Trust but Verify
“Post Installation Inspection (PII) of Storm Pipe”
Today’s Discussion Topics;

• Basic Overview of Tools and Techniques
• National Trends
• WIN-WIN Aspects of PII
• Important Lessons Learned
• Implementation Resources
Post Installation Inspection

- **Acid Test for Installation**
  - Larger Diameters - Visual Inspection
  - Small Diameters – CCTV

- **Document Issues**
  - Location
  - Defect
  - Severity
  - Documentation, Measurements - Sketches – Photos

- **Advanced Tools**
  - CCTV
  - Laser Profiler
  - Laser Crack Measurement
Tools of the TRADE

Camera (Video)
Tools Cont...

LASERS....
Tools Cont...

Video Micrometer for measuring other Defects…NEWEST TOOL
Where we Stand Today

- 2 of 3 of State DOT’s Require PII
- 1 of 4 allow or require Advanced Inspection Tools

www.concrete-pipe.org
PII is Sweeping Across the Country!

Read More About it – ACPA ePipe - PII
WIN-WIN-WIN for Stakeholders

- **OWNER** assumes a *Trust but Verify* Position
- **Provides QA of Completed Installation**
  - Insures Owner getting what they Pay For
- **Provides Confirmation of Structural Integrity and Hydraulic Capacity**
- **Has Greatly Reduced Risk for unanticipated Maintenance or Replacement**
- **Improved Quality of installations**
- **Reduces Lifetime Project Cost!**
Lessons Learned!

- **Must Prepare DOT/Muni. Inspection & Evaluation Team**
  - Obtain Clear and good Inspection Data
    - Develop Standard PII Report Format
    - Develop Clear Evaluation Protocol
- **Educate Installers**
- **Communicate PII Eval. Process to all Stakeholders**

[www.concrete-pipe.org](http://www.concrete-pipe.org)
Inspection Team Preparation

• Trained on Proper Use of Inspection Equipment

• Proper Inspection Techniques & Issue Coding
  NASSCO PACP Certification

• Know Limitations

• Provide thorough, clear, quantifiable information

• Report Format as outlined by owner.
Inform & Train Installers

• Proper Handling & Installation Techniques are Critical!
• 99% of issues Identified in PII Reports are from damage inflicted during Handling/storage or Installation of pipe!

www.concrete-pipe.org
Handling

Do

Don’t

Balance

Do Not Drag
Stockpiling / Storage

- Do: Support on Barrel
- Don’t: Support on Bell
Driving It Like He Stole It!

Or Speed Kills!!!
Just Get it Off the Truck!
Chip to You,
Hole in Pipe In Inspection Notes,
Leaking Joint Later!

REPAIR IT!!!
Stable Foundation - Critical
Bedding Inspection

**Do** (support on barrels)

**Don’t** (support on bells)

**Don’t** (nonuniform support)
Line & Grade

**Incorrect**

**Do**
remove pipe section

**Don’t**
adjust pipe alignment or grade with pipe in the home position.

American Concrete Pipe Association
Evaluation Team

• DOT/Muni Specs. & AASHTO Guidelines

• Differentiate Between
  ▪ Cosmetic = Non-ISSUES
  ▪ Minor Damage = Note but No Repair
  ▪ Structural Issue = Evaluate Severity and determine if acceptable or what remedy required
PII Specs go Hand in Hand with Pipe Evaluation Guidelines

• Experience/Lessons Learned
  ▪ PII Drives Need for Eval. Guidelines
  ▪ No Guideline = Fire Drills and Lots of Emergency (Intense) Training
  ▪ Set and Agree on Expectations before Video Cameras Roll!
Lessons Learned REVIEW!

• Must Prepare DOT/Muni. Inspection & Evaluation Team
  ▪ Obtain Clear and good Inspection Data
    ▪ Develop Standard PII Report Format
    ▪ Develop Clear Evaluation Protocol

• Educate Installers

• Communicate PII Eval. Process to all Stakeholders

www.concrete-pipe.org
ACPA Post Installation Inspection – Implementation RESOURCES

- ACPA - PII ePipe - Overview of PII + Summary of State Standards/Specifications
- PII Model Specifications
- PII Pipe Evaluation and Repair Guidelines
PII Inspection Tool #1

Over the past decade, the deteriorating state of our nation’s infrastructure has gained increased attention. Great emphasis has been placed on the aging bridges of our nation’s roadways due to several high profile catastrophic failures. Sadly, it took the death of several motorists to spur a public outcry to address the current state of despair of one our nation’s most important infrastructure components.

Our roadway pipe systems demand this very same attention, since they are the “unseen” bridges of our nation’s ground transportation systems. While we must address the existing aging system, to maximize the life of future installations we must act now to ensure quality installations are occurring.

It is apparent that we must fully address the importance of:
- Proper **INSPECTION** of all installations,
- Adequate design life,
- Conservative design approaches,
- Complete and stringent reviews of all critical construction components,
- Strong quality assurance programs throughout the construction process, and
- Diligent and proper maintenance of all the components of our roadway infrastructure.
ePipe – “Video and Laser Measurement Tools”

• Home Page www.concrete-pipe.org – ePipe’s

• Content
  ▪ Overview & Benefits
  ▪ ASTM/AASHTO Stds.
  ▪ DOT Acceptance

• Format = Print Brochure (Available Now) or Fully Electronic Version (90% Complete)
Post Installation Inspection
Resources

• Guidelines for PII (Model Specs)
  ▪ “Post Installation Inspection Basics”
  ▪ “Post Installation Inspection Methods, Tools, and Reports”

• www.concrete-pipe.org – Home Page
  – What’s New, Guidelines for PII
Evaluation and Repair Tools

- “Post Installation Evaluation and Repair Guidelines of Installed RCP”
- “Evaluation & Repair Guidelines for New Drainage Pipe”
- “Sample Specifications for Evaluation of Newly Installed Culvert and Storm Drain Pipe”
Evaluation Tool #1

Post Installation Evaluation and Repair of Installed Reinforced Concrete Pipe

American Concrete Pipe Association
info@concrete-pipe.org
www.concrete-pipe.org
Evaluation and Repair Manual Details…

• Post Installation Evaluation and Repair of Installed RCP
  ▪ Background
  ▪ Contents
  ▪ Target Audience
  ▪ Opportunities to Learn More
CONTENTS Of Manual

- Background on RCP Loads, Design, Structural Confirmation, & Joint Performance

- Decision Matrix
  - Crack Eval. & Repair
  - Joint Eval. & Repair
  - Spalling and Slabbing Eval. & Repair

- Commentary for all Matrix ?’s & action suggestions

- References & Supporting Documents
II. MATRIX

RCP Crack Evaluation

- C1: Evaluate crack orientation.
  - C2: Is the crack transverse or longitudinal?
    - Yes: C2a: Seal crack with approved method.
    - No: C2b: Measure crack.
  - C3: Is the crack width < 0.010? (inches)
    - Yes: C4: Note in inspection. No repair or remediation required. Photograph for monitoring conditions for subsequent inspections.
    - No: C5: Consider the crack as stabilizing or structural.
      - Yes: C6: Is the pH of soil & effluent > 3.5? (suitable for stabilization?)
        - Yes: C7: Seal crack with approved method to protect reinforcing.
        - No: C8: Note in inspection. No repair or remediation required. Photograph for monitoring conditions for subsequent inspections.
      - No: C9: Is the crack width < 0.100? (inches)
        - Yes: C10: Is the pipe stabilized?
          - Yes: C11: Structural repair.
          - No: C12: Remove pipe or replace pipe.
        - No: C13: Stabilize the pipe and remove and replace pipe.
  - C14: Is there vertical stress across cracks?
    - Yes: C15: Seal crack with approved method to protect reinforcing.
    - No: C16: Seal crack with approved method to protect reinforcing.
C1-Evaluate crack orientation.

C2-Is the crack longitudinal or tranverse?

C3-Is there soil migration through the crack?

Yes → C22-Seal crack with approved method.

No → C21-Note in inspection. No repair or remediation required. Photograph for monitoring conditions subsequent inspections.

C4-Measure crack.
III. CRACK EVALUATION AND REPAIR

C1 (CRACK INSPECTION), C2 (LONGITUDINAL /TRANSVERSE CRACKS)

It is important to understand that the orientation of a crack in the pipe wall will assist in determining the severity and possible cause of the crack. There are excellent references to better understand crack orientation, crack severity, and possible causes of issues that may be found in pipe inspections. The *AASHTO LRFD Bridge Construction Specification Section 27.6.4 & 5* contains several brief explanations in the commentary portions of that document about the cause of various crack location or crack patterns. The following is an excerpt from FHWA Culvert Inspection Manual\(^7\) that discusses possible causes of certain crack locations and or patterns one might find in installed RCP:
Eval. Tool #2
“Evaluation & Repair Guidelines for New Drainage Pipe” (Short Simple…)

Eval. Tool #3 -
“Sample Specifications for Evaluation of Newly Installed Culvert and Storm Drain Pipe” (More Detailed Approach)

• Located on Home Page of ACPA Website
  ▪ What’s New – Guidelines for PII
WANT MORE DETAILS MORE DEPTH
Post Installation Inspection & RCP Evaluation Tools DEMO & Plant Tour
Goal

• Introduce Attendees to PII Tools and Procedures, RCP Strength & Quality
• Provide Knowledge and Tools to obtain Correct Evaluation of Installed RCP
• See RCP Pipe Production and Structural Testing Procedures
I Am All Ears....for your ?’s