

Third-Party Inspection for Pipe Installations

The City of Monroe (City) is approving the use of third-party inspection firms for inspection of certain pipe installations based on the conditions and requirements of this document. There is not an alternative option for City staff to perform these inspections.

The conditions and requirements of this document apply to any portion of the storm drainage system placed within and/or conveying runoff from the public right of way. Testing and inspections must be structure to structure, no partial inspections are allowed.

A professional engineer licensed in the state of North Carolina will be responsible for the completion of the Post Installation Certification Statement found in **Exhibit 1**, certifying the conditions and requirements within this document have been met prior to street acceptance and bond release. The certifier should note that some of the checklist items herein pertain to certification of items and require inspections prior to, during, and after construction.

Definitions:

Flexible Pipe: High Density Polyethylene, Polypropylene, Corrugated Aluminized Steel and Corrugated Aluminum Alloy Pipes Arches and/or Plate.

Non-Standard Pipe: Reinforced Concrete Box Culverts, Reinforced Concrete Arch Culverts.

Third Party Inspection Requirements:

- Inspections shall be performed by a licensed, competent third-party inspection firm and the inspections shall be directed or performed by a North Carolina Professional Engineer.
- The third-party inspection firm shall have no ownership or financial interest in the development other than that created by being retained as a third-party inspector and/or Engineer of Record.
- All pipe materials that are subject to Third-Party inspection, as defined within this document, must be inspected and approved by a third-party inspector prior to installation. At a minimum the following information will be required:
 - ☐ AASHTO or ASTM Designation
 - ☐ Pipe class and type of wall (concrete products)
 - ☐ The date of manufacture
 - ☐ Name or trademark of the manufacturer
- All backfill material shall be approved by the third-party inspector prior to placement of the material within the trench. See Section 1.08 of the Standard Specifications and Detail Manual.
- The third-party inspector must be present during the backfilling operations of all pipe subject to the conditions and requirements of this document. The inspector shall be present during the final trench preparation, backfilling of the haunch, soil lifts, compaction of soils up to the finished grade, and to verify that adequate cover over the pipe has been provided prior to heavy equipment being allowed to operate over the pipe.
- The engineer overseeing the inspection activities is responsible for specifying the rate and type of physical testing of soils and compaction that is to be performed by the third-party to verify the conditions of this document have been met.

City of Monroe Engineering Storm Water Division

- Inspections and reports must Meet the additional conditions found in **Appendix A** of this document.
- Provide to the City an engineer's report prior to requesting a final inspection. The report shall include:
 - Documentation
 - Inspection reports and delivery tickets
 - Mandrel, laser profile, or direct measurement results
 - PACP compliant pipe video and pipe video inspection reports
 - o pipe video and video inspection reports should be included on a single flash drive
 - Post Installation certification statement

Exhibit 1 – Post-Installation Certification Statement

Post-Installation Certification Statement

I do hereby certify that the pipe and backfill materials have been inspected, installed, and repaired per the requirements herein and in the Standard Specifications and Detail Manual. I have reported all defects, and repairs have been made to address all defects.

Professional Engineer's Signature

Date

Project Name: _____

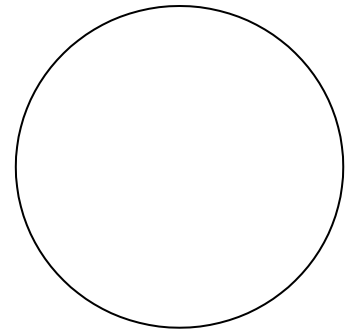
City of Monroe Project Number: _____

Project Address: _____

Owner's Name: _____

Owner's Address: _____

Date of Compliance Verification: _____



(Professional seal)

Appendix A – Third-Party Inspection Requirements

1. Third-party inspectors are charged with performing required inspections associated with the City of Monroe's "Third Party Inspection for Pipe Installation" document. Any inspection report with the term "observe" in-lieu of "inspection" for the third-party inspections will be rejected and required to be revised for City acceptance.
2. Installation of pipes/culverts associated within this document is subject to the City of Monroe *Post Installation Inspection of Storm Drainage Pipes and Culverts*.
3. The third-party inspector/engineer will be responsible for documenting the visual observations of the pipes installed condition, determine if/when rehabilitation needs to be made on the pipe segment and specify the appropriate renewal or repair method per Industry Standards. All NASSCO-PACP defect codes and grades will require recommendations from the Engineer of Record for rehabilitation, or replacement (if warranted).
4. The Engineer's recommendations must be reviewed and approved by City staff before starting rehabilitation or replacement. Any defects of the pipe identified by the video process will be repaired by the owner prior to acceptance of the roadway. Additional pipe video and deflection testing of repairs may be required by the City staff prior to roadway acceptance.
5. Inspection reports should include:
 - i. Development name
 - ii. City of Monroe project number
 - iii. Date and time of inspection and weather
 - iv. Inspector name
 - v. Location of inspection based on the construction plans
 - vi. Report summary of:
 1. work activities
 2. methods
 3. machinery used
 4. materials used
 5. loading / unloading practices
 6. testing
 - vii. Photos of work activities
 - viii. PACP compliant pipe video and pipe video inspection reports
 - ix. Report on corrective actions requested and actions taken by the owner to comply with the request
 - x. Photos or copies of any product and material tickets available
 1. Verify that all pipes are sourced through an NCDOT approved producer/supplier and they must participate in the NCDOT QA/QC program for each respective pipe material.

City staff may request additional information regarding specific sections of interest, observations made in the report, or their own observations on the site.

6. All storm drainage installation utilizing flexible pipe shall also require a post installation deformation evaluation. Test the polypropylene pipe for up to 3% and HDPE, Aluminum/Aluminized pipe for up to 5% deformation. Any pipe that exceeds 3%-5% respective

deformation shall be replaced/reinstalled by the owner, immediately upon receiving test findings. No exceptions to the 3%-5% testing requirement will be allowed.

- i. Thirty (30) days or later after backfilling the pipe, deflection testing shall be performed.
- ii. Round pipe - Certified Mean Pipe Diameter - The certified mean pipe diameter shall be the nominal diameter shown on the plans. AASHTO inside diameter tolerances shall not be used for ranges in assuming the provided pipe's diameter for deflection comparisons. Allowable exceptions in defining the certified mean pipe diameter are:
 1. The owner may submit the certified mean pipe diameter that is supplied by the manufacturer at the time of shipment to the third-party inspector. This diameter may then be used as the certified mean pipe diameter in deflection comparisons.
 2. Prior to pipe installation, the third-party inspector may perform direct measurements of the pipe at a section on the pipe with no defects or out of roundness. Measurements shall be taken to the nearest hundredth of a foot. This diameter may then be used as the certified mean pipe diameter in deflection comparisons.
- iii. The third-party inspector shall utilize one of the following methods through the entire length of each flexible pipe installed:
 1. Mandrel testing:
 - a. To ensure measurements, the owner shall clean the lines prior to testing.
 - b. The owner shall supply a mandrel and proving ring for each pipe size installed.
 - i. Mandrel requirements:
 1. Rigid, nonadjustable, with pulling rings on each end.
 - a. Manufactured from steel or aluminum and able to withstand 200psi without being deformed.
 2. Engraved with the nominal pipe size and mandrel outside diameter at a location other than on a runner.
 3. Outer diameter equal to 97% of the certified mean pipe diameter of the pipe for polypropylene pipe and 95% for HDPE pipe
 - a. Statistical or other "tolerance packages" shall not be considered in mandrel sizing.
 4. Odd number of equally spaced fins (9 minimum) with a length not less than 7/16 of the outside diameter of the mandrel.
 - ii. Proving Ring requirements:
 1. Manufactured of steel or aluminum.

2. Inner diameter 0.02" larger than the mandrel outside diameter that is engraved on the mandrel.
 3. An exception for use of the proving ring may be allowed where the mandrel manufacturer's documentation provides an acceptable method to the City's inspector for validating the mandrel size within 0.1-inch of the size that is engraved on the mandrel.
 - c. Verify each mandrel size with their respective proving ring.
 - d. Pull the properly sized mandrel through each pipe. No mechanical equipment shall be used in the deflection testing. If the properly sized mandrel successfully is pulled through the entire length of the pipe without resistance, the pipe passes. Otherwise, the pipe fails.
 - e. Report Requirements:
 - i. Provide a table with identifiable IDs for each pipe with a pass/fail designation from the mandrel test.
2. Laser profile testing:
 - a. The inspector shall be NASSCO PACP certified.
 - b. To ensure measurements, the owner shall clean the lines prior to testing.
 - c. No flow or standing water shall be allowed in the pipe during laser profile testing.
 - d. Laser profile requirements
 - i. The deflection measurement equipment shall be able to measure deflection/ovality to the nearest 0.5%.
 1. Equipment shall have a certified accuracy of 0.5% or better and a repeatability of 0.12% or better.
 - ii. The inspection company shall provide the City with the manufacturer's user manual and specifications for the laser profile test equipment. Any deviation from the recommended inspection calibration, allowable pipe sizes/ shapes/ material, inspection practices, or requirements shall be cause for rejection of the inspection.
 - iii. Calibrate the laser deflection measuring tool according to manufacturer's specifications.
 1. The calibration process shall be recorded and provided with the report.
 - iv. Show time and distance in the video image, so that the speed of the inspection can be verified at intermittent points throughout the video. Under no circumstances shall the rate of inspection exceed the manufacturer's recommendations or 30 feet per minute, whichever is more restrictive.

- v. Deflection shall be measured at 0.1-foot intervals along the pipe.
- e. Report Requirements:
 - i. Provide a report that documents the certified mean pipe diameter versus any pipe deformation measurements of 3% or greater for polypropylene pipe and 5% for HDPE and aluminum/aluminized pipe, with the respective 3%-5% deflection limit clearly delineated.
 - ii. Any locations where the respective 3%-5% deflection limit has been exceeded, the measurement should be highlighted and marked with the word "Fail".
 - iii. Provide a table with identifiable IDs for each pipe with a pass/fail designation from the Laser profile testing.
 - iv. Quantified measurements of flattening, creasing, buckling, asymmetrical sections, peaking, non-uniform curvature, reverse curvature, or other deformation concerns should be integrated into the final PACP inspection report.
- f. Mandrel testing or manned entry inspection, at the owner's expense, will be required where the measurements in the laser profile testing are called into question by the Engineer.