Welcome to PACP Version 7.0

The New Standard to Pipe Asset Management

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NASSCO — Setting the industry standards for the rehabilitation of underground utilities since 1976

WRIGHT-PIERCE
Engineering a Better Environment

NASTT-NE
November 17, 2016

Overview

- Background
- PACP Updates
- MACP/LACP Updates
- Risk Management
- Program Benefits
- V7 Software Certification
- Q/A

Background

- Industry Standard
  - Pipes, structures, laterals
  - Original Release 2002
  - Minor/Major Updates
- Increased User Base
- New User Base
  - USCE and DOTs
- Revisions by Committee
  - Over 100 CS Professionals
- Version 7.0 May 2015

NASSCO

National Association of Sewer Service Companies

Mission

Improve the success rate of everyone involved in the pipeline rehabilitation industry through education, technical resources, and industry advocacy

Goals

Set industry standards for the assessment and rehabilitation of underground pipelines by providing standardization and consistency in evaluating pipes, manholes and laterals.

Statistics

- 500+ Member Organizations
- Over 20,000 users
- US, Canada, South America
  - Manual available in English, French, Spanish

PACP Updates

- Educational Improvements
- Robust/Informative Header Form
- Deterioration Mechanisms
- Supplemental Technologies
- Inspection Status
- Consequence of Failure
- Additional edits/improvements
  - 7.0.1 and 7.0.2

Educational Improvements

- Training material follows manual
- Clarification language for FAQs
- Significant illustrations added: diagrams, schematics, photographs, examples
- Pipe Material, Linings, & Coatings
- Moved Buckling into Deformed Code
- Color Coded Chart Enhancements

Section 2 — Header Form Fields

20 Sewer Use 2-8

SS	=	Sanitary
SW	=	Stormwater
PR	=	Processes
CB	=	Combined
FM	=	Force Main
XX	=	Not Known
ZZ	=	Other

21 Direction 2-9

U	=	Upstream
D	=	Downstream

22 Flow Control 2-9

P	=	Plugged
L	=	Lift Station
B	=	Bypassed
N	=	Not Controlled
D	=	Dewatered Using Jetter

25 Shape 2-10 D-1

A	=	Arched
B	=	Barrel
C	=	Circular
E	=	Egg-shaped
H	=	Horseshoe
O	=	Oval (elliptical)

25 Shape 2-10 D-1

R	=	Rectangular
S	=	Square
T	=	Trapezoidal
U	=	U-Shaped with Flat Top
Z	=	Other

26 Material 2-10 D-4

AC	=	Asbestos Cement
ABS	=	Acrylonitrile Butadiene Styrene
BR	=	Brick
CAS	=	Cast Iron
CMP	=	Corrugated Metal Pipe
CP	=	Concrete Pipe

26 Material 2-10 D-4

CSB	=	Conc. Segments Bolted
CSU	=	Conc. Segments Unbolted
CT	=	Clay Tile
DIP	=	Ductile Iron Pipe
FRP	=	Fiberglass Reinforced Pipe

26 Material 2-10 D-4

OB	=	Orangeburg/Pitch Fiber
PCCP	=	Pre-Stressed Concrete Cylinder Pipe
PCP	=	Polymer Concrete Pipe
PE	=	Polyethylene
PP	=	Polypropylene

26 Material 2-10 D-4

PSC	=	Plastic/Steel Composite
PVC	=	Polyvinyl Chloride
RCP	=	Reinf. Concrete Pipe
RMP	=	Reinf. Plastic Pipe
SP	=	Steel Pipe
SB	=	Segmented Block

26 Material 2-10 D-4

VCP	=	Vitrified Clay Pipe
WD	=	Wood
XXX	=	Not Known
ZZZ	=	Other

27 Lining Method 2-11 D-17

CP	=	Cured-In-Place Pipe
FF	=	Fold and Form
GRC	=	Glass Reinf. Cement
SW	=	Spiral-Wound
SC	=	Continuous Slip Liner
SE	=	Sectional Slip Liner
SN	=	Segmented Panel

27 Lining Method 2-11 D-17

SP	=	Segmented Pipe
GP	=	Grout-In-Place Liner
FP	=	Formed-In-Place Liner
SL	=	Spray Liner
XX	=	Not Known
ZZ	=	Other

27a Coating Method 2-12 D-23

EP	=	Epoxy
PO	=	Polyurethane
PU	=	Polyurea
CT	=	Coal Tar
CM	=	Cement Mortar
XX	=	Not Known
ZZ	=	Other

34 Purpose 2-14

A	=	Maintenance
B	=	Infiltration/Inflow Invest.
C	=	Post-Rehabilitation
D	=	Pre-Rehabilitation
E	=	Pre-Acceptance
F	=	Routine Assessment

34 Purpose 2-14

G	=	Capital Improvement Program Assessment
H	=	Resurvey
R	=	Pre-Existing Video
X	=	Not Known

36 Pre-Cleaning 2-15

J	=	Jetting
H	=	Heavy Cleaning
N	=	No Pre-Cleaning
X	=	Not Known

Header Form Updates

- Reviewed by & Certificate #
- Inspection Status
- Vertical Datum (Z elev)
- Inspection Technology Used
- Coating or Lining Method
- Infiltration (I) code modifiers (B, L, C, J)
- Tap (T) code modifiers prioritized (D, I, C, A, B)

Deterioration Mechanisms

Structural	O&M	Construction/Design
Soil quality	Cleaning Methods	Surcharging
Position of GW Table	Roots	Quality of Construction
Loads	FOG	Lateral Connection Methods
Alignment/Sags	H_2S	
Pipe Strength	Blockages	
Mortar Loss	Improper Pipe Repairs	

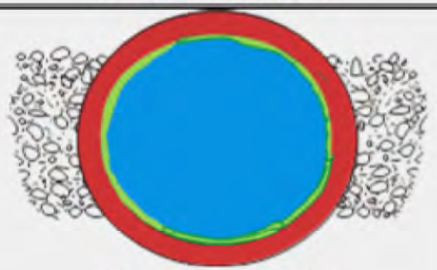
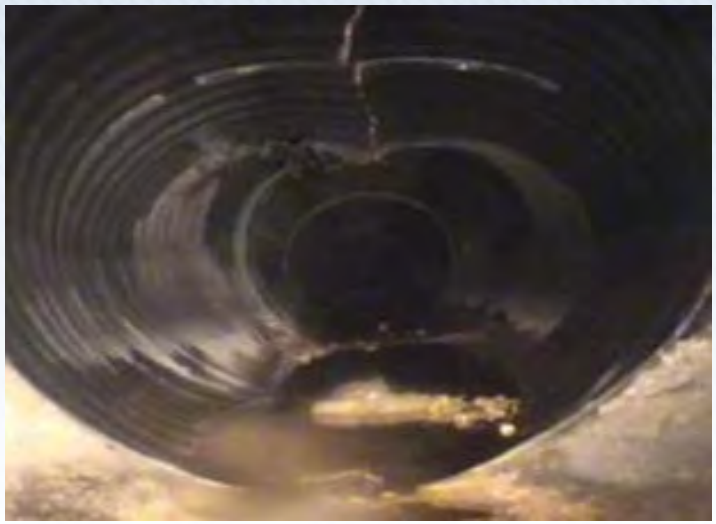
Stage	Illustration
Stage 1 – Dissolved oxygen concentrations can be depleted in force mains and large slow moving gravity pipes, where the sewage stagnates. Sulfate reducing bacteria, present within the wastewater and in the slime layer on the pipe, convert the sulfates into dissolved hydrogen sulfide and hydrogen sulfide ions. The top image shows this slime layer as it occurs on the pipe walls of a force main or siphon. The bottom image shows the slime layer occurring on the bottom of a low slope pipe where there is no turbulence to introduce dissolved oxygen into the sewage.	 Force Main  Gravity Pipe
Stage 2 - The sulfide is then released as hydrogen sulfide gas at points of wastewater turbulence (drops, discharges, velocity changes). Hydrogen sulfide gas is then oxidized to create sulfuric acid (H_2SO_4) by bacteria living on sewer walls and structures above the wastewater. The acid reacts with the concrete to produce low-strength by-products and corrode the pipe material. This image illustrates the usual deterioration above the water level, which is created by the release of hydrogen sulfide gas.	

Figure 1: Surface Deterioration from H_2S Attack

Inspection Technologies

- Laser profiling
- Laser diode measurement tools
- Sonar
- Sidewall scanning
- Zoom camera
- Pipe penetrating radar



Inspection Status

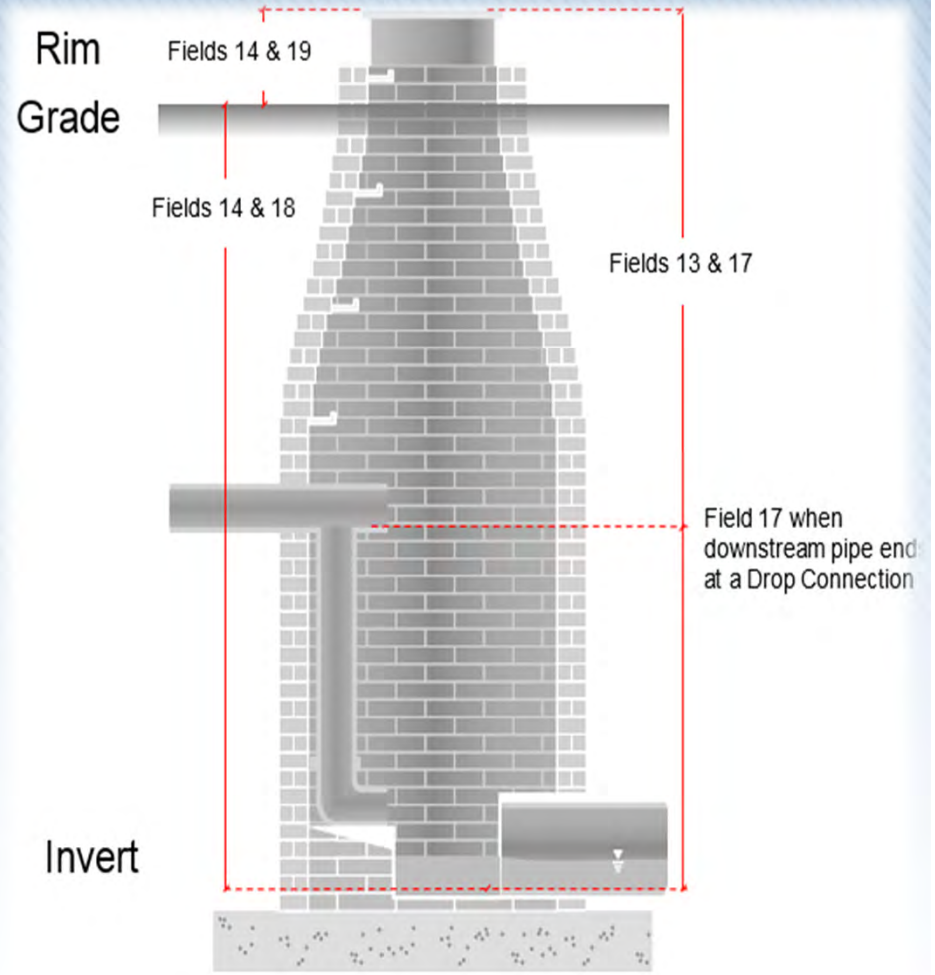
- New field
- Taken from MACP
- Complete (CI) vs. Incomplete Inspections
  - BM = Buried and Marked
  - NA = No Access
  - NE = Does not Exist
  - NF = Not Found
  - NI = Traffic
  - NO = Not Opened
  - SD = Surcharged/Debris or too much debris
- Ability to easily report production

MACP/LACP Updates

- Manhole Diagram
- Manhole Ratings
- Simplified Level 1 Inspections
- New Codes:

  Backflow Preventers

  Roof Vents



Risk Management

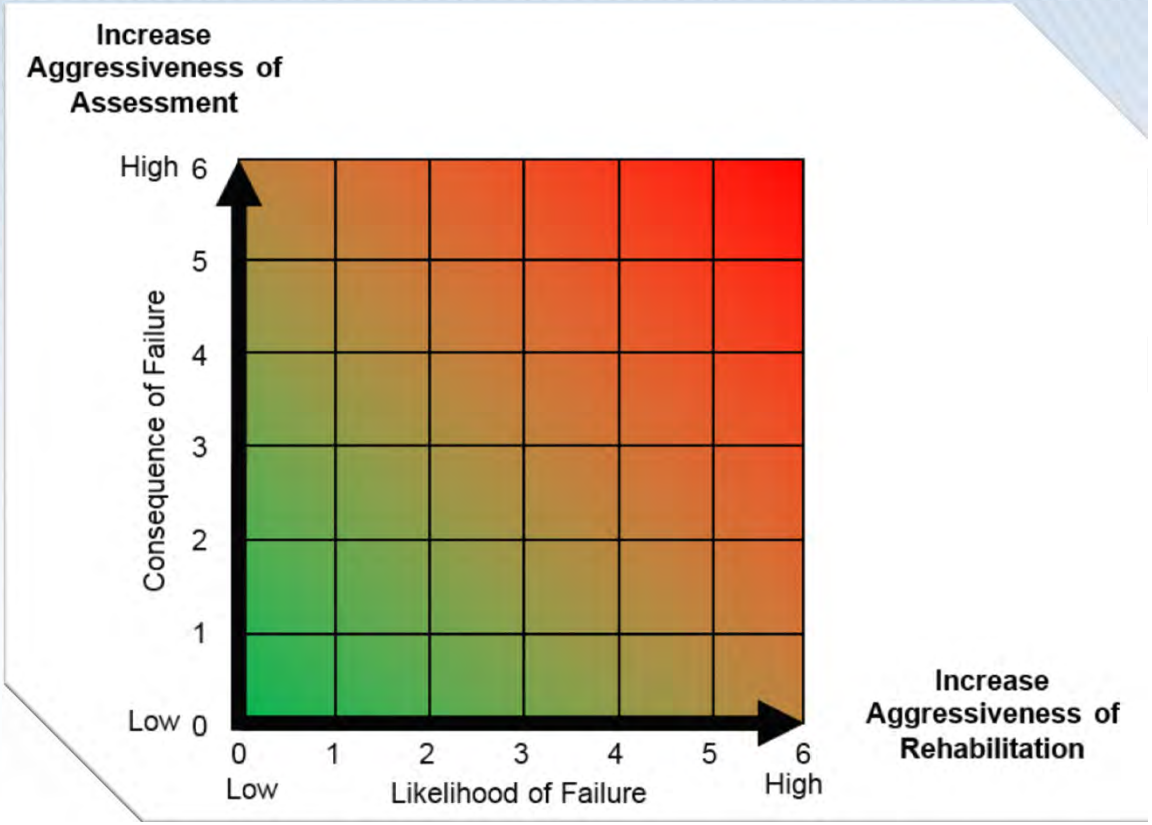
- Condition = Likelihood of Failure (LoF)
  - PACP condition ratings
- Criticality = Consequence of Failure (CoF)

Environmental Contamination	**Social Impacts**	**Economical Impacts**
Soil Contamination	Hospitals	Repairs
Groundwater	Schools	Legal Fees
Waterways	Critical Services	Fines

Risk Management

- CoF provided by customer
- Manual provides method to establish CoF

RISK =
LoF x CoF



Program Benefits

Data Collection	Engineering/Management	Regulatory
Simplifies inventory process	Improved data quality, reliable data	CMOM Consent Orders
Increases consistency	Better understand pipeline condition	AM Plans & Approval
Improves objectivity	Deterioration modeling & benchmarking	Annual Reporting
Standard codes for condition	Project & Funding Approval	Project & Funding Approval
Ease in benchmarking	CIP & AM Planning	Recognized & Suggested by EPA

EPA United States Environmental Protection Agency

Condition Assessment of Underground Pipes

April 2015

With excerpts from: Condition Assessment of Wastewater Collection Systems, EPA/600/R-09/049

EPA New England Water Infras
managers, local officials, and other
see http://www.epa.gov/region1/ss

Why perform a condition
across the United States m

4. Data Management

A successful condition assessment program requires that the data collected are organized, analyzed, and maintained in a database system. This important step not only allows a utility to manage, sort, evaluate and store the data, it helps to develop an understanding of trends. There are three general approaches to database management that have varying degrees of cost and complexity but all of which use commercially available software:

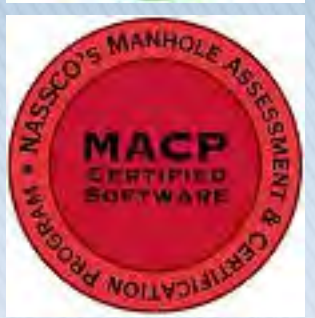
1. Software specifically designed for condition assessment and asset management.
2. Database software that is not specifically designed for condition assessment.
3. Spreadsheet software.

Condition Assessment/Asset Management Software

There are numerous commercially available data management programs for condition assessment with a range in level of complexity and cost. The primary component is a storage location for data and defect coding on pipe segments both spatially and over time. Most commercially available systems also

Another type of commercially available software is designed to summarize the results of a CCTV pipe inspections and its defects data. This has become standard practice in the industry. NASSCO certifies CCTV operators and licenses software programs to be consistent using the Pipeline Assessment Certification Program (PACP), Manhole Assessment Certification Program (MACP), and Lateral Assessment Certification Program (LACP) rating systems (discussed below).

V 7.0.2 Software Release Update



- NASSCO certifies data collection/ AM software
- Data conforms to all standards
- Input/output is seamless between pr and versions;
  all use MS Access database
- Certification process underway

Summary

- Significant Improvements – *"user friendly and organized"*
- Technical, Educational, Organizational
- New Risk Management Appendix describes Asset Management Using PACP
- Provides benefits on multiple levels!
  - Operations, Engineering, Management, Regulatory

PACP/MACP/LACP Recertification

- PACP Online Recertification – 11/23
- 1 year grace period from expiration
- MACP/LACP – online recertification in development

For more information…

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-or-

www.nassco.org

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Questions / Discussions

Thank you!

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