CITY OF FORT WAYNE MASTER UPDATED: 1/5/15

SECTION 33 41 00

STORM UTILITY PIPING INSTALLATION

NTS: Portions of this section contain detailed descriptive requirements of the product(s) of the named manufacturer(s). If the product of another manufacturer (where named) is to be included as acceptable, this section may require editing.

NTS: This section is based on gravity storm utility piping installation. For pressurized storm piping add requirements needed or refer to Section 33 11 00 Water Piping Installation.

1. GENERAL
	1. DESCRIPTION
		1. Scope:
			1. Contractor shall provide all labor, materials, equipment, and incidentals as shown, specified, and required to install and test all buried piping, and specials. The Work includes the following:

NTS: Coordinate below with applicable sections of Divisions 31 and 33 to ensure proper installation specifications for all buried piping. Edit as required.

* + - * 1. Installation of all types and sizes of buried storm utility piping, except where buried piping installations are specified under other sections.
				2. Unless otherwise shown or specified, this section includes all buried piping Work required, beginning at the inside face of structures or structure foundations, including piping beneath structures, and extending away from structures.
				3. Work on or affecting existing buried piping.
				4. Installation of all jointing and gasket materials, specials, flexible couplings, mechanical couplings, and other Work required.
				5. Supports and restraints.
				6. Pipe encasements.
				7. Field quality control, including testing.
				8. Cleaning.
				9. Incorporation of special items shown or specified into piping systems in accordance with the Contract Documents and as required.
		1. Coordination:
			1. Review installation procedures under this and other sections, and coordinate installation of items to be installed with or before buried piping Work.
			2. Coordinate with appropriate piping material sections of Division 33, Utilities.
		2. Related Sections:

NTS: List below only sections covering products, construction, and equipment specifically identified in this section and specified in another section and directly referenced in this specification. Do not list administrative and procedural Division 01 sections.

NTS: Insert at (--1--) the number and name of the Division 33 material section(s). Edit references to suit the project.

* + - 1. Section (--1--).
			2. Section 31 00 05, Trenching and Earthwork.
			3. Section 33 11 00, Water Piping Installation

NTS: Section “1.2” is to be included if project is bid on unit price basis. Section to be deleted or revised if project is to be bid on lump sum basis.

NTS: Adjust Section “1.2” below for additional work item numbers as needed.

* 1. MEASUREMENT AND PAYMENT
		1. Pipe Installation
			1. Pipe installation shall be included in the measurement and payment of each pipe material and associated appurtenances installed.

NTS: Coordinate Paragraph “B.3” with other work specified, measured, and paid in Division 33 Utilities and Division 31 Earthwork.

NTS: Coordinate Paragraph “B” below with 31 00 05 Trenching and Earthwork for flowable fill used for abandoned pipes.

* + 1. Pipe Plugs (Bulkheads)
			1. Work Item Number and Title

 **33 41 00-A Pipe Plugs**

* + - 1. The payment quantity shall be the number of plugs actually installed.
			2. Payment under this item shall be on a unit price basis regardless of plug size.
			3. This price shall include all cost associated with: removal of surface improvements, excavation, disposal of excavated material, temporary sheeting, shoring, or bracing; dewatering, furnishing and placing Class A concrete for the bulkhead; furnishing, placing and compacting required backfill; and placing required surfacing.
	1. REFERENCES

NTS: Retain applicable standards below, add others as required, and delete standards for materials not used on project.

* + 1. Standards referenced in this section are listed below:
			1. INDOT
				1. Indiana Department of Transportation Standard Specifications, latest edition.
			2. American Society for Non-Destructive Testing
				1. ASNT-TC-1A, Recommended Practice, Personnel Qualification, and Certification in Non-destructive Testing.
			3. American Association of State Highway and Transportation Officials.
				1. AASHTO M198, Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants
			4. ASTM International
				1. ASTM C443, Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
				2. ASTM C924, Practice for Testing Concrete Pipe Sewer Lines by Low-Pressure Test Method.
				3. ASTM D2321, Practice for Underground Installation of Thermoplastic Pipe for Sewers and other Gravity-Flow Applications.
				4. ASTM F1417, Test Method for Installation Acceptance of Plastic Gravity Sewer Lines using Low-Pressure Air.
			5. American Water Works Association.
				1. AWWA M23, PVC Pipe - Design and Installation.
				2. AWWA M41, Ductile-Iron Pipe and Fittings.
				3. AWWA M55, PE Pipe - Design and Installation.
			6. American Society of Civil Engineers/Structural Engineering Institute
				1. ASCE 37, Design and Construction of Sanitary and Storm Sewers.
			7. American Concrete Pipe Association
				1. Concrete Pipe Design Manual.
	1. QUALITY ASSURANCE
		1. Regulatory Requirements:
			1. Comply with requirements and recommendations of authorities having jurisdiction over the Work, including:

NTS: Insert at (--1--) names of authorities having jurisdiction over the work, including utility owners as applicable, owners of rights-of-way, INDOT, county highway department, or city right-of-way department and others. Add paragraphs as required.

* + - * 1. Indiana Department of Environmental Management
				2. (--1--)
			1. Obtain required permits for Work in roads, rights‑of‑way, railroads, and other areas of the Work, as required by Authorities Having Jurisdiction listed above.

NTS: Edit Article “1.5” to suit the project, in coordination with submittal requirements of the pipe material sections.

* 1. SUBMITTALS

NTS: Laying Schedules are usually not required for piping with non-restrained joints. If a Laying Schedule is required for project add to section submittal requirements below. Refer to 33 11 00 Water Piping Installation for details.

NTS: Only field quality control submittals are listed below. Coordinate product data, shop drawings, and test results, with submittal requirements listed in applicable material specification sections.

* + 1. Informational Submittals: Submit the following:
			1. Field Quality Control Submittals:
				1. Results of each specified field quality control test.
	1. DELIVERY, STORAGE, AND HANDLING
		1. Material delivery, storage and handling must conform to requirements in Contract Documents. Refer to Section 01 65 00 Product Delivery Requirements and Section 01 66 00 Product Storage and Handling Requirements.
1. PRODUCTS
	1. MATERIALS

NTS: Pipe materials are typically shown on drawings and bid tab. If in different location edit below.

* + 1. Piping materials are located on the Drawings.
		2. Piping materials shall conform to Specifications for each type of pipe and piping appurtenances in applicable sections of Division 33, Utilities.
1. EXECUTION
	1. INSTALLATION
		1. General:
			1. Install piping as shown, specified, and as recommended by pipe and fittings manufacturer.
			2. In the event of conflict between manufacturer’s recommendations and the Contract Documents, request interpretation from Engineer before proceeding.
			3. Engineer will observe excavations and bedding prior to laying pipe by Contractor. Notify Engineer in advance of excavating, bedding, pipe laying, and backfilling operations.
			4. Minimum cover over buried storm piping shall be 3 feet, unless otherwise shown on Drawings or approved by Engineer.

NTS: Include the following: “31 00 05, Trenching and Earthwork in the Project Manual.

* + - 1. Excavation in excess of that required or shown on Drawings, and that is not authorized by Engineer shall be backfilled at Contractor’s expense with granular material furnished, placed, and compacted in accordance with Section 31 00 05, Trenching and Earthwork.
			2. The width of trenches shall be such as to provide a clearance of not less than 6 inches or not more than 15 inches on each side of the pipe. All pavements shall be cut with an abrasive saw. Concrete driveways, walks, alleys, etc., shall be cut to the nearest joint unless approved by Engineer.
			3. Excavation in excess of that required or shown, and that is not authorized by Engineer shall be filled at Contractor’s expense with granular material furnished, placed, and compacted in accordance with Section 31 00 05, Trenching and Earthwork.

NTS: Delete inapplicable paragraphs below. If separation of sanitary or storm sewers and water mains is required, coordinate Paragraph “C” with requirements of authority having jurisdiction. Although a water main is not usually installed below a sewer, consider each installation individually to determine what additional protection is required for the water main.

* + 1. Separation of Sewers and Potable Water Piping:
			1. Horizontal Separation:
				1. Where possible, proposed sanitary sewers shall be separated from existing potable water mains and service lines horizontally by a clear distance of at least ten feet, measured edge to edge.
				2. If local conditions preclude the specified clear horizontal separation, installation will be allowed if potable water main is in a separate trench or on an undistributed earth shelf on one side of sewer and with bottom of the potable water main at least 18 inches above the crown of the sewer.
				3. Exception:

Where it is not possible to provide minimum horizontal separation described above, construct the sewer pipe of pressure pipe complying with public water supply design standards of The City of Fort Wayne. Hydrostatically test newly installed pressure piping to a minimum of 125 psi, meeting the testing requirements of City of Fort Wayne Specification 33 11 00, Water Piping Installation.

Sewer of water grade pipe shall extend from manhole to manhole.

NTS: Edit Paragraph “2” to comply with local laws and regulations, and standards, if different than specified below. Consider concrete encasement of water main for at least ten feet on each side of the crossing.

* + - 1. Vertical Separation:
				1. Provide minimum vertical distance of 18 inches between outside of potable water main and outside of sewer when sewer crosses potable water main.
				2. Center a section of potable water main pipe at least 17.5 feet long over sewer so that sewer joints are equidistant from potable water main joints.
				3. Provide adequate structural support where potable water main crosses under sewer. At minimum, provide compacted select backfill for ten feet on each side of crossing.
				4. This deviation may allow installation of the sewer closer to the water main, provided that the water is in a separate trench or on an undisturbed earth shelf located on one side of the sewer and at horizontal separation of at least 10 feet measured edge to edge.
				5. Exception:

Where it is not possible to provide minimum horizontal separation described above, construct sewer pipe of pressure pipe complying with public water supply design standards of authority having jurisdiction. Hydrostatically test newly installed pressure piping to a minimum of 125 psi, meeting the testing requirements of City of Fort Wayne Specification 33 11 00, Water Piping Installation.

Sewer in water grade pipe shall extend from manhole to manhole.

* + 1. Separation of Sewer Mains and Potable Water Structures:
			1. Maintain a 50 feet minimum distance from water supply wells or other water supply sources and structures.
		2. Plugs (Bulkheads):
			1. Temporarily plug the installed pipe at end of each day of Work or other interruption of pipe installation to prevent entry of animals, liquids, and persons into pipe, and entrance or insertion of deleterious materials into pipe.
			2. Install standard plugs in bells at dead ends, tees, and crosses. Cap spigot and plain ends.
			3. Fully secure and block plugs, caps, and bulkheads installed for testing to withstand specified test pressure.
			4. Where plugging is required for phasing of the Work, abandonment of existing utilities, or subsequent connection of piping, install watertight, permanent type plugs, caps, or bulkhead acceptable to Engineer.

NTS: Coordinate pipe bedding requirements with details on the drawings. Type and configuration of bedding required depends on the type of pipe (rigid or flexible) being installed, pipe size, depth and character of soil in the trench, depth of earth cover, and requirements of the pipe manufacturer.

Edit the following paragraphs to suit the project. Trench excavation, bottom preparation, bedding materials, and backfill requirements should be specified in Section 31 00 05 Trenching and Earthwork.

* + 1. Bedding Pipe: Bed pipe as specified and in accordance with details on the Drawings.

NTS: Include in the Contract Documents: “31 00 05 Trenching and Earthwork” as applicable. Coordinate unit price payment items for additional excavation and granular material with the Bid Form and edit Paragraph “2” as required.

* + - 1. Trench excavation and backfill, and bedding materials shall conform to the Contract Documents. Reference Section 31 00 05, Trenching and Earthwork.
			2. Where over excavation is required by Engineer due to unsuitable soil in trench or excavation subgrade, remove and replace unsuitable material with approved granular material furnished, placed, and compacted in accordance with the Contract Documents. Payment for removal and replacement of unsuitable soils will be made under the unit price payment items in the Contract Documents.
			3. Excavate trenches below bottom of pipe by amount shown and indicated in the Contract Documents. Remove loose and unsuitable material from bottom of trench.
			4. Carefully and thoroughly compact pipe bedding with hand held pneumatic compactors.
			5. Do not lay pipe until Engineer approves bedding condition.
			6. Do not bring pipe into position until preceding length of pipe has been bedded and secured in its final position.
		1. Alignment:
			1. Install pipe accurately to line and grade shown and indicated in the Contract Documents, unless otherwise approved by Engineer.
			2. Slope piping uniformly between elevations shown.
			3. Maintain reference line and grade with laser equipment daily for adjustment and accuracy. Correct deficiencies in equipment, reference line and reference grade. Take precautions to prevent deflections in reference line and grade.
			4. Contractor shall install sewer pipe in compliance with slope requirements shown on the Drawings. All sewer pipes shall have a maximum slope deviation no greater than the indicated percents for the following pipe sizes:

NTS: Retain only pipe sizes that pertain to the project, delete others.

|  |  |
| --- | --- |
| PipeDiameter | Pipe SlopeDeviation |
| 8 inch | ±15% |
| 10 inch | ±18% |
| 12 inch | ±20% |
| 15 inch  | ±20% |
| 18 inch | ±20% |
| 21 inch | ±20% |
| 24 inch | ±20% |

* + - 1. Contractor shall test every other section of installed sewer pipe for compliance with design slope. In the event that the as-built slope exceeds the indicated deviation notify Engineer in writing. Removal and replacement of pipe as directed by the Engineer shall be at no additional cost to the Owner.

NTS: Edit references in Paragraph “G” below to suit types of pipe included in the project.

* + 1. Laying Pipe:
			1. Conform to manufacturer’s instructions and requirements of standards and manuals listed below, as applicable:
				1. Ductile Iron Pipe: AWWA M41.
				2. Concrete Pipe: ASHTO M198.
				3. Thermoplastic Pipe: ASTM D2321, AWWA M23, AWWA M45, AWWA, M55.
				4. Sanitary and Storm Sewers: ASCE 37.
			2. Do not lay pipe in water. Maintain dry trench conditions until jointing and backfilling are complete. Keep clean and protect interiors of pipe, fittings, valves, and appurtenances.
			3. Start laying pipe at lowest point and proceed towards higher elevations, unless otherwise approved by Engineer.
			4. Place bell and spigot-type pipe so that bells face the direction of laying, unless otherwise approved by Engineer.
			5. Excavate around joints in bedding and lay pipe so that pipe barrel bears uniformly on trench bottom.
			6. For push-on jointed pipe, do not push past the manufacturer’s specified home position.
			7. Carefully examine pipe, fittings, and specials for cracks, damage, and other defects while suspended above trench before installation. Immediately remove defective materials from the Site and replace with acceptable products.
			8. Inspect interior of all pipe, fittings, and specials and completely remove all dirt, gravel, sand, debris, and other foreign material from pipe interior and joint recesses before pipe and appurtenances are moved into excavation. Bell and spigot-type mating surfaces shall be clean and dry immediately before pipe is laid.
			9. Field cut pipe, where required, with a machine specially designed for cutting the type of pipe being installed. Make cuts carefully, without damage to pipe, coating or lining, and with smooth end at right angles to axis of pipe. Cut ends on push-on joint type pipe shall be tapered and sharp edges filed off smooth. Do not flame-cut pipe.
			10. Do not place blocking in trench under pipe, unless specifically approved by Engineer for special conditions.
			11. Touch up protective coatings in manner satisfactory to Engineer prior to backfilling.
			12. Notify Engineer in advance of backfilling operations.
			13. On steep slopes, take measures acceptable to Engineer to prevent movement of pipe during installation.
			14. Exercise care to avoid flotation when installing pipe in cast‑in-place concrete and in locations with high groundwater.

NTS: Retain applicable joint requirements below, add others as required, and delete joint requirements for materials not used on project.

* + 1. Jointing Pipe

NTS: For thermoplastic pipe in Paragraph “1”, below, bell and spigot joints are typically used on sewers and waterlines. Solvent cement welded joints are typically used on other services, such as buried chemical lines. Add specifications for solvent cement welded joints if required for project.

* + - 1. Thermoplastic Pipe Joints:
				1. Bell and Spigot Joints:

Bevel pipe ends, remove all burrs, and provide a reference mark at correct distance from pipe end before making joints.

Clean spigot end and bell thoroughly before making the joint. Insert O-ring gasket while ensuring that gasket is properly oriented. Lubricate spigot with manufacturer’s recommended lubricant. Do not lubricate bell and O-ring. Insert spigot end of pipe carefully into bell until reference mark on spigot is flush with bell.

* + - 1. HDPE and PP Pipe Joints:
				1. Bell and Spigot Joints:

Remove all burrs and provide reference mark at correct distance from pipe end. Place mark such that no more than 1/2-inch of machined spigot surface will be visible outside of bell after pipe has been joined.

Clean spigot end and bell thoroughly with soap and water before positioning gasket.

Lubricate spigot groove with manufacturer’s recommended lubricant. Thoroughly clean gasket and place in spigot groove starting at bottom, ensuring that gasket fins face backwards toward pipe.

Thoroughly lubricate gasket with pipe manufacturer’s recommended lubricant and equalize stretch in gasket by mean of manufacturer’s recommended procedure. Reposition gasket in groove after stretching.

Thoroughly clean and lubricate receiving bell. Align pipe as straight as possible and insert spigot end of pipe carefully into bell until reference mark on spigot is flush with bell.

If mechanical means are used to insert spigot end, protect with wood the end of pipe being pushed, to ensure even distribution of pressure.

* + - 1. Ductile Iron Push-On Joint Pipe:
				1. Prior to assembling joints, thoroughly clean with wire brush the last eight inches of exterior surface of spigot and interior surface of bell, except where joints are lined or coated with a protective lining or coating.
				2. Wipe clean rubber gaskets and flex gaskets until resilient. Conform to manufacturer’s instructions for procedures to ensure gasket resiliency when assembling joints in cold weather.
				3. Insert gasket into joint recess and smooth out entire circumference of gasket to remove bulges and to prevent interference with proper entry of spigot of entering pipe.
				4. Immediately prior to joint assembly, apply thin film of pipe manufacturer’s recommended lubricant to surface of gasket that will come in contact with entering spigot end of pipe, or apply a thin film of lubricant to outside of spigot of entering pipe.
				5. For assembly, center spigot in pipe bell and push pipe forward until spigot just makes contact with rubber gasket. After gasket is compressed and before pipe is pushed or pulled in the rest of the way, carefully check gasket for proper position around the full circumference of joint. Final assembly shall be made by forcing spigot end of entering pipe past gasket until spigot makes contact with base of the bell. When more than a reasonable amount of force is required to assemble the joint, remove spigot end of pipe to verify proper positioning of gasket. Do not use gaskets that have been scored or otherwise damaged.
				6. Maintain an adequate supply of gaskets and manufactures recommended joint lubricant at the Site when pipe jointing operations are in progress.
			2. Reinforced Concrete Pipe Joints:
				1. Immediately before making the joint, completely clean bell and spigot surfaces to be jointed.
				2. All joints shall have a groove on the spigot for placement of a flexible, rubber gasket in conformance with AASHTO M198 or ASTM C443. The gasket shall be a continuous ring that fits snugly into the annular space between the overlapping surfaces of the assembled pipe joint to form a flexible soil-tight seal.
				3. After pipe is lowered into place, align spigot and bell so that spigot will squarely enter the bell.
				4. Before joint is fully assembled, check position of gasket in bell using methods recommended by pipe manufacturer and accepted by Engineer.
				5. Butyl rubber based material may be used in lieu of rubber gaskets when round pipes with diameters larger than 24 inch, elliptical pipes larger than 19 inch x 30 inch, arch pipes larger than 18 inch x 28 1/2 inch, or box culverts are used.
		1. Backfilling:
			1. Conform to applicable requirements of the Contract Documents. Refer to Section 31 00 05, Trenching and Earthwork.
			2. Place backfill as Work progresses. Backfill by hand and use power tampers until pipe is covered by at least one foot of backfill.
		2. Transitions:
			1. Provide necessary adapters, specials, and connection pieces required when connecting different types and sizes of pipe or connecting pipe made by different manufacturers.
		3. Closures:
			1. Provide closure pieces shown or required to complete the Work.

NTS: Delete Article “3.2” if not applicable, or edit to suit the project.

* 1. WORK AFFECTING EXISTING PIPING
		1. Location of Existing Underground Facilities:
			1. Locations of existing underground facilities shown on the Drawings should be considered approximate.
			2. Prior to beginning excavation, determine the true location of existing underground facilities to which connections are to be made, crossed, and that could be disturbed, and determine location of underground facilities that could be disturbed during excavation and backfilling operations, or that may be affected by the Work.

NTS: Delete Paragraphs “B” and “C”, below, if not applicable.

* + 1. Taking Existing Pipelines and Underground Facilities Out of Service:
			1. Do not take pipelines or underground facilities out of service unless specifically listed in Contract Documents, or approved by Engineer.
			2. Notify Engineer in writing prior to taking pipeline or underground facilities out of service. Shutdown notification shall be provided in advance of the shutdown in accordance with the Contract Documents.
		2. Work on Existing Pipelines or Underground Facilities:
			1. Cut or tap piping or underground facilities as shown or required with machines specifically designed for cutting or tapping pipelines or underground facilities, as applicable.
			2. Install temporary plugs to prevent entry of mud, dirt, water, and debris into pipe.
			3. Provide necessary adapters, sleeves, fittings, pipe, and appurtenances required to complete the Work.
	1. FIELD QUALITY CONTROL

NTS: Edit requirements below to suit the project. Add testing specification for hydrostatic testing, exfiltration testing, vacuum testing, or low pressure air test of the entire pipe as required. Refer to Section 33 31 00 Sanitary Utility Piping Installation for standard testing specifications.

NTS: If a Piping Schedule is used, replace “by the Engineer or Owner’s Representative in writing.” with “in the Piping Schedule”.

* + 1. General:
			1. Test all piping, except as exempted by the Engineer or Owner’s representative in writing.
			2. When authorities having jurisdiction are to witness tests, notify Engineer and authorities having jurisdiction in writing at least 48 hours in advance of testing.
			3. Conduct all tests in presence of Engineer or Owner’s representative.
			4. Remove or protect pipeline-mounted devices that could be damaged by testing.
			5. Provide all apparatus and services required for testing, including:
				1. Test pumps, compressors, hoses, calibrated gages, meters, test containers, valves, fittings, and temporary pumping systems required to maintain Owner’s operations.
				2. Temporary bulkheads, bracing, and blocking.
			6. Provide air if an air test is required
			7. Repair observed leaks and repair pipe that fails to meet acceptance criteria. Retest after repair.
			8. Unless otherwise specified, testing shall include existing piping systems that connect with new piping system. Test existing pipe to nearest valve. Piping not installed by Contractor and that fails the test shall be repaired upon authorization of Owner. Unless otherwise included in the Work, repair of existing piping or Underground Facilities will be paid as extra Work.
		2. Low Pressure Air Test for Pipe Joints:
			1. Plug and bulkhead ends of pipe segment to be tested.
				1. One plug shall have an orifice through which to pass air and a second orifice shall be continuously connected to a pressure gauge having a range from 0 to 10 psi, minimum divisions of 0.10 psi, and accuracy of plus or minus 0.04 psi.
			2. The air supply line shall have a positive on-off valve and suitable means for readily disconnecting from the control panel.
			3. The section of pipe shall be pressurized to approximately 4 psi.
			4. The air shall be shut off and allowed to stabilize for a minimum of 2 min. If during this time the pressure drops below 3.5 psi, more air shall be added to raise pressure to a minimum of 3.5 psi.
			5. After the air has stabilized, the air line shall be disconnected and timing will begin.
			6. The time of test in minutes will be equivalent to one-half of the nominal diameter of the pie being tested.
			7. The maximum allowable pressure drop during the specified time period will be 1.0 psi.

NTS: Vertical deflection testing is used to check whether bedding around pipe has been properly installed and whether pipe has deformed out of round.

* + 1. Vertical Deflection Test for Flexible Pipe:
			1. Conduct vertical deflection test at least thirty days after backfill has been placed.
			2. Use rigid ball or mandrel for deflection test, which shall have diameter of at least 95 percent of base inside diameter or average inside diameter of piping, depending on which is specified in applicable ASTM standard, including appendix, to which pipe is manufactured. Perform test without mechanical pulling devices. Re-install and retest pipe segments that exceed deflection of 5 percent.

NTS: Retain Paragraph “E” when required, otherwise, delete, because televising increases the cost of the project. Requiring televising increases the cost of the project. Televised inspections create a baseline assessment for new pipe and can catch obstructions or construction debris that other tests may miss. Insert at (--1--) the lines to be televised.

* + 1. Televised Inspection:
			1. Televise the following: (--1--).
			2. Televise completed sewer and appurtenant structures, including manholes and chambers, and provide to Engineer copy of video on digital video disc (DVD). Repair apparent leaks and re-televise the pipe until acceptance by Engineer.
			3. Inspection shall be performed by Subcontractor certified in Pipeline Assessment Certification Program (PACP) by National Association of Sewer Service Companies (NASSCO). Provide copy of PACP certification prior to starting inspection. Televising shall conform to coding and reporting standards and guidelines specified in PACP. Identify report annotations, pipe conditions, and pipe defects in accordance with PACP. Severity ratings shall be calculated in accordance with PACP.
			4. Camera for main line shall be pan-and-tilt, radial viewing, pipe inspection camera that pans plus-or-minus 275 degrees and rotates 360 degrees. Use camera with an accurate footage counter that displays on television monitor exact distance of camera from centerline of starting manhole. Use camera with height adjustment so that lens is always centered at one-half inside diameter or higher, in pipe being televised. Provide lighting system that allows features and condition of pipe to be clearly seen. Camera shall operate in 100 percent humidity. Camera, television monitor, and other components of video system produce a minimum 450-line resolution coloredvideo picture. Picture quality and definition shall be satisfactory to Engineer.
			5. Repair apparent leaks in pipe Work in manner satisfactory to Engineer without additional cost to Owner and re-televise the pipe.
	1. CLEANING

NTS: Edit Paragraph “A” to suit the project, and delete inapplicable requirements.

* + 1. Cleaning, General: Clean pipe systems as follows:
			1. Thoroughly clean all piping, in manner approved by Engineer, prior to placing in service.
		2. All manholes, inlets, catchbasins, and other installed structures shall be thoroughly cleaned, in a manner approved by Engineer, prior to placing in service.
		3. All installed stormwater BMPs shall be thoroughly cleaned, per manufacturers’ recommendations and in a manner approved by Engineer, prior to placing in service.
			1. Swirl separators shall be cleaned by use of a vac truck, prior to placing in service.

+ + END OF SECTION + +