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TENNESSEE

PIPE INSPECTION & EVALUATION GUIDANCE DOCUMENT FOR CITY OF FRANKLIN STORMWATER INFRASTRUCTURE

INTENT

This document will provide guidance for the inspection and quality control requirements of pipe that is to become City of Franklin's asset and private infrastructure that directly ties into City infrastructure.

To avoid or reduce issues discovered after the pipe is installed, it is important to inspect the pipe material prior to installation. Post Installation Inspection requirements are the responsibility of a Grading Permittee representative experienced in determining if storm infrastructure pipe has been installed appropriately. The representative shall ensure that the COF Streets Department stormwater inspector has been given notice that infrastructure is being installed. Below outlines the three steps in the Post Installation Inspection process and the requirements at each step.

PRE-INSTALLATION INSPECTION AND PREPARATION

Reinforced Concrete Pipe (RCP) shall be class III unless otherwise specified. Visually inspect 100% of all pipes for fractures, cracks, spalling, chips, and breaks during all phases of the installation process. Chipped or 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 and placing an 18" wide filter fabric centered on the exterior of the pipe at the joint and overlapping from 9 o-clock to 3 o-clock (top half of pipe) repairing the damage to the joint prior to pipe installation. RCP with damaged ends may be installed if it meets the acceptable criteria as outlined in AASHTO R 73 "Standard Practice for Evaluation of Precast Concrete Drainage Products" or meets the repairable criteria and the 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.

High Density Polyethylene (HDPE) / High Density Polypropylene (HDPP) Pipe

HDPE/PP pipe may be used for site drainage but shall not be used within street right-of-way or public easements except to connect into storm infrastructure within ROW or PUDE to convey stormwater from the site. Refer to manufacture backfill specifications for proper installation. Max pipe diameter shall be 36 inches.

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.

1. 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.

2. 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.

3. 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.

4. Protect pipe from construction damage by placing 2 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 the City to maintain and infrastructure directly tied into COF maintained infrastructure shall be video inspected to verify proper installation.

To ensure 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:

1. 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 COF.

2. An as-built LID spread sheet, as/if warranted from changes.

3. Hydrologic and hydraulic calculations for as-built conditions, as/if required.

4. As-built drawings showing final elevations and topography of all stormwater management facilities. This shall include invert elevations of outlet control structures.

5. Any deviations from the approved plans shall be noted on as-built drawings submitted.

6. Copy of as-built plan CAD file submitted digitally through the IDT plan review system.

7. Cut and fill balance certification for floodplain and sinkhole alterations.
8. Riparian buffers shall be surveyed and included with the as-built submittal.
9. Any public (to be maintained by COF) stormwater infrastructure and infrastructure directly connected to City maintained 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. Video to be delivered to the COF Streets Department on a USB thumb drive.
10. 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 ensure proper jointing, clear flow, and that line, grade, and any defect found in the pipe do not exceed allowable limits. Inspection firm shall 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; Residential will be after the site has passed a subgrade proof roll and up to 50% build out. Commercial/multifamily will be after fill materials have been placed for at least 30 days and up to Temporary Certificate of Occupancy.

Provide a written PII Report to the Engineer of Record along with corresponding video and pictures 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 of 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 (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 of 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 shall re-video the entire run of pipe and the EOR shall confirm proper repairs have been made.

FINAL DELIVERABLES

The following shall be included in the as-built package submitted to COF Streets Department:

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

COF 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 is being properly coded per NASSCO – PACP guidelines and criteria. COF staff will meet with the inspection company as needed to clarify and revise any discrepancies. If major discrepancies are repeated, COF may disqualify the inspection company from future inspection work for submittal to City of Franklin.

GUIDE FOR RCP EVALUATION

Evaluation of report findings shall be reviewed by a qualified person(s) and finding shared with the surety holder for further repair decisions. Evaluation shall correspond with 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, (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 which are typically small cracks that 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 (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).

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

GUIDE FOR HDPE/PP EVALUATION

Evaluation Criteria for Flexible Wall Pipe (Coded as DF)

Flexible pipe Post Installation Inspection reports shall include deflection confirmation tests either by using a nine-vane mandrel or a remote entry video profiler camera system. Any thermoplastic pipe with deflection greater than 5% when inspected shall be removed and replaced and reinspected prior to submitting inspection report to COF. Mandrel diameter, if used, shall be set utilizing the certified mean diameter for the pipe as supplied by the pipe producer. COF reserves the right to request proving rings be supplied to them before any mandrel testing is completed. Any flexible wall pipe with wall creasing (DFC), Wall bulging (DFBR), Inverse Curvature (DFBI) shall be removed and replaced and reinspected prior to submitting reports to COF.