

DeIDOT

Pipe Inspection and Remediation Guide

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Presented by:

Mike Nauman, PE

mnauman@gpinet.com

302-203-6093

Barry Benton, PE

bbenton@gpinet.com

302-203-6083



How Did We Get Here?

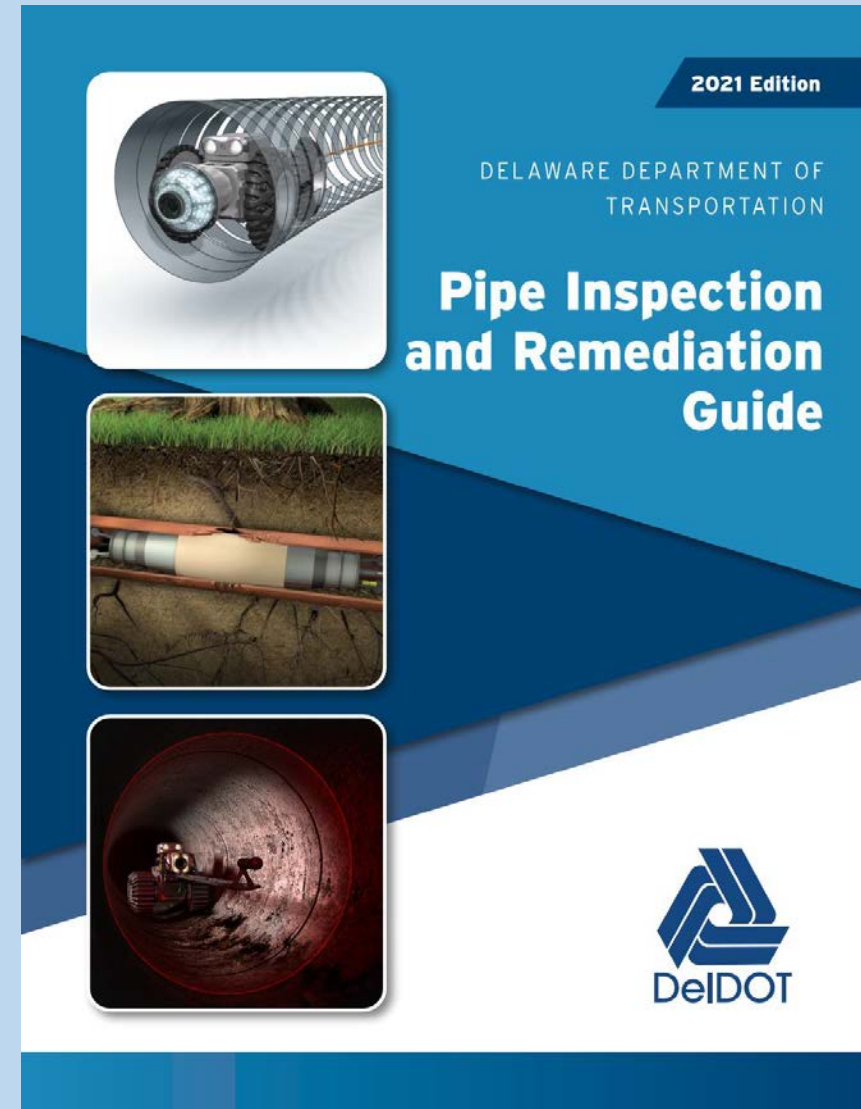
601.3.9 Post Installation Inspection.

- A. The Department will video, deflection test, or manually inspect repaired, lined, or new pipes 48 inches in diameter or less no sooner than 30 days after placement or before placement of the final lift of hot mix.
- B. The Department will manually inspect pipes 48 inches in diameter or larger.
- C. Clean pipe before video or manual inspection.
- D. Provide traffic control during pipe inspection as needed.
- E. The Department will conduct inspections of pipes placed under paved areas, or areas planned for paving, before placement of the final layer of roadway pavement material.
- F. Defects determined by the engineer to require remedial work will require submittal and approval of the repair.



What is the Purpose of the Guide?

- Document DeIDOT's policy for post installation pipe inspection,
- Document current procedure for post installation pipe inspection,
- Document the requirements and submittals for anyone performing post installation pipe inspection on DeIDOT projects, and
- Provide guidance to staff evaluating post installation pipe inspection reports.



Contract Hierarchy (105.6)

From Standard Specifications:

1. General Description
2. General Notices
3. Plans
4. Special Provisions
5. Standard Construction Details
6. Standard Specifications
7. Electronic Design Files

“This guide is intended to compile industry best practices and does not have contract governance unless specifically cited.”

Standard Specifications

for
Road and Bridge Construction

AUGUST 2020



Prepared by

The State of Delaware

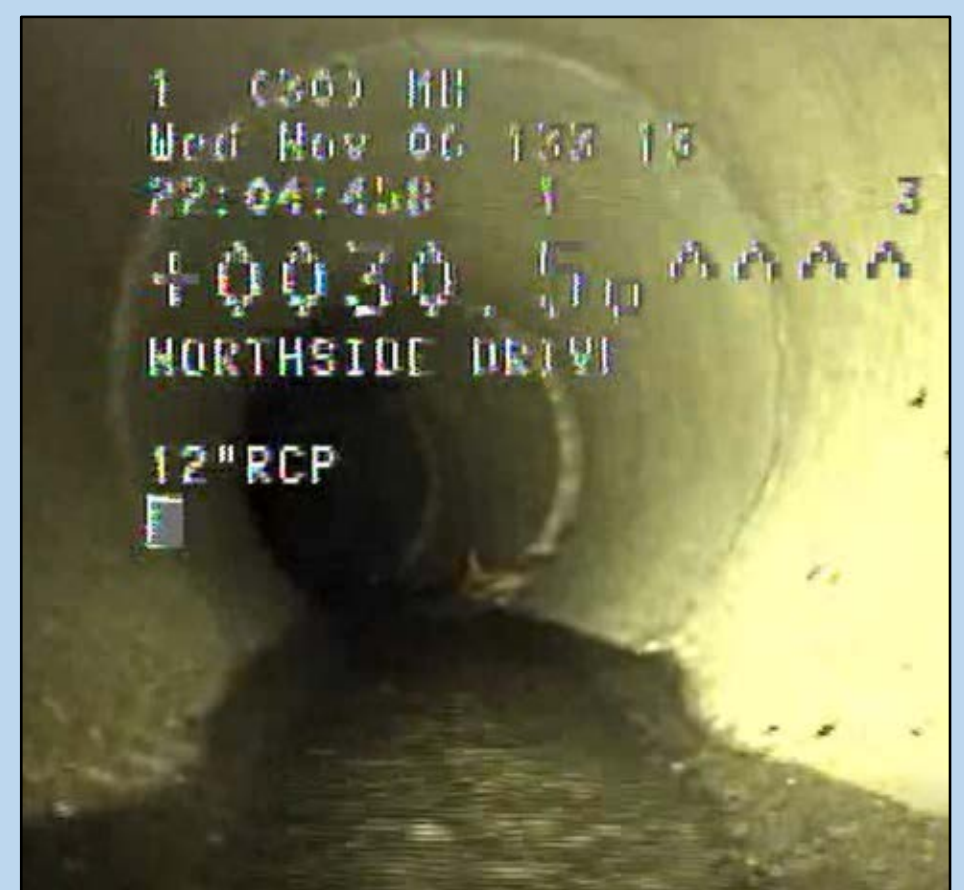
DEPARTMENT OF TRANSPORTATION
Excellence in Transportation • Every Trip • Every Mode • Every Dollar • Everyone

Jennifer Cohan, Secretary
Shanté A. Hastings, Chief Engineer



Design Application

- Includes Section 1.1: “Pipe Video Inspections During the Design Phase”.
- This guide is a reference and provides best practices to follow.
- Design phase investigations have allowed time to elapse, so defects present themselves.



601.3.1 Preconstruction Inspection.

The Department will review all existing pipes for use in the final drainage system and will discuss the system condition with the contractor before starting construction.



M & O Activity

- Includes Section 1.4: “Maintenance Activity Considerations”.
- Cost vs benefit considerations.
- Consider performing full post installation in the following cases:
 - Long installations of pipe.
 - High traffic volumes.
 - Locations where other available post installation inspection tools are not effective.
 - Documented installation issues during construction.



Construction Application

- Primary users of the manual.
- Post installation pipe inspection work is being performed under current Construction Inspection agreements.
- Guide provides a standardization of deliverables to be provided to the Department.
- Provides information to assist the Department reviewer understand the defects present and their severity.



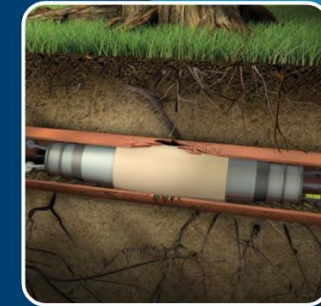
Non-DeIDOT Administered Contracts

- Best practice as well.
- Pertinent language must be incorporated as part of the permit or other contract to be able to enforce.



What is in the Guide?

1. Introduction
2. Inspection Preparation and Procedures
3. Equipment
4. Storm Drain Inspection Deliverables
5. Reinforced Concrete Pipe Post Installation Inspection
6. Thermoplastic Pipe Post Installation Inspection
7. Corrugated Metal Pipe Post Installation Inspection
8. Remediation Treatments



2021 Edition

DELAWARE DEPARTMENT OF
TRANSPORTATION

Pipe Inspection and Remediation Guide



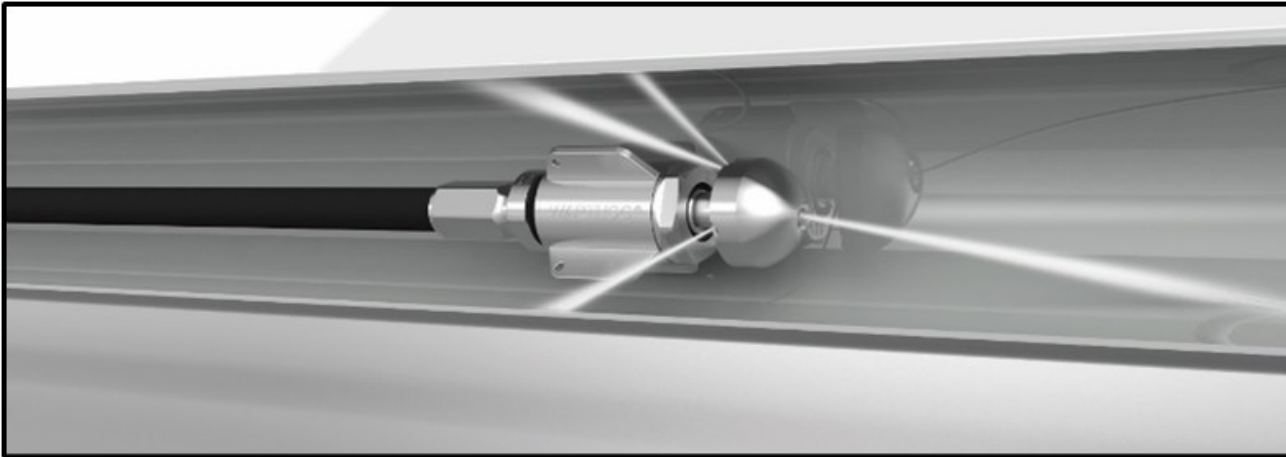
Chapter 2: Contents

- Inspection Preparation and Procedures
 - Traffic control
 - Flow control
 - Pipe cleaning
 - Inspection procedures and best practices.



Chapter 3: Equipment

- Pipe Cleaning Equipment
 - High-Velocity Hydro Jetting
 - Vacuum Extraction
- Camera Equipment
- Mandrels



Chapter 4: Deliverables

- Pipe video for each individual pipe run (for pipes under 48" diameter),
- GIS data for asset management purposes, and
- Storm Drain Report.
 - Cover sheet (standard form),
 - Table of Contents,
 - Schematic plans,
 - Post Installation Pipe Inspection Defect Log (standard form),
 - Discussion of results, and
 - Pertinent inspection reports (some standard forms).



DeIDOT Storm Drain Inspection Report

Date Submitted:

Project Information:

Project/ Subdivision Name:

County:

District:

Project Number:

Contractor/ Developer:

Inspector Information:

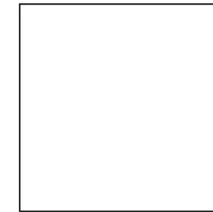
Post Installation Inspection Contractor Company:

Construction Inspection Company:

I certify to the to the best of my knowledge and belief that the staff responsible for the creation of this report were qualified for the task and that the information contained in the report is accurate and follows the criteria and procedures outlined in the current DeIDOT Pipe Video Manual.

Staff Supervisor

Date

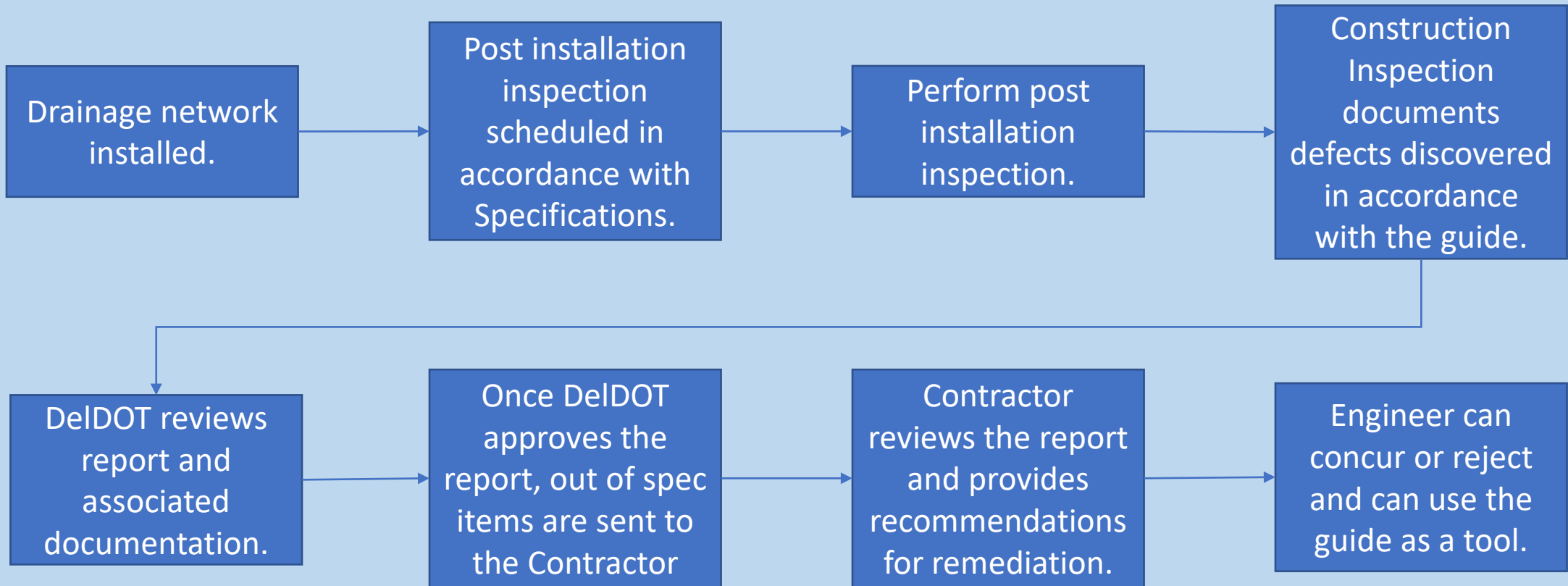


Apply Seal Above

Figure 4-1: Storm Drain Report Cover Sheet

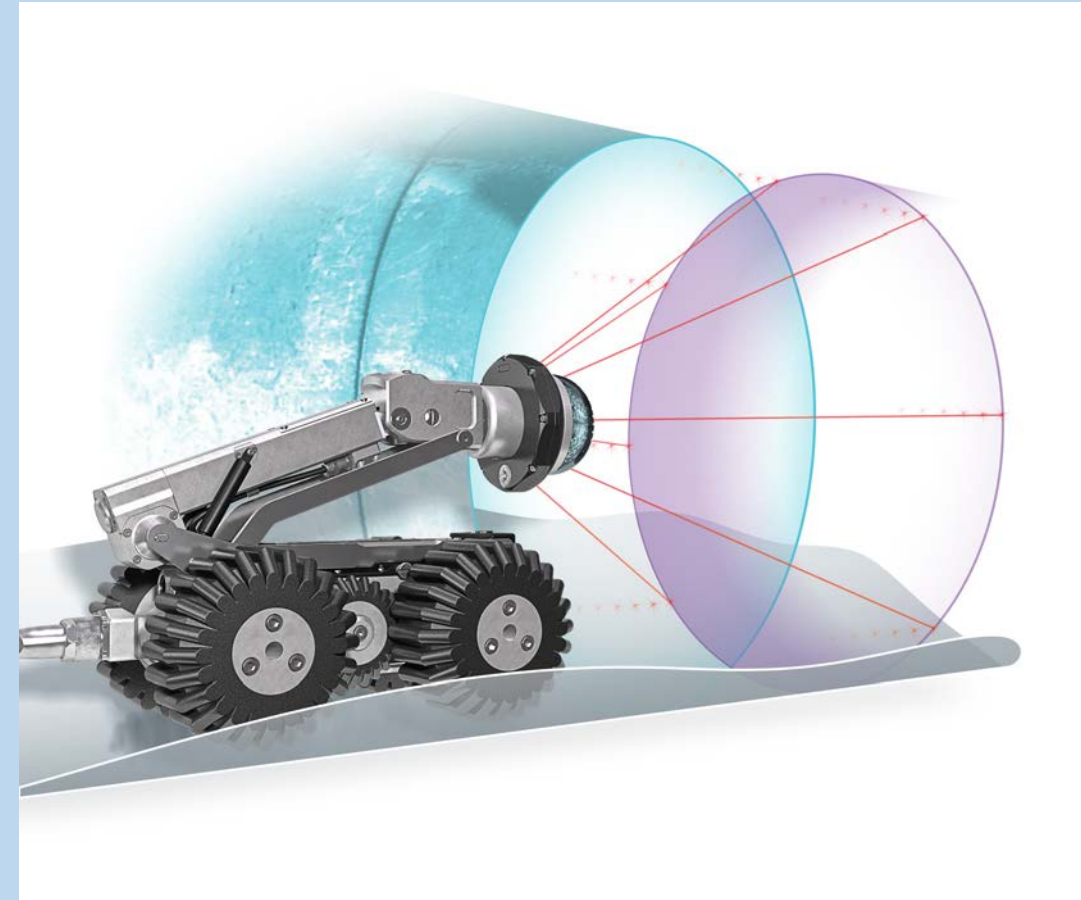


Post Installation Flow Chart



Content of Chapters 5 to 7

- Describes the properties for the various pipe materials that DeIDOT uses.
- Different defects for different pipe materials.
- Each chapter contains the following:
 - Section on Defects,
 - Section on General Considerations, and
 - Section on Suggested Remediation Flow Charts.

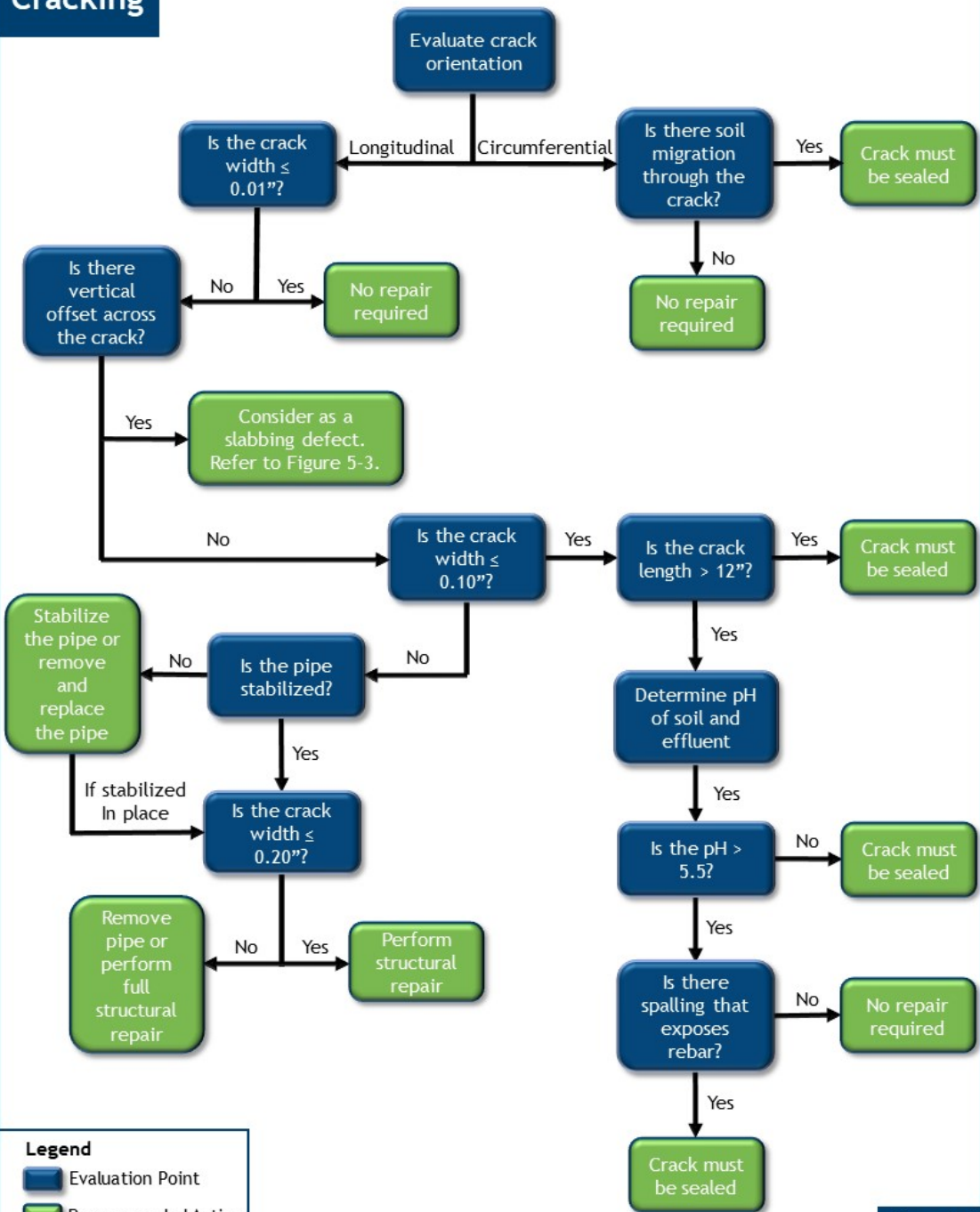


Chapter 5 Contents

- Defects included:
 - Joint defects (joint gaps, joint spalling, joint cracking and faulting),
 - Cracking (circumferential and longitudinal)
 - Vertical offset, crack spalling and slabbing
 - Misalignment, and
 - Spalling.
- General considerations:
 - Autogenous healing,
 - pH,
 - Installation stabilization, and
 - Differential settlement.



Cracking



Legend
 Evaluation Point
 Recommended Action

Figure 5-1



Chapter 5 Example

601.3.3 C 2

The engineer will determine the need for remediation or replacement for pipe post-installation for any of the following reasons:

- a. Vertical or horizontal misalignment;
- b. spalls;
- c. slabbing meaning large slabs of concrete peeling away from the sides with a straightening of the reinforcement;
- d. cracks greater than 0.01 inch in width extending 12" or greater regardless of position in the pipe wall are to be sealed;
- e. cracks greater than 0.1 inch in width and in accordance with AASHTO M207 or M170;
- f. differential joint movement;
- g. improper gasket or joint sealant placement;
- h. joint leakage;
- i. settlement; and
- j. joint separations greater than manufacturer's recommendation or as follows, whichever is less:
 - I. 12 to 36 inch diameter 0.75 inch
 - II. 42 inch and larger diameter 1.25 inch
 - III. All elliptical pipe 1.50 inch

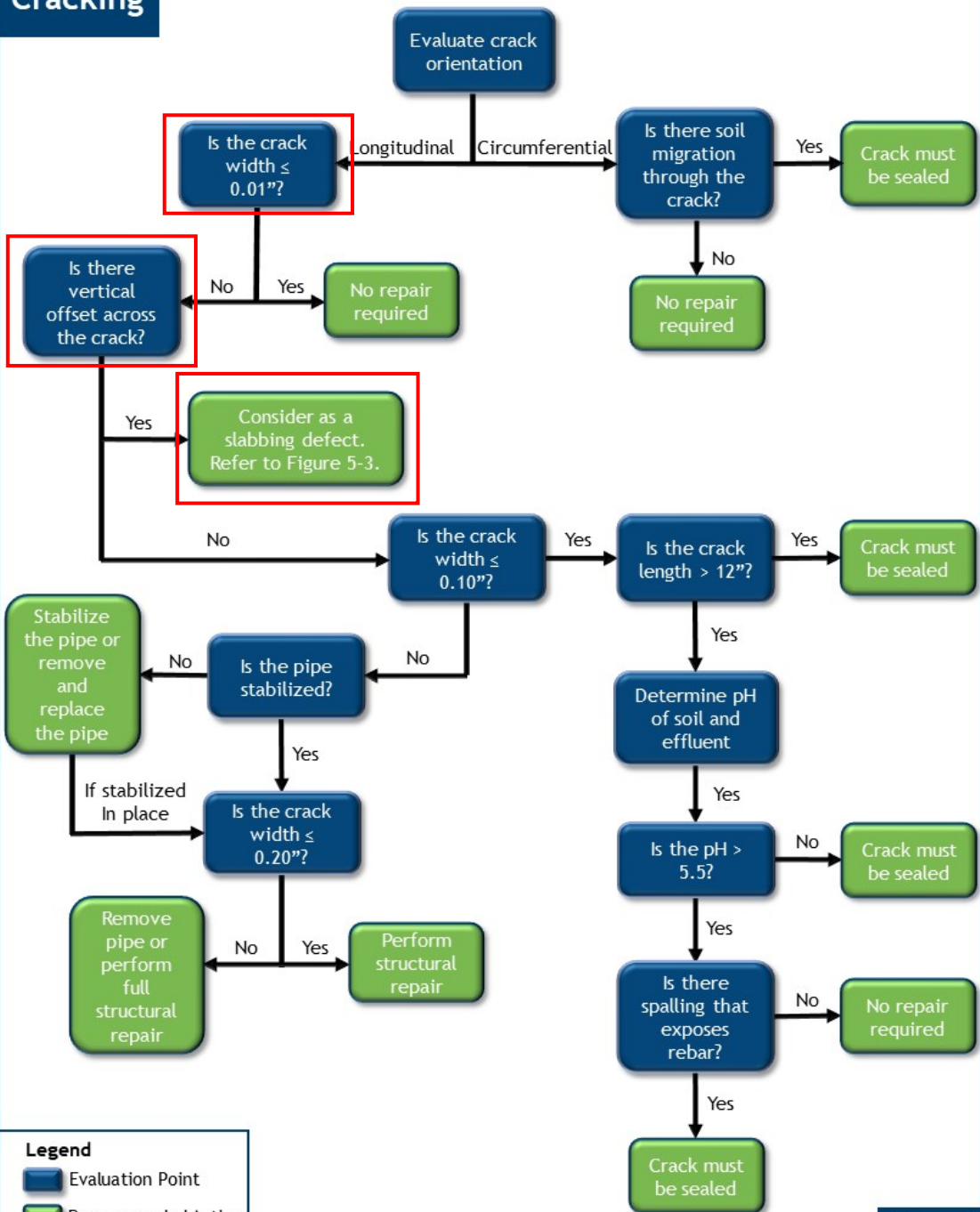


Chapter 5 Example

- Post installation video discovers 0.15" crack with significant vertical offset.
 - Defined as a defect in Chapter 5 of Pipe Inspection and Remediation Guide. CI documents in accordance with Chapter 4 requirements.
 - Defined as a defect according to the Standard Specifications where “the engineer will determine the need for remediation or replacement for pipe” (see items 2d and 2e).
 - DeIDOT Engineer receives CI’s report documenting the defect.
 - If there are no comments, the Engineer can provide to the contractor and ask the contractor for remediation in accordance with requirements of Specifications.
 - The Engineer can review contractor’s submission in accordance with Figure 5-1.



Cracking

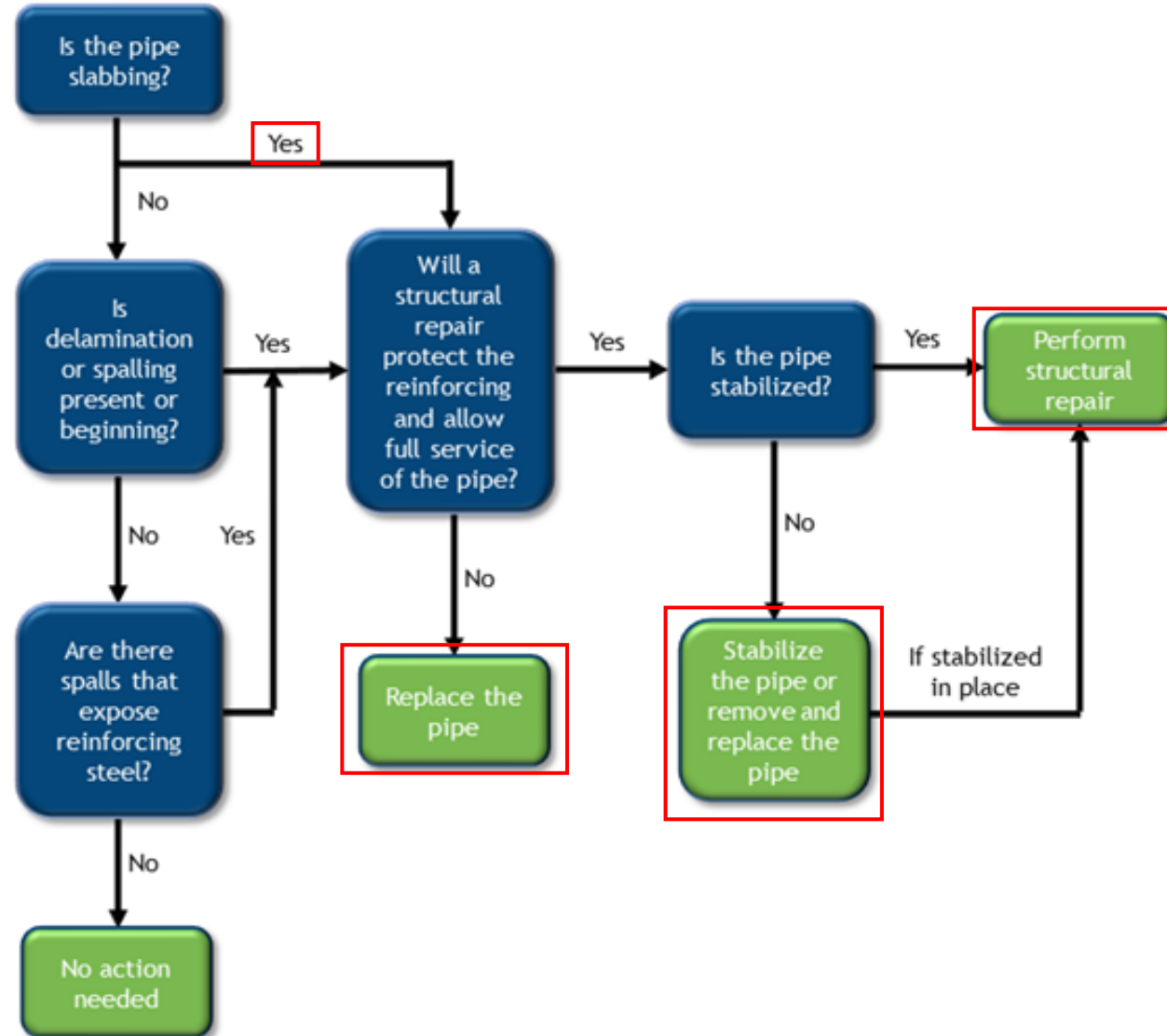


Legend
 Evaluation Point
 Recommended Action

Figure 5-1



Spalling and Slabbing



Legend



-  Evaluation Point
-  Recommended Action

Figure 5-3

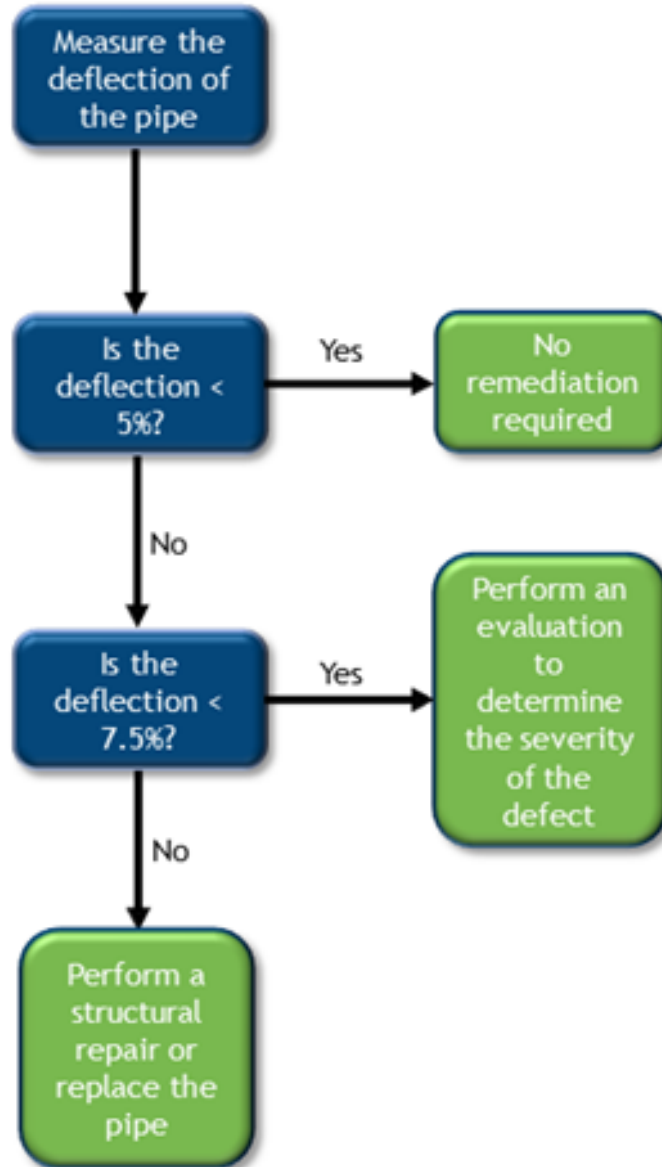


Chapter 6 Contents

- Defects included:
 - Installation deflection,
 - Joint defects,
 - Cracks, tearing and holes,
 - Misalignment, and
 - Buckling, bulging or racking.
- General considerations:
 - Allowable joint gaps.



Deflection



Legend

 Evaluation Point

 Recommended Action

Figure 6-1



Chapter 6 Example

601.3.4 C 2

The engineer will determine the need for remediation or replacement for pipe post-installation for any of the following reasons:

- a. pipe deflection greater than 5 percent or the manufacturer's recommendation, whichever is less;
- b. vertical or horizontal joint misalignment;
- c. connections with a gap exceeding $3/16$ of an inch;
- d. cracking or tearing;
- e. creases; and
- f. joint separations greater than the manufacturer's recommendation or 1 inch, whichever is less.

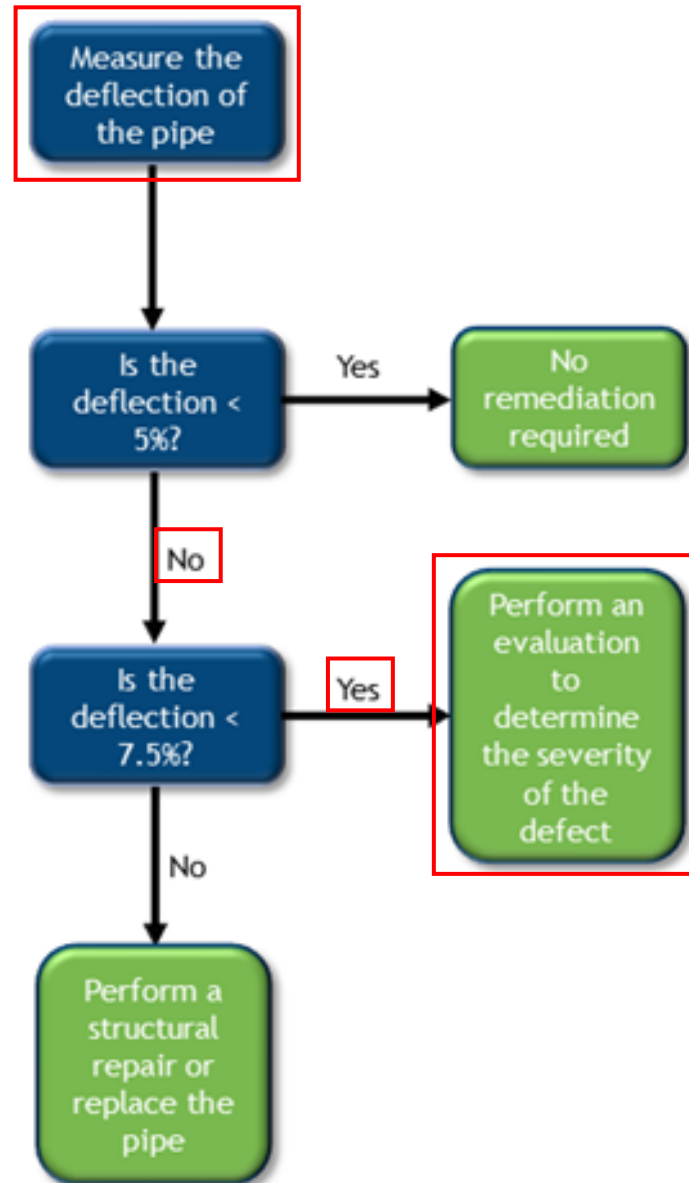


Chapter 6 Example

- Post installation video discovers 6.5% deflection.
 - Defined as a defect in Chapter 6 of Pipe Inspection and Remediation Guide. CI documents in accordance with Chapter 4 requirements.
 - Defined as a defect according to the Standard Specifications where “the engineer will determine the need for remediation or replacement for pipe” (see item 2a).
 - DeIDOT Engineer receives CI’s report documenting the defect.
 - If there are no comments, the Engineer can provide to the contractor and ask the contractor to submit either analysis or remediation alternatives.
 - The Engineer can review contractor’s submission in accordance with Figure 6-1.



Deflection



Legend

 Evaluation Point

 Recommended Action

Figure 6-1



Chapter 7 Contents

- Defects included:
 - Installation deflection,
 - Joint defects,
 - Cracks, tearing and holes,
 - Misalignment,
 - Buckling, bulging or racking, and
 - Coatings damage.
- General considerations:
 - Environmental conditions,
 - Crimping of pipe wall, and
 - CMP pipe joint connection.



Chapter 8 Contents

- Not an all-inclusive list of remediation techniques.
- Two defect types:
 - Localized point defect – Pipe remediations that occur at a spot location and not applied linearly along a pipe.
 - Linear defect – Pipe remediations that occur linearly along a substantial length of a pipe.
- Two categories of Remediations:
 - Trenchless techniques – Does not require an open cut to perform repair.
 - Open techniques – Requires an open cut to perform the repair.



Pipe Remediation

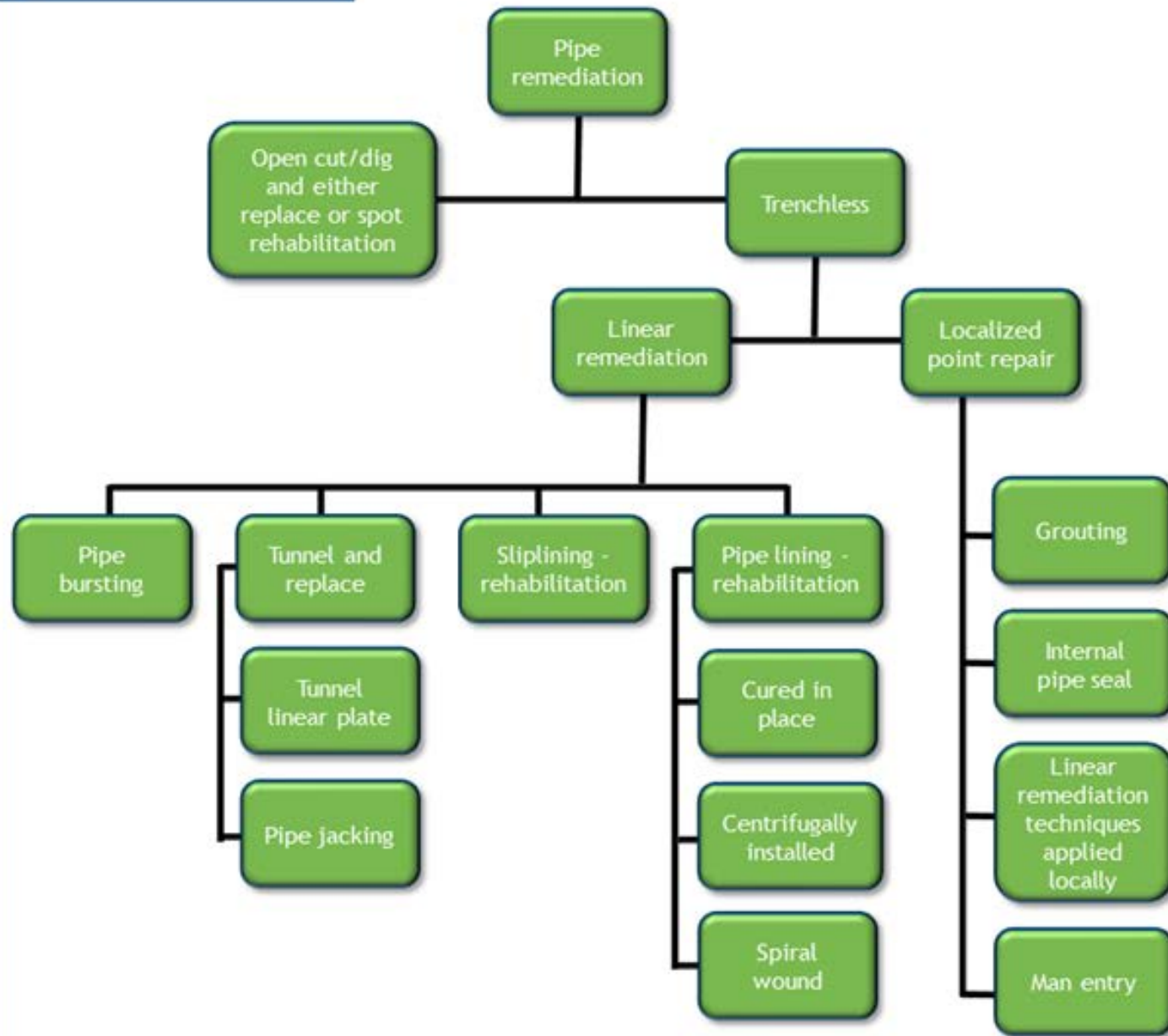


Figure 8-1



Special Provisions

- 601510 – Internal Pipe Point Repair, 12” to 42” Diameter
- 601511 – Internal Pipe Point Repair, Greater than 42” Diameter
- 601512 – External Pipe Point Repair, 12” to 36” Diameter
- 601513 – External Pipe Point Repair, Greater than 36” Diameter
- 601514 – Non-structural Pipe Liner, 12” to 36” Diameter
- 601515 – Non-structural Pipe Liner, Greater than 36” Diameter
- 601516 – Structural Pipe Liner, 12” to 36” Diameter
- 601517 – Structural Pipe Liner, Greater than 36” Diameter



Videos:

- Pipe Grouting: <https://youtu.be/PQTIXBzLk04>
- Pipe Lining: <https://youtu.be/AB4vgNLGmNM>
- Slip Lining: <https://youtu.be/AB4vgNLGmNM>
- Pipe Jacking: <https://youtu.be/PQTIXBzLk04>
- Pipe Bursting: <https://youtu.be/HX5beh0ubGY>
- Centrifugally Installed: <https://youtu.be/TxTbySKCs6Y?t=141>



Thank You!

James Osborne, PE

James.osborne@delaware.gov

302-760-2221

Mike Nauman, PE

mnauman@gpinet.com

302-203-6093

Barry Benton, PE

bbenton@gpinet.com

302-203-6083



Vermin (Raccoon) in pipe

