  B. Robotic Reinstatement

- **Debris Removal**
  a. Dust Collector

Lateral Reconditioning
a. Robotic Lateral Reinstatement

- **Turnkey Approach**
  a. Engineering Gas/Lining Layout
  b. Pit Design and Excavation
  c. Disassembly and Reassembly of Gas Main

Improved Adhesive

- Epoxy vs. Polyurethane
- Epoxy has longer pot life allowing for:
  - a. Large Diameter Pipelines to be Lined
  - b. Longer Inversion Lengths
  - c. Working in Hot Summer Months

gti

HPL-180 FINAL REPORT

GTI PROJECT NUMBER 20301

Development of an HPL-180 Liner

Final Report

Report Issued:
January 3, 2008

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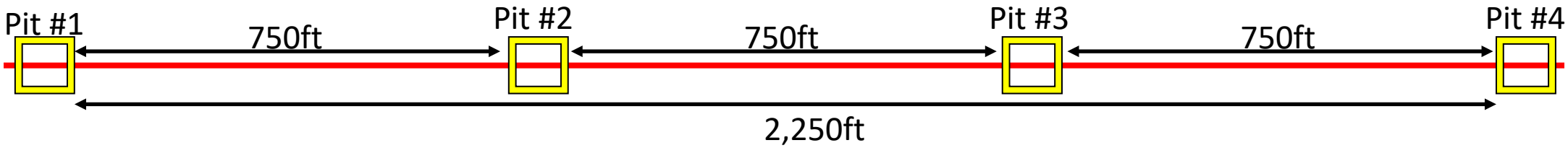
Development of a HPL-180 Liner – Final Report

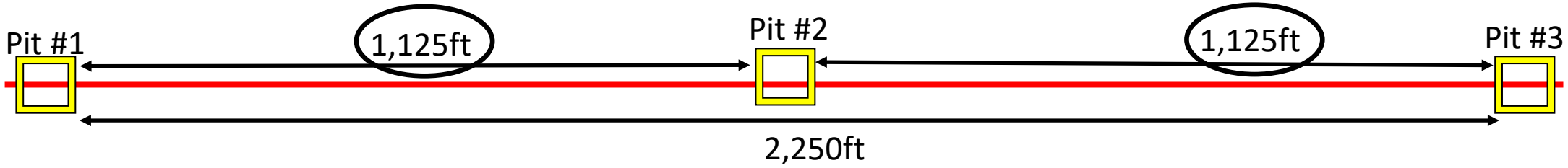
- Funded by National Grid & Atmos Energy
- Tested at GTI
- Prepared by PPM
- Liner & Epoxy Meets ASTM 2207

Longer Distances Between Pits

Example A. To Line approx. 2,250ft of Main 4 Pits are Required Without Advancements



Example B. To Line approx. 2,250ft of Main 3 Pits are Required With Advancements



Collective Cost Savings Associated with One Single Pit Eliminated include;

- Excavation, Backfill & Paving W/Associated Traffic Control
- Pipe Cutting & Removal W/ New Assembly Reconnected
- Crew Time, Both PPM & National Grid

Remote Pressure Monitoring

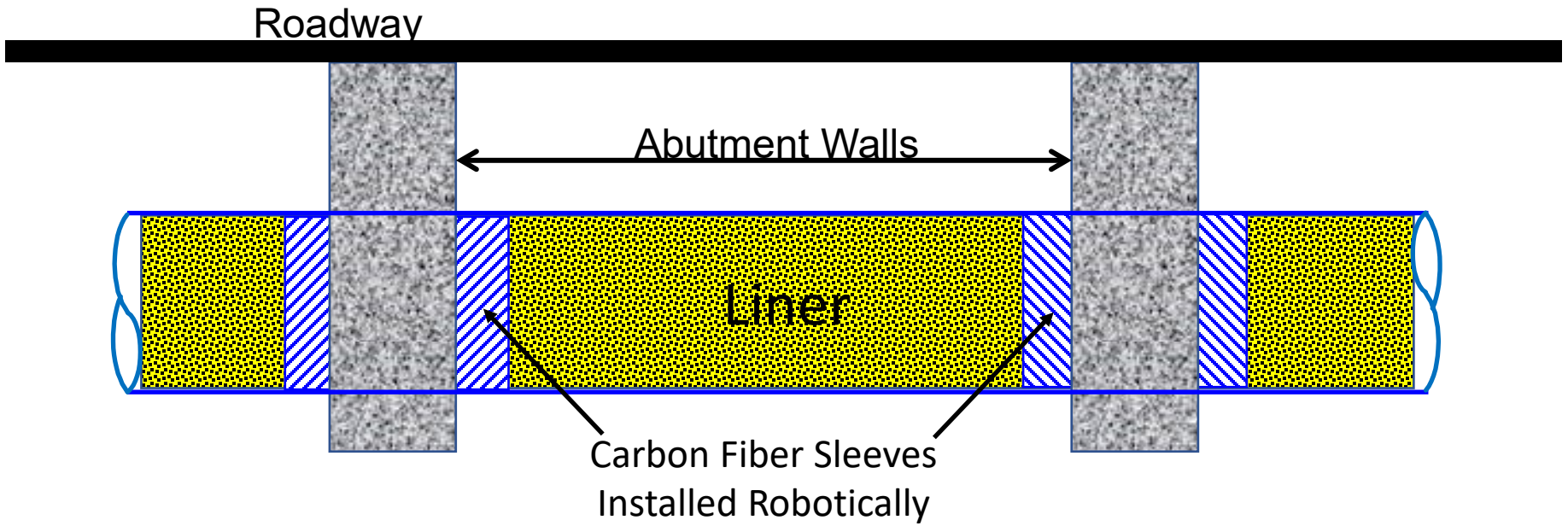
- Remote Pressure Monitoring allows PPM's Technicians to read the internal Pressure of the Liner without the need for a PPM Crew as well as a Utility Crew plus traffic control to open the road plates to view the Pressure Gauges.
- PPM Technicians can Read the Pressure "Off Site" and Report Their Findings back to the Utility

Collective Cost Savings Associated with One Project include;

- Crew Time, Both PPM & National Grid
- Associated Traffic Control

Carbon Fiber Reinforcement

- Saves The Removal of the Pipeline

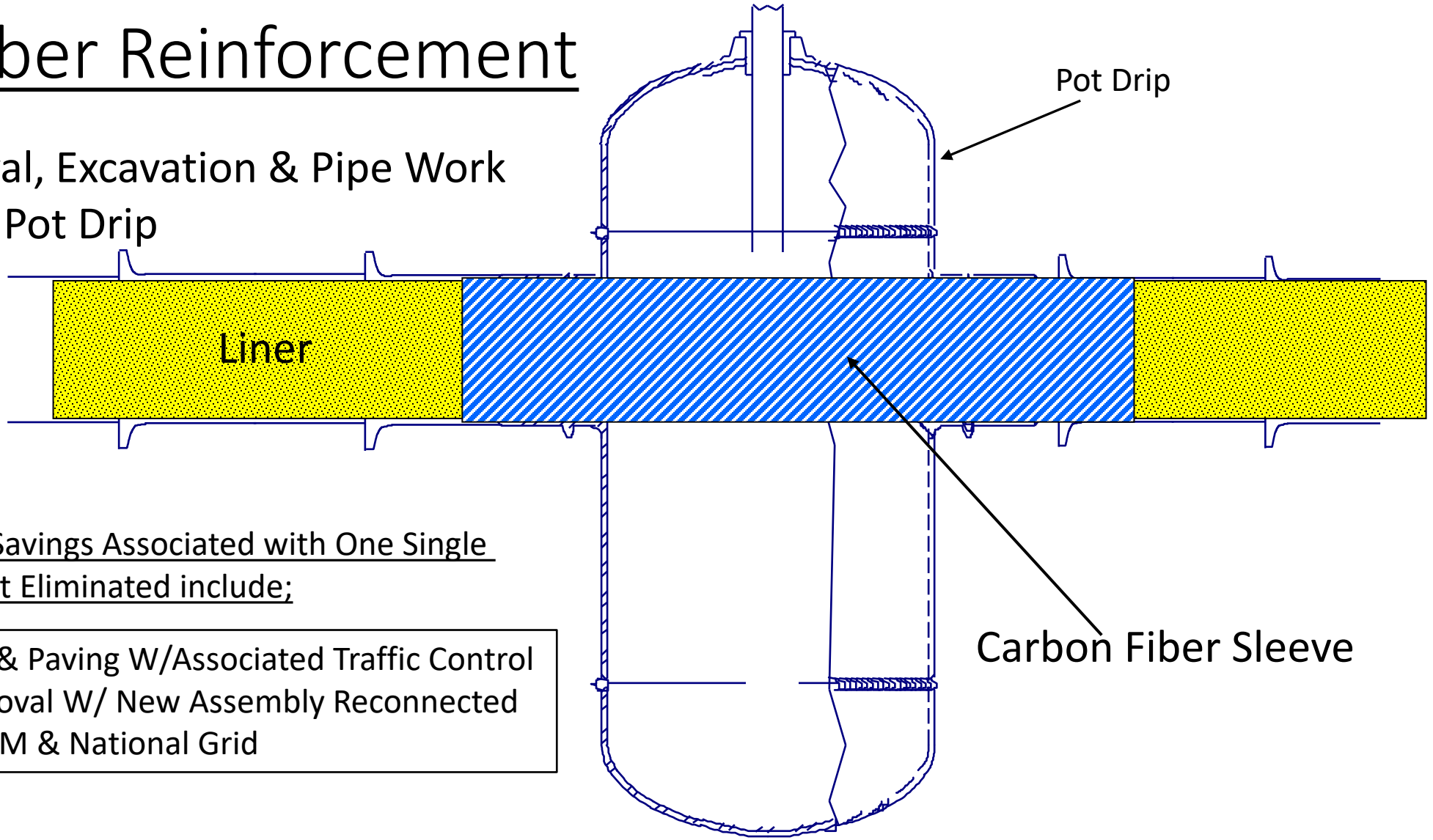


Collective Cost Savings Associated with One Project include;

- Approved Carbon Fiber Materials

Carbon Fiber Reinforcement

- Saves The Removal, Excavation & Pipe Work of the Unwanted Pot Drip

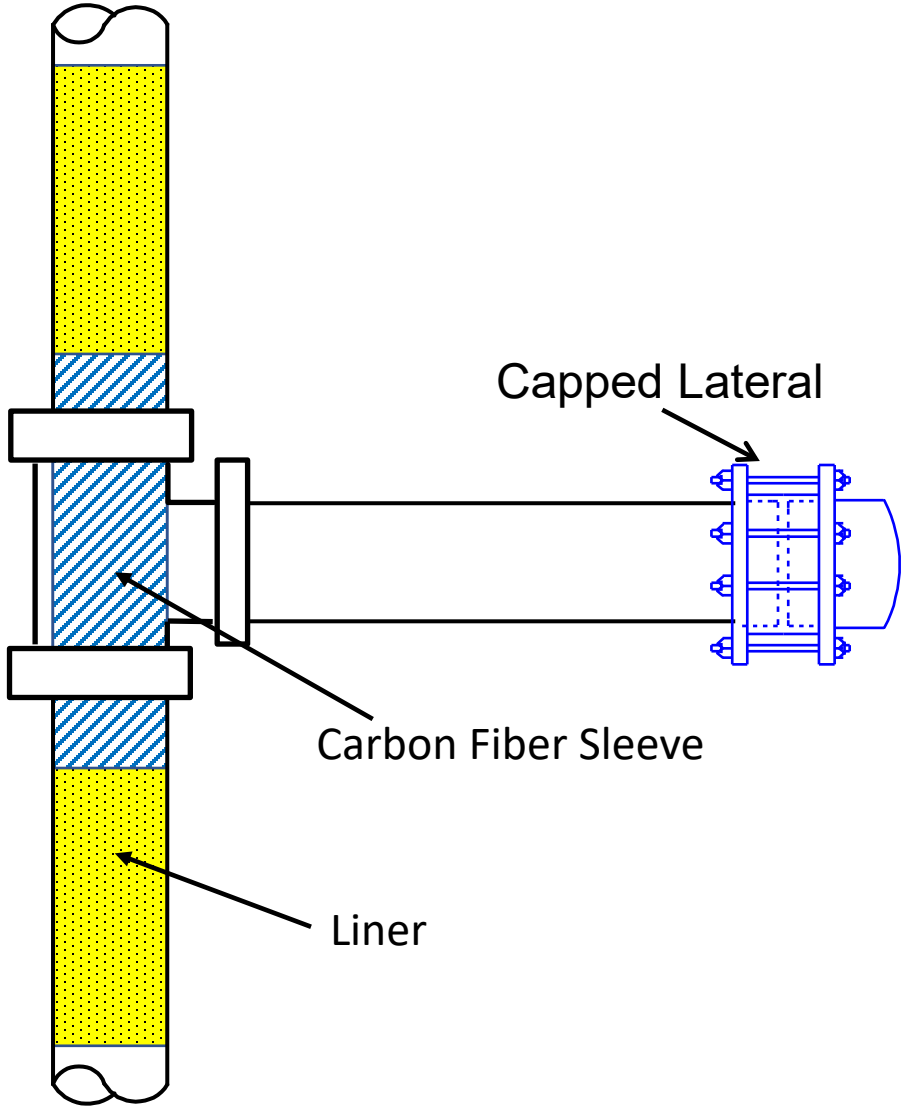


Collective Cost Savings Associated with One Single Pit Eliminated include;

- Excavation, Backfill & Paving W/Associated Traffic Control
- Pipe Cutting & Removal W/ New Assembly Reconnected
- Crew Time, Both PPM & National Grid

Carbon Fiber Reinforcement

- Saves The Removal, Excavation & Pipe Work of the Unwanted Lateral



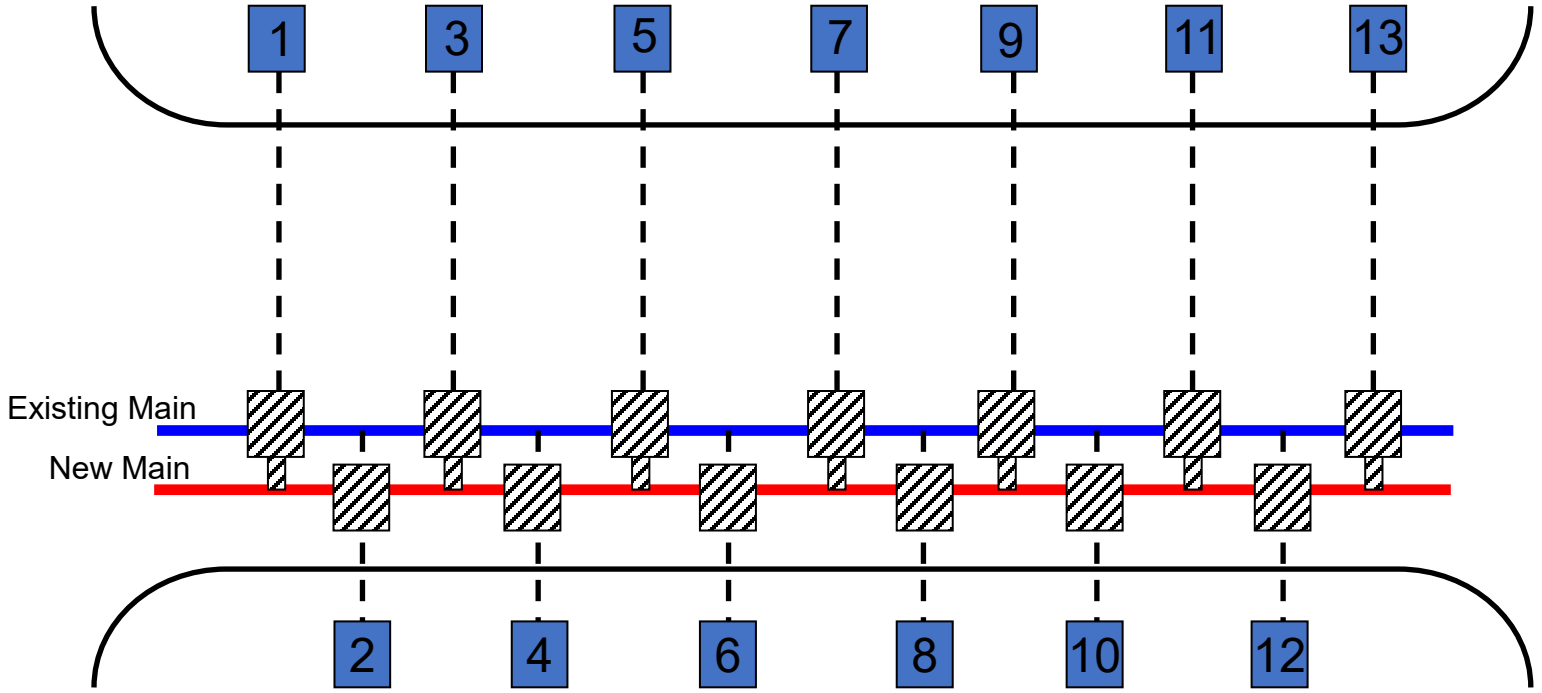
Collective Cost Savings Associated with One Single Pit Eliminated include;

- Excavation, Backfill & Paving W/Associated Traffic Control
- Pipe Cutting & Removal W/ New Assembly Reconnected
- Crew Time, Both PPM & National Grid

Service Transfer

- Saves The Transfer, Excavation & Pipe Work with Each Gas Service

- Conventional methods of installation requires trenching to install new main and a separate excavation at every service

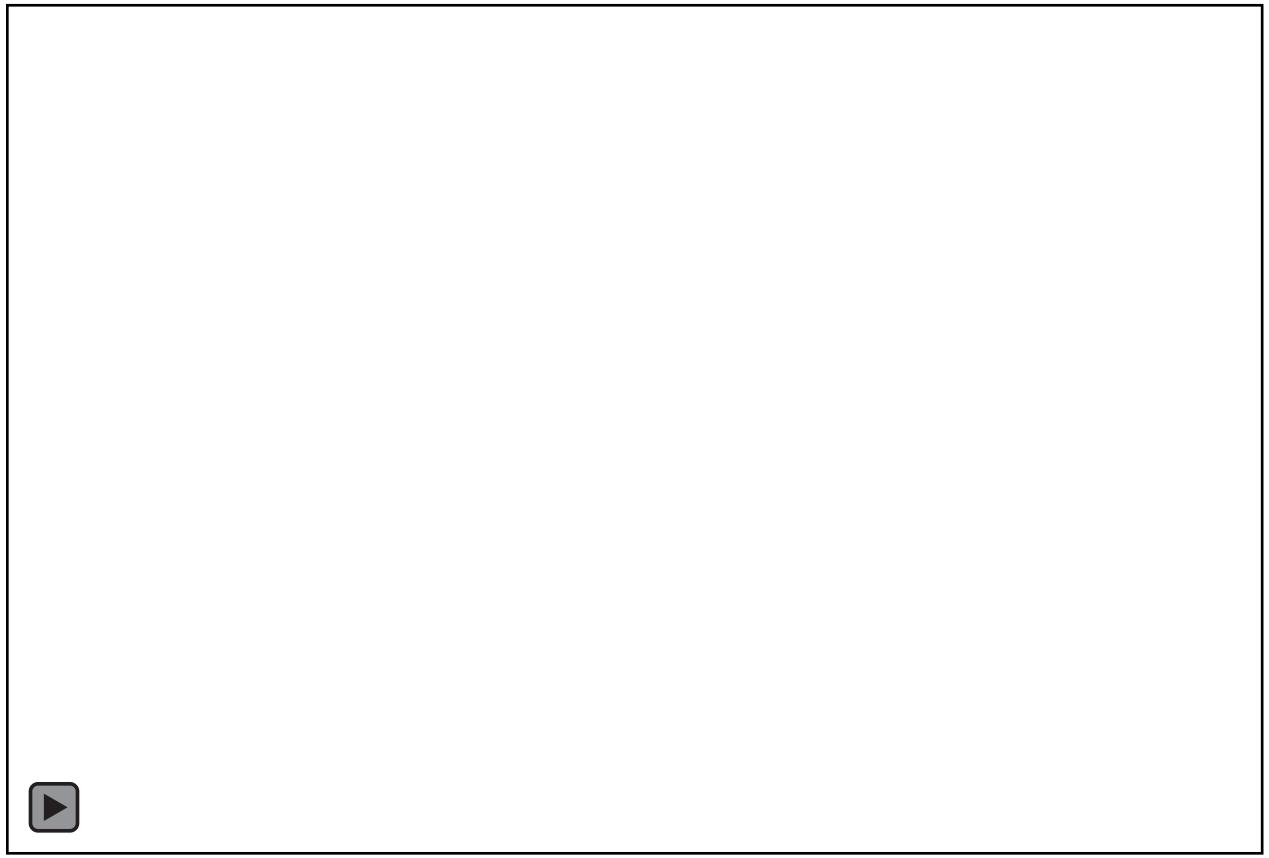


Robotic Service Reinstatement

- Saves The Removal, Excavation & Pipe Work at Each Service Transfer

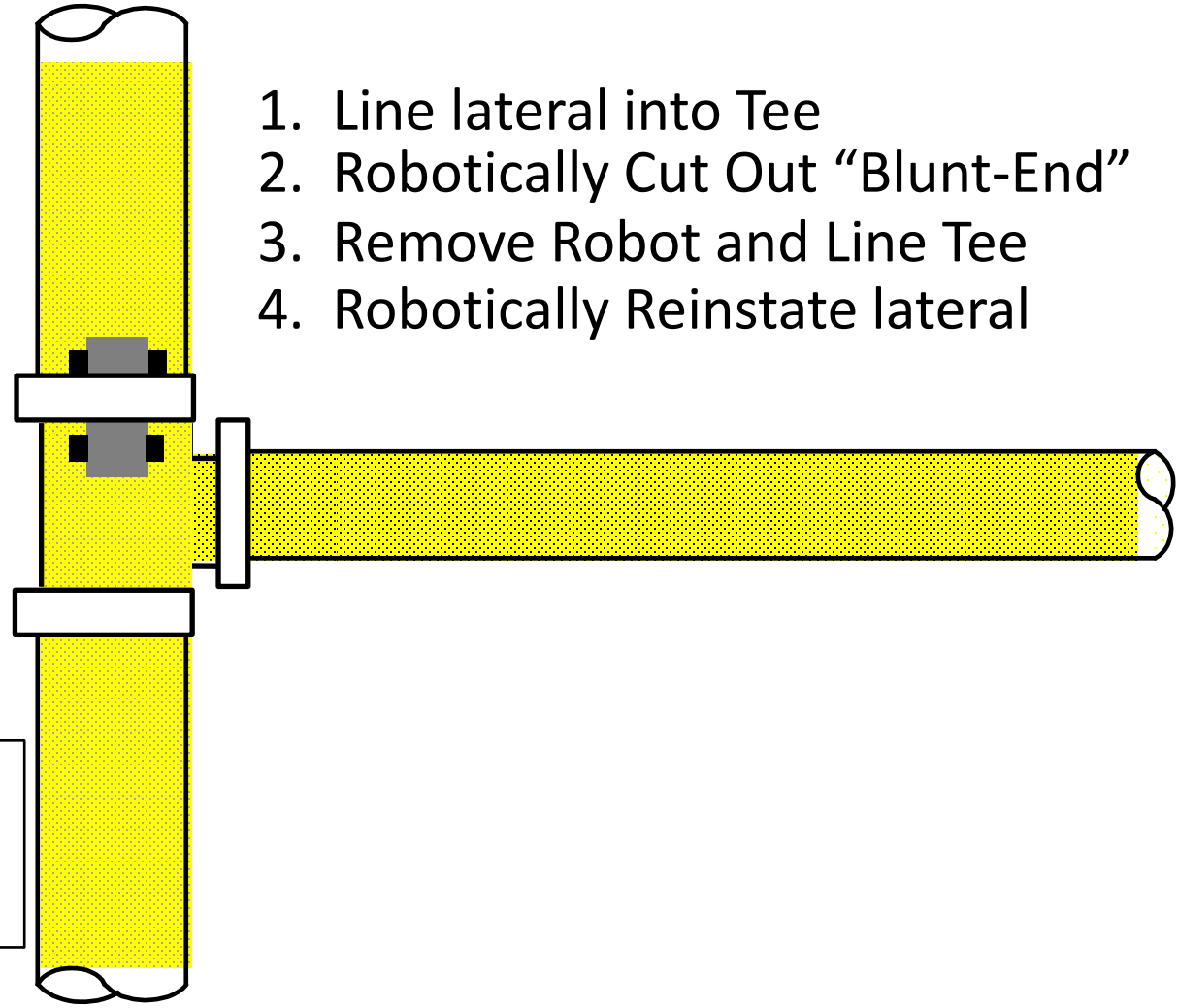
Collective Cost Savings Associated with One Single Pit Eliminated include;

- Excavation, Backfill & Paving W/Associated Traffic Control
- Pipe Cutting & Removal W/ New Assembly Reconnected
- Crew Time, Both PPM & National Grid



Lateral Reconditioning

- Saves The Removal, Excavation & Pipe Work of the Required Lateral



1. Line lateral into Tee
2. Robotically Cut Out “Blunt-End”
3. Remove Robot and Line Tee
4. Robotically Reinstate lateral

Collective Cost Savings Associated with One Single Pit Eliminated include;

- Excavation, Backfill & Paving W/Associated Traffic Control
- Pipe Cutting & Removal W/ New Assembly Reconnected
- Crew Time, Both PPM & National Grid

Dust Collector

- Smaller Footprint
- Very Quiet
- Easy Assembly

Site Selection

IDEAL CANDIDATES FOR CIP LINING:

- Crossings (bridges, highways, railroads, rivers, env. sensitive)
- Large diameter pipe where throughput cannot be reduced
- Urban centers & areas of high concern (schools, churches, hospitals)
- High $ restoration areas (paving, stringent & costly stips)
- Residential areas where customer service may be of concern

Turn-key Approach: PPM/Subcontractor & National Grid

Turn-key Approach

DEFINED SCOPE OF WORK
GENERAL GUIDELINES, TASKS & INFORMATION

A. ENGINEERING LAYOUT & ANALYSIS

- *DESIGN, STOP-OFF, PURGE, PIPE WORK AND* RECONNECT *PROCEDURE*

B .EXCAVATIONS

C. RECONNECT PROCEDURE IN PREPARATION OF PRESSURE TEST

D. BACK-FILL AND FINAL RESTORATION

E. ASSIGNED PROJECT MANAGER ON SITE THROUGHOUT ENTIRE PROJECT

CIPL Adds 100 Years of additional Longevity to the Existing Pipeline

Thank You

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PPM PROGRESSIVE PIPELINE MANAGEMENT
THE INFRASTRUCTURE RENEWAL SPECIALISTS