



GUIDANCE FOR VISUAL INSPECTION PIPES PENETRATING LEVEES

FEBRUARY 2013

SECTION 1 - BACKGROUND

Inspection of the interior of gravity pipes that penetrate under or through flood protection systems, discharge pipes from pump stations, and other third-party high-pressure pipelines (e.g., water distribution lines, petroleum product transmission lines) is necessary during pipe condition evaluation. This assists in developing an understanding of the need to replace or rehabilitate a pipe, and selecting appropriate and economical solutions for deteriorated pipes. Pipes are also inspected after replacement or rehabilitation to document the new baseline condition for the pipe.

The current inspection checklist allows for either visual or television camera video-taping (CCTV) with a report of the findings provided to USACE on a 5 year frequency. When the visual method is employed, pipes shall be inspected using the methods described in this guidance.

Entry/walking-through a pipe should only be done when size (diameter) permits, it is safe to do so, and only when appropriate confined space entry procedures are followed. Examples of unsafe conditions include the potential for fire and explosion, heat stress, asphyxiation, drowning, and engulfment or entrapment. It should also be noted that a heavily corroded or structurally damaged culvert could collapse at any time and is not safe to enter.

Third-party high-pressure pipelines are regulated by other agencies and USACE recognizes those inspection methods as appropriate on a case-by-case basis.

SECTION 2 – GRAVITY PIPES AND PUMP STATION DISCHARGE PIPES

VISUAL INSPECTION PROCEDURES

Pipe inspections are most efficient when planned and executed so that fieldwork is performed during periods of low or no flow in the pipe. Removal of small roots and debris is required prior to inspection. All debris shall be removed from the sewer system and properly disposed of with no debris passing downstream.

The process described below includes the minimum requirements for entry/walk-through inspections and documentation.

Inspector qualification

Individuals carrying out inspection of pipes should be working under the direction of, or be qualified as, a registered professional engineer. Inspectors shall be knowledgeable about pipe design and construction, potential pipe defects, modes of failure and pipe joint details. The inspector shall also be familiar with project-specific plans, issues and

history. All inspectors utilizing the entry/walk-through method of inspection shall work under the highest standard of safety.

Equipment

The following equipment is required for entry/walk-through pipe inspection:

- All appropriate permits (if applicable), air monitoring, communication, and rescue equipment required for safe entry
- Bright, high intensity light source, preferably capable of controlling the intensity to provide visual clarity of defects
- Camera to document all defects with digital video and/or still photos
- Method for determining the distance from the entry point (headwall, manhole or sluice gate) to the nearest 0.1 foot for accurate location of defects within the pipe.



Limits of visual inspection

Within Levee Embankment Sections. Pipes penetrating the levee embankment cross section are inspected from headwall to headwall.

Beneath Levee Embankment Sections. Pipes underlying levee embankments which do not daylight at the levee toes are inspected a minimum distance of 15 horizontal feet as measured perpendicular from either toe; however, the inspection continues to the riverside headwall if the pipe does not daylight within the 15 horizontal feet.

T-Wall Sections. Pipes underlying T-Walls are inspected a minimum distance of 8 horizontal feet as measured perpendicular from either side of the base; however, the inspection continues to the riverside headwall if the pipe does not daylight within the 8 horizontal feet.

I-Wall Sections. Pipes underlying I-Walls are inspected a minimum distance of 15 horizontal feet as measured perpendicular from either face of the wall; however, the inspection continues to the riverside headwall if the pipe does not daylight within the 15 horizontal feet.

Discharge Pipes from Pump Stations. Discharge pipes from the pump stations are inspected between the pump discharge and the end of the discharge line at the headwall/gate well. If the discharge pipe ends in a gate well, inspection from the gate well to the headwall at the river is required. In this case, pipe access may be possible through an air vent and a push camera with adequate lighting may be used.

Inspection documentation

Pipe inspection documentation shall be accomplished by including, as a minimum, the following written information in a bound report for submittal to USACE within two (2) weeks of the field inspection:

- a. Inspection details
 - Date of inspection

- Inspector name
 - Nearest as-built station number to the pipe that is being inspected
 - Manhole depth (invert to top of casting to nearest 0.1 ft)
 - Segment length (from inside wall of adjacent manholes to nearest 0.1 ft)
 - Description of purpose for the pipe
 - Type of pipe (material, diameter, shape, segment length)
 - Inspection method
 - Inner diameter of pipe
- b. Defect details
 - Clock position of defect relative to the position of the hour hand of a clock
 - Distance from reference end of pipe
 - Defect measurements to establish height, width, depth, if possible
 - Picture of each defect
 - Structural condition and deformation of the pipe walls
 - Cracked, fractured, torn, displaced or offset joints
 - Holes or perforations, as well as movement of soil through voids
 - Deviations from horizontal or vertical alignment
 - Cracking, flaking (scaling), erosion, or exposed reinforcing steel or concrete pipe
 - Corrosion, rusting, flaking, or delamination of steel pipe
 - Condition of joints and pipe walls
 - Cracking of clay, fiberglass, or plastic pipe
 - Standing water/sag conditions
 - c. Service defects and features
 - Roots
 - Infiltration/exfiltration
 - Encrustation (accumulation of sand, silt or other material in the pipe as described by loss of cross-sectional area)
 - Debris/sedimentation
 - Obstruction (large object creating loss of cross-section)
 - Fluctuations in water level
 - d. Construction features and defects
 - Size, location and condition of pipe laterals or defects w/ clock position



- Defective, intruding, or recessed connections
- Defective junctions

If inspection of an entire sewer segment cannot be completed due to a collapse, excessive deformation, debris, intruding connections, obstructions or large displaced joints, move equipment to the downstream manhole/headwall and attempt inspection in the upstream direction. Advise the Owner's Representative on a daily basis if the complete sewer segment cannot be inspected.

Track all locations where a complete inspection is not obtained and clearly document the length of sewer not inspected, location, segment, distance from adjacent manholes, etc.

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