

Pipe Inspection & Evaluation

Guidance Document from Metro Water Services

Intent: Provide Guidance for the inspection and quality control requirements of pipe that is to become the responsibility of Metro Nashville to maintain.

To avoid or reduce issues discovered after the pipe is installed, it is important to inspect the pipe prior to installation. Construction Installation Inspection requirements are the responsibility of a Grading Permittee representative experienced in determining if storm infrastructure pipe has been installed appropriately.

Pre-Installation Inspection and Preparation:

“Visually inspect 100% of all pipe types for fractures, cracks, spalling, chips, and breaks during all phases of the installation process. Chipped/Damaged pipe ends that prevent the full bond between joint sealant/gasket and both pipes may only be installed by fully grouting the damaged joint or repairing the damage to the joint prior to pipe installation. RCP with damaged ends may be installed if it meets the acceptable or repairable criteria as outlined in AASHTO R 73 “Standard Practice for Evaluation of Precast Concrete Drainage Products” and joint damage is repaired or the pipe installed as outlined above. The installer may also use pipe if the damaged area is fully removed and the “short” pipe section is used in a drainage structure at the ends of a pipe run.”

Pipe Installation/Inspection:

Install and compact specified materials in the bedding, haunch, and or backfill as shown on the trench details and specifications in project documents.

- Confirm the foundation is firm.
 - If foundation is soft or groundwater is encountered the installer shall contact Project Engineer of Record (EOR) for guidance on corrective action required by the installer before installing pipe.
- Install granular bedding to the appropriate elevation and slope.
 - Do not compact the bedding material prior to placing the pipe in the trench.
 - If pipe is supplied with a protruding bell the installer shall excavate a small area in the bedding to accommodate the protruding bell so that the entire barrel of the pipe will be supported throughout its length.
- RCP Joints - Install preformed flexible sealant or rubber gasket according to gasket material manufacturer guidelines.
 - Install preformed flexible sealant on the leading edge of the spigot or bell end of the pipe.
 - When rubber gasket is utilized, proper lubrication and equalization of the gasket is required per joint manufactures recommendations
 - Installed joints shall have no gap greater than 3/4” when confirmed prior to backfill unless approved by the Engineer of Record.

- Protect pipe from construction damage by placing 3 feet of compacted soil above the pipe prior to allowing heavy construction traffic to cross pipe installation.

Post Installation Inspection (PII):

All stormwater infrastructure (pipe and structures) that is to become the responsibility of Metro to maintain shall be video inspected to verify proper installation. See Policy [Stormwater Management Manual (SWMM) Volume 1, Section 3.9] below:

To insure the adequacy of stormwater quantity detention facilities, stormwater quality management practices, and public infrastructure, the certification submittal shall also include the following as a part of the as-built package:

- a. An engineer sealed certification letter from TN registered P.E. stating that the site has been inspected and that the stormwater management system and stormwater control measures (both structural and non-structural) are complete and functional in accordance with the plans approved by MWS.
- b. An as-built LID spreadsheet, as warranted from changes.
- c. Hydrologic and hydraulic calculations for as-built conditions, as required.
- d. As-built drawings showing final topographic features of all these facilities. This shall include invert elevations of outlet control structures.
- e. Any deviations from the approved plans shall be noted on as-built drawings submitted.
- f. Copy of as-built plan CAD file submitted digitally and should be registered to the TN State Plane Coordinate System, North American Datum 1983 (NAD83). Data should be placed in separate layers and should be labeled / named for easy identification.
- g. Cut and fill balance certification for floodplain and sinkhole alterations.
- h. Water quality buffers shall be surveyed and included with the as-built submittal.
- i. Any public (to become the responsibility of Metro to maintain) stormwater infrastructure shall be video-inspected to verify proper installation with the video recording and any associated inspection report submitted as part of as-built record.
- j. Additional testing may be required as/if warranted by video inspection.

All post installation inspections are the responsibility of the Contractor/Owner's Representative. These video inspections can only be completed by NASSCO PACP Certified inspection professionals.

These inspections are to be completed to insure proper jointing, clear flow, and that line, grade, and any defect found in the pipe do not exceed allowable limits. Inspection firm will perform these inspections with a combination of either:

- Remote Video Camera (condition, jointing, obstructions, line & grade) for pipes 48-inch diameter and smaller, or
- Person Way Direct Measurement (see ASTM 1840 for guidance on Person Way Inspection and Reporting Guidance) for pipes larger than 48-inch diameter.

Inspections of completed pipe installations will be performed after the embankment is in place and all non-asphalt bases and/or subgrades have been completed for at least 30 days. In cases where the Contractor's accepted schedule indicates that paving operations will be conducted in less than 30 days, an early inspection may be performed if approved by MWS.

Provide a written PII Report to the Engineer of Record along with corresponding video, pictures, and laser profiler data on a digital media storage device. Inspection report shall note any Structural Defect Issue as defined in the NASSCO PACP Program. A still image must be provided for any issue observed with a NASSCO-PACP stormwater condition grade of 3 or higher along with all field inspection information that indicates why this area is noted shall be included in all reports. Each still image and description of condition for issues with a condition grade 3 or higher shall also have information that will allow the project's Engineer or Record (EOR) to locate and view this issue in the video recording if the inspection was a remote inspection.

It is NOT the responsibility of the inspection consultant (i.e. those doing the pipe video inspection work) to evaluate any issue of concern. It is the responsibility of the EOR to evaluate the video inspection to determine if any remediation is required. EOR Evaluation shall follow the guidelines below in "Guide for RCP Evaluation and Remediation" regarding installed pipe evaluation, acceptance, and remediation. Any repair or treatment to defects (prior to submittal of video or as observed by the City Agency) shall be corrected in compliance with Industry Standard approved methods. Example: By following the American Concrete Pipe Association's Post Installation Evaluation and Repair of Installed Reinforced Concrete Pipe.

After any needed corrections are made, the inspection consultant will re-video the entire run of pipe and the EOR will confirm proper repairs have been made.

Final Deliverables:

The following will be included in the As-built package submitted to MWS Development Services:

- Final video of the completed system that is in accordance with MWS standards
- Video report prepared by a NASSCO PACP certified operator

See SWMM Volume 1, Section 3.9 for As-built information.

Metro Water Services personnel that are NASSCO PACP certified will complete Quality Assurance review of the Videos and Reports submitted to ensure the information noted by the inspection provider are being properly coded per NASSCO – PACP guidelines and criteria. Metro Water Services will meet with the inspection company as needed to clarify and revise any discrepancies. If major discrepancies are repeated, Metro Water

Services may no longer accept inspection work from that inspection company for the Metro as-built submittal process.

Guide for RCP Evaluation:

Evaluation of report findings is the responsibility of EOR. Evaluation shall follow the following guidelines.

Evaluation Criteria for Longitudinal Cracks/Fractures (PACP CM, CH3, CH4, FL, FM, FS, FH2, FH3, FH4) in RCP: two longitudinal cracks the length of the pipe section (CH2 & FH2) is acceptable when the cracks/fractures are within 15 degrees of any quarter point of pipe, i.e. 11 o'clock to 1 o'clock, 2 to 4 o'clock, 5 to 7 o'clock, and 8 to 10 o'clock. Cracks at these points are signs of acceptable stress load cracks and are typically small cracks and do not allow soil infiltration and are not cause for concern unless the pipe is in an acidic condition (pH of soil/runoff less than 5). Pipes with more than two longitudinal cracks/fractures the length of the pipe (CH2 & FH2) at the quarter points or pipe with cracks at 30 degrees +/- from invert i.e. 4 to 5 o'clock and or 7 to 8 o'clock should be further evaluated by an Engineer with experience in RCP pipe design and evaluation. Any crack exhibiting significant vertical offset should be remediated.

Evaluation Criteria for Transverse Cracks in RCP (CC, FC); Circumferential cracks or fractures are acceptable unless the Crack/fracture is allowing migration of backfill into the pipe. Any crack allowing backfill migration shall be remediated.

Broken Pipe or Pipe with Hole (PACP = B, BSV, BVV, H, HSV, HVV): All Broken pipe shall be evaluated by the EOR to determine the likely hood of backfill migration. If backfill migration is noted or looks to be possible the pipe shall be remediated or removed. BSV, BVV, HSV & HVV when confirmed with video evidence shall be remediated.

Evaluation Criteria Soil/Silt Tight Joints for all Pipe Types (JOM, JOMD, JOL, JOLD, JSM, JSL, JAM, JAL): Note all joint offsets (JOM, JOMD, JOL), Separations (JSM, JSL), or angular irregularities (JAM, JAL). Remediate any joint with the following defects or damage: joints allowing soil infiltration (JOL, JOLD, JSL), joints with vertical offset where pipe wall at joint area also exhibits large open cracks (JOL). Joint with vertical offset exposing backfill (JOL), a joint with joint gap that exposes backfill material (JSL) should be remediated.

ASTM C 1840 "Standard Practice for Inspection and Acceptance of Installed Reinforced Concrete Culvert, Storm Drain, and Storm Sewer Pipe" also provides good guidance on evaluation of installed RCP for items not included in Evaluation criteria above.