FDOT Study: Durability of In-Situ Pipe Repair

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INTRODUCTION

• FDOT – maintenance of significant Pipe infrastructure system

• Goal: Implement most effective repair methods to enhance durability and efficiency of the entire pipe networks

• Approach: Study the longevity and ultimate effectiveness of the existing repairs
REPAIR MATRIX

Office of Construction / Contractor issues
Pipe Repair Matrix

Specialty Toolbox

The Pipe Repair Matrix is a compilation of pipe repair methods submitted by pipe manufacturers and found in the Standard Specifications. This Matrix is a living document and will continue to evolve as the Department refines its pipeline inspection and repair processes and repair technology advances.

As a result, this Matrix is a guidance document ONLY and does not replace Engineering judgment.

It is incumbent upon the District to use that judgment when selecting and approving repairs for their projects. Finally, the Department encourages the review and use of emerging repair technologies provided they are based on sound scientific principles and defensible engineering analysis.

SELECT A TYPE OF PIPE

Metal Pipe  HDPE Pipe  PVC Pipe  Concrete Pipe

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BACKGROUND

- Recurring investment - $9.5M (5-years)
- **Gap**: Little work on developing a pipe management system
- **Need**: Guidelines for a preventive maintenance program
- **Deliverable**: Compile database, and recommend state-of-the-art practices
LITERATURE REVIEW

• Durability – ability to resist corrosion & abrasion
• Lining – most commonly used
• Life expectancy: 10 - 35 years
• Performance of Concrete culverts
  * pH of the flow  * Age  * Slope
• Functional – sediment depth
• Location – soil strata
LITERATURE REVIEW (contd.)

- Performance of Metal pipes
  - Corrosion
  - Backfill Gradation
  - Abrasion
  - Compaction

- Performance of Plastic culverts
  - Soil-structure interaction
Installation & backfilling procedures must be handled with care.
• Culvert Inspection Criteria
  * FHWA
  * FEMA
  * NASSCO
  * Ohio DOT

• Inspection of Culvert Repairs
  * No published criteria
  * Different from the host pipe
• Culvert Management program – five levels
  • Level 1 – Routine maintenance
  • Level 2 – Preventive maintenance
  • Level 3 – Repairs
  • Level 4 – Rehabilitation
  • Level 5 - Replacement
• Trenchless rehabilitation – adds 50 years
  • *Lining*
    * Sliplining
    * GIPP
  * CIPP
  * FIPP

• *Coating* – cementitious/non cementitious

• *Point repairs*
CIPP LINING
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### Site Visits Summary

#### Electrical Conductivity / Soil Resistivity

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#### Acid-Base reactions

- Site Visits Summary Table
- Electrical Conductivity / Soil Resistivity
- Acid-Base reactions
• Chemical Grout – weak durability, shorter longevity, effective in smaller dia

• Liners – very strong durability, good longevity, extremely effective in all dia

• Point repair (repair sleeve) – strong durability, good longevity, extremely effective in all dia
REPAIR FLOW CHART

1. Reinforced Concrete Pipe (RCP)
   - Pipe Diameter > 30 inches?
     - No: Joint Issue?
       - No: Pipe Liner (Recommended)
       - Yes: Band Seal Repair (Recommended)
     - Yes: Joint Seal (Recommended)
   - Yes: Chemical Grout
RECOMMENDATIONS

• Develop guidelines to systematically track & assess condition of pipes over time

• Need for comprehensive Pipe Management System to enable
  • Scheduling of maintenance activities
  • Prioritization of pipe work
  • Identification of funding needs
  • Methods of repair
• Deterioration Model
• Service Life Prediction
• Life Cycle Cost Analysis
• Develop relative economic rating of maintenance & rehab alternatives
QUESTIONS???

THANK YOU!