

# Invitation To Bid for Construction Services for the Scott Creek Aerial Sewer Repair Project

## ITB 2021-01 ADDENDUM #2

**FEMA EVENT: 4600DR-GA**

**FEMA PROJECT #: 186575**

**Clarification: Proposals are due at 2pm local time on December 3, 2021.**

The following questions have been received for the above-mentioned project, answers to questions are in red italics.

1. Will the construction entrance shown be encroaching on the guardrail anchor, if so, will it need to be replaced? – Per Pre-bid meeting -YES

*Answer: Yes*

2. General note No. 1- indicates to coordinate with the City of Clayton for Easement information. Please provide the locations & widths of the existing easements. Will a temporary easement be provided for construction? Per Pre-bid meeting, Specific information is NOT available. Therefore, please confirm contractor will be permitted to utilize existing access and will be provided a minimum width of 15' without permission or purchase from private property owners.

*Answer: Yes*

3. Can vehicles/Equipment be parked on the East side of Shadyside drive north of the Railing? Vehicles and equipment will be allowed to park in this area.

*Answer: Yes*

4. Is it possible to access the west side of Scott Creek from Shadyside drive? Such as from the Housing authority driveway? Please confirm where access will be provided from Shadyside drive since crossing the creek will not be permitted.

*Answer: The Housing Authority has confirmed that equipment can cross their property to access the site. Any damage caused will need to be replaced to pre-construction condition or better.*

5. How long will Shadyside drive be closed? Can we assume there will be no thru traffic during construction of this contract?- unknown -Dependent on other contract.

*Answer: Shady Side Drive slope stabilization project is anticipated to be awarded in January 2022. No schedule has been established for that project yet, so it is unknown when the roadway will be opened.*

6. When does the owner expect to issue NTP – DIP may have unexpected lead-time.

**Answer:** *The Notice to Proceed (NTP) date will be coordinated with the selected Contractor based on the pipe lead time.*

7. Can one lane of Shadyside drive be closed in the area of construction?

**Answer:** *This can be discussed with the City of Clayton upon award of the contract. Permanent closure would not be anticipated, but temporary during working hours may be possible. If closed, contractor will be responsible for all traffic control.*

8. General note No. 4 indicates Piers will not be set in the creek bed. The current pier on the East side of Scott Creek is in the water. Is it possible these locations will change, and the span of casing will be longer?

**Answer:** *The proposed design accounted for relocating the existing piers. The current pier spacing is approximately 25-ft, and the proposed spacing is 36-ft. The spiral wound pipe can accommodate spacing up to 42-ft if needed.*

9. Detail 1 and 3 on sheet DT-1 shows the piers and strapping to be buried. Is this correct?

**Answer:** *Yes, it is likely based on the span and existing grade that the pipe anchors will be buried.*

10. Please provide specifications for the 3-mil epoxy coating required on the casing and the carrier pipe. Please confirm this is to be Exterior coating as the DIP will be lined with Protecto 401.

**Answer:** *The exterior coating shall be an epoxy polyamide such as Series 66 by Tnemec, Macropoxy 646 by Sherwin Williams, Carboguard 890 by Carboline, or other Engineer approved equal.*

11. What is the rebar size required for the vertical bars 12" OC?

**Answer:** *Provide #5 bars.*

12. Concrete is called out as Class A – Please confirm this is GDOT class A – 3000 PSI.

**Answer:** *Yes, this is GDOT Class A Concrete.*

13. Detail for the casing indicates a vent pipe on one end of the casing. What is the minimum height if finished grade is below straps/Pier?

**Answer:** *If the end of the casing pipe is exposed, which is unlikely based on grades, the bottom of the vent should be a minimum of 12-inches above the top of the casing pipe.*

14. Please confirm Bid Time.

**Answer:** *2pm local time on December 3, 2021.*

**15.** Section 2.8.2 indicates bidders must submit with their bid a letter from their insurance company attesting requirements can be met. General conditions indicate this information will be in section 007316. Please provide this section.

**Answer:** *All references to Section 00 73 16, should be replaced with “Attachment C – Insurance Requirements” which was provided in the Bid Documents.*

**16.** Section 011100 indicates a testing allowance. Section 012310 indicates this allowance is \$5,000.00. Section 012900 also identifies this allowance. This is contrary to pre-bid meeting. Please clarify responsibility for soil and concrete testing.

**Answer:** *A \$5,000.00 allowance will be provided for soil and concrete testing as indicated in Section 01 23 10. Bid Form 5 – Cost Proposal, has been updated to reflect this Allowance. Please use updated Bid Form in your submittal.*

**17.** Is a quality control plan per 014000 applicable to this project?

**Answer:** *A quality control plan will not be required; however, Contractor will be required to meet the quality requirements as outlined in Section 01 40 00. A revised version of this Section is provided with Addendum #2.*

**18.** Are all the requirements of section 013224 applicable to this project?

**Answer:** *Yes, Contractor will be required to take pre-construction photos and video but may submit by email or file transfer in lieu of DVD, CD, or USB.*

**19.** Section 016000 indicates insulation of all piping. Please confirm if this is applicable to this project.

**Answer:** *Piping insulation will not be required.*

**20.** Will the owner televise the existing line prior to the bid? If NOT, can an allowance line item be added to examine the condition of the existing clay line.

**Answer:** *The City will complete a CCTV inspection of the lines as soon as possible, but it is not anticipated that this will be complete before bids are due. Depending on the results of the CCTV inspection, the City may negotiate a change order with the selected contractor.*

**21.** Can a doghouse Manhole be placed on the downstream line in order to shorten the bypass route?

**Answer:** *This will not be allowed. Contractor to utilize existing manholes for bypass operation.*

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SIGNATURE PAGE TO FOLLOW

This addendum shall be signed and attached to any proposals submitted to the City of Clayton for this project. If this addendum is not returned or not signed, responding individuals, companies or other organizations will still be responsible for the requirements of this addendum and the specifications or changes herein.

Acknowledged:

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Printed Name

\_\_\_\_\_  
Company

## BID FORM 5 – ADDENDUM #2 COST PROPOSAL

The undersigned Bidder proposes to furnish all services, materials and equipment required to perform the Construction Services (the “Services”) in accordance with the Bid, Draft Contract Documents included in Appendix B of the Bid.

The undersigned declares that it is the Bidder or by holding the position below indicated is authorized to execute this Cost Proposal on behalf of the Bidder and that all representations made on this Cost Proposal are true and correct.

The undersigned acknowledges that the Cost Proposal is based on the Draft Contract Documents included in Appendix B of the Bid and as amended by any Addenda during the procurement period.

Cost Proposal

Bidder shall complete, by filling in the blanks and execute this Form and include it in its Bid Proposal.

Item No.	Item Description	Unit	Estimated Quantity	Unit Price	Extended Amount
1	Lump Sum for Installation of Aerial Sewer Replacement	LS	1	\$	\$
2	Allowance 1 – Soil and Concrete Testing	LS	1	\$5,000.00	\$ 5,000.00
				\$	\$
	<b>Total Bid Price</b>				\$

The Total Bid Price for the items listed above for construction complete as indicated by the Contract Documents (in words and numerals) is:

\_\_\_\_\_ (Dollars)  
and \_\_\_\_\_ (Cents) [\$\_\_\_\_\_].

\_\_\_\_\_  
Bidder

\_\_\_\_\_  
Name and Title

\_\_\_\_\_  
Date

## **01 40 00      QUALITY REQUIREMENTS**

### **1.00    GENERAL**

#### **1.01    CONTRACTOR'S RESPONSIBILITIES**

- A. Control the quality of the Work and verify that the Work meets the standards of quality established in the Contract Documents.
  - 1. Inspect the Work of the Contractor, Subcontractors and Suppliers. Correct defective Work.
  - 2. Inspect products and materials to be incorporated into the Project. Ensure that Suppliers of raw materials, parts, components, assemblies, and other products have adequate quality control system to ensure that quality products are produced. Provide only products that comply with the Contract Documents.
  - 3. Provide all facilities and calibrated equipment required for quality control tests.
  - 4. Provide consumable construction materials of adequate quality to provide a finished product that complies with the Contract Documents.
  - 5. Perform tests as indicated in this and other sections of the Specifications. Schedule the time and sequence of testing with the Engineer. All quality control testing is to be observed by the Engineer or designated representative.
  - 6. Maintain complete inspection and testing records at the Site and make them available to Owner, Engineer and Engineer.
  
- B. Retain the services of a professional materials testing laboratory selected and approved by the Owner and Engineer to ensure that Work fully complies with the Contract Documents. Provide services of a testing laboratory capable of performing a full range of testing procedures complying with the standards for testing procedures specified, with personnel certified to perform the tests required. An allowance is provided in the Bid to pay for the services of the testing laboratory (Reference Section 01 23 10 – Alternates and Allowances).
  - 1. Coordinate scheduling of testing laboratory.
  - 2. Provide access to the Work at all times Work is in progress.
  - 3. Cooperate fully in the performance of sampling, inspection, and testing.
  - 4. Furnish labor and facilities to:
    - a. Provide access to the Work to be tested.
    - b. Obtain and handle Samples for testing at the Site or at the source of the product to be tested.
    - c. Facilitate inspections and tests.
    - d. Provide adequate lighting to allow observations.
    - e. Store and cure test Samples.
  - 5. Furnish copies of the tests performed on materials and products.

6. Provide adequate quantities of representative product to be tested to the laboratory at the designated location.
  7. Give the Engineer or Owner's representative adequate notice before proceeding with Work that would interfere with testing.
  8. Notify the Engineer or Owner's representative and the testing laboratory prior to the time that testing is required. Lead time is to be adequate to allow arrangements to be made for testing.
  9. Do not proceed with any Work until testing services have been performed and results of tests indicate that the Work is acceptable.
  10. Provide complete access to the Site and make Contract Documents available.
  11. Provide personnel and equipment needed to perform sampling or to assist in making the field tests.
- C. Technical specifications govern if any requirements of this section conflicts with the requirements of the technical specifications.

#### 1.02 QUALITY ASSURANCE ACTIVITIES BY THE OWNER

- A. Owner may perform its own quality assurance test independent of the work performed under the testing allowance described above. Assist the Owner, Engineer, and testing organizations in performing quality assurance activities. Quality assurance testing performed by the Owner will be paid for by the Owner.
- B. Quality assurance activities of the Owner through their own forces or through contracts with materials testing laboratories and survey crews are for the purpose of monitoring the results of the Contractor's Work to see that it is in compliance with the requirements of the Contract Documents.
- C. Quality assurance activities of the Owner or non-performance of quality assurance activities:
  1. Do not relieve the Contractor of its responsibility to perform Work and furnish materials and products and constructed Work conforming to the requirements of the Contract Documents.
  2. Do not relieve the Contractor of its responsibility for providing adequate quality control measures.
  3. Do not relieve the Contractor of its responsibility for damage to or loss of the material, product or Work before Owner's acceptance.
  4. Do not constitute or imply Owner's acceptance.
  5. Do not affect the continuing rights of the Owner after Owner's acceptance of the completed Work.
- D. The presence or absence of the Owner's Resident Representative or Engineer does not relieve the Contractor from any contract requirement, nor is the Owner's Resident Representative or Engineer authorized to change any term or condition of the Contract Documents without the Owner's written authorization in a Field Order or Change Order.

- E. Failure on the part of the Owner or Engineer to perform or test products or constructed Works in no way relieves the Contractor of the obligation to perform Work and furnish materials conforming to the Contract Documents.
- F. All materials and products are subject to Owner's quality assurance observations or testing at any time during preparation or use. Material or products which have been tested or observed or approved by Owner at a supply source or staging area may be re-observed or re-tested by Owner before or during or after incorporation into the Work, and rejected if they do not comply with the Contract Documents.

#### 1.03 SUBMITTALS

- A. Submittals shall be in accordance with Section 01 33 00 "Submittal Procedures" and shall include:
  - ~~1. A written Quality Management Plan that establishes the methods of assuring compliance with the Contract Documents. Submit this program as Record Data.~~
  - ~~2. A Statement of Qualifications for the proposed testing laboratory. The statement of qualifications is to include a list of the engineers and technical staff that will provide testing services on the Project, descriptions of the qualifications of these individuals, list of tests that can be performed, equipment used with date of last certification and a list of recent projects for which testing has been performed with references for those projects.~~
  - 3. Test reports per Paragraph 1.07 of this Specification. Reports are to certify that products or constructed Works are in full compliance with the Contract Documents or indicate that they are not in compliance and describe how they are not in compliance.
  - 4. Provide Certified Test Reports on materials or products to be incorporated into the Project. Reports are to indicate that material or products are in full compliance with the Contract Documents or indicate that they are not in compliance and describe how they are not in compliance.

#### 1.04 STANDARDS

- A. Provide a testing laboratory that complies with the ACIL (American Council of Independent Laboratories) "Recommended Requirements for Independent Laboratory Qualifications."
- B. Perform testing per recognized test procedures as listed in the various sections of the Specifications, standards of the State Department of Transportation, American Society of Testing Materials (ASTM), or other testing associations. Perform tests in accordance with published procedures for testing issued by these organizations.

#### 1.05 DELIVERY AND STORAGE

- A. Handle and protect test specimens of products and construction materials at the Site in accordance with recognized test procedures.

#### 1.06 VERIFICATION TESTING

- A. Provide verification testing when tests indicate that materials or the results of construction activities are not in conformance with Contract Documents.



- B. Verification testing is to be provided at the Contractor’s expense to verify products or constructed works are in compliance after corrections have been made.
- C. Tests must comply with recognized methods or with methods recommended by the testing laboratory and approved by the Engineer.

1.07 TEST REPORTS

- A. Test reports are to be prepared for all tests.
  - 1. Tests performed by testing laboratories may be submitted on their standard test report forms. These reports must include the following:
    - a. Name of the Owner, project title and number, equipment installer and general contractor.
    - b. Name of the laboratory, address, and telephone number.
    - c. Name and signature of the laboratory personnel performing the test.
    - d. Description of the product being sampled or tested.
    - e. Date and time of sampling, inspection, and testing.
    - f. Date the report was issued.
    - g. Description of the test performed.
    - h. Weather conditions and temperature at time of test or sampling.
    - i. Location at the Site or structure where the test was taken.
    - j. Standard or test procedure used in making the test.
    - k. A description of the results of the test.
    - l. Statement of compliance or non-compliance with the Contract Documents.
    - m. Interpretations of test results, if appropriate.
  - 2. Submit reports on tests performed by Contractor or his suppliers or vendors on the forms provided by the Engineer.
  - 3. Engineer will prepare test reports on test performed by the Engineer.
- B. Distribute copies of the test reports to the Engineer within 24 hours of completing the test. Flag tests reports with results that do not comply with Contract Documents for immediate attention. Hard copies of test reports are to be distributed to individuals designated at the pre-construction conference:

Recipient	No. of Copies
Owner	1
Engineer	1
Contractor	1

- C. Payment for Work subject to testing may be withheld until the Contractor’s quality control test reports of the Work are submitted to the Engineer or the Owner’s Resident Representative.

#### 1.08 NON-CONFORMING WORK

- A. Immediately correct any Work that does not comply with the Contract Documents or submit a written explanation of why the Work is not to be corrected immediately and when corrective action to the Work will be performed.
- B. Payment for non-conforming Work shall be withheld until Work is brought into compliance with the Contract Documents.

#### 1.09 LIMITATION OF AUTHORITY OF THE TESTING LABORATORY

- A. The testing laboratory representatives are limited to providing consultation on the test performed and to an advisory capacity.
- B. The testing laboratory is not authorized to:
  - 1. Alter the requirements of the Contract Documents.
  - 2. Accept or reject any portion of the Work.
  - 3. Perform any of the duties of the Contractor.
  - 4. Stop the Work.

#### ~~1.10 QUALITY CONTROL PLAN~~

- ~~A. Submit Contractor's Quality Control Plan that identifies personnel, procedures, control, instructions, tests, records, and forms to be used. Construction will be permitted to begin only after acceptance of the Quality Control Plan or acceptance of an interim plan applicable to the particular feature of Work to be started. Work outside of the features of Work included in an accepted interim plan will not be permitted to begin until acceptance of a Quality Control Plan or another interim plan containing the additional features of Work to be started.~~
- ~~B. Content of the Quality Control Plan. The Quality Control Plan shall include, as a minimum, the following to address all construction operations, both on-site and off-site, including work by Subcontractors and Suppliers:
  - 1. A description of the quality control organization, including a chart showing lines of authority and acknowledgement that the quality control staff shall implement the quality control program for all aspects of the Work specified.
  - 2. The name, qualifications (in resume format), duties, responsibilities, and authorities of each person assigned a quality control function.
  - 3. A copy of the letter to the Quality Control Manager signed by an authorized official of the firm which describes the responsibilities and delegates sufficient authorities to adequately perform the functions of the Quality Control Manager, including authority to stop Work which does not comply with the Contract Documents or will result in Work that does not comply with the Contract Documents. The Quality Control Manager shall issue letters of direction to all other various quality control representatives outlining duties, authorities, and responsibilities. Copies of these letters shall also be furnished to the Engineer.~~

- ~~4. Procedures for scheduling, reviewing, certifying, and managing submittals, including those of Subcontractors and Suppliers.~~
  - ~~5. Control, verification, and acceptance testing procedures for each specific test is to include the test name, specification paragraph requiring test, feature of Work to be tested, test frequency, person responsible for each test, applicable industry testing standards and laboratory facilities to be used for the test.~~
  - ~~6. Procedures for tracking phases of quality control, verification, and acceptance tests including documentation.~~
  - ~~7. Procedures for tracking construction deficiencies from identification through acceptable corrective action. Indicate how documentation of the verification process for deficiencies will be made.~~
  - ~~8. Reporting procedures, including proposed reporting formats.~~
  - ~~9. The name of the proposed testing laboratory along with documentation of qualifications, a list of tests that can be performed, and a list of recent projects for which similar testing has been performed with references from those projects.~~
- ~~C. Notification of Changes. After submittal of the Quality Control Plan, the Contractor shall notify the Owner in writing of any proposed changes.~~
- ~~D. Coordination Meeting. After the Pre construction Meeting and before start of construction, the Contractor shall meet with the Owner and Engineer to discuss the Contractor's Quality Control Plan. The Quality Control Plan shall be submitted a minimum of 14 calendar days prior to the Coordination Meeting. During the meeting, a mutual understanding of the system details shall be developed, including the forms for recording the Quality Control operations, testing, administration of the system for both on-site and off-site Work, and the interrelationship of Contractor's management and control with the Owner's Quality Assurance. Revise the Quality Management Plan to reflect comments and recommended changes resulting from this meeting.~~

## **2.00 PRODUCTS**

### **2.01 TESTING APPARATUS**

- A. Furnish testing apparatus and related accessories necessary to perform the tests.

## **3.00 EXECUTION**

### **3.01 QUALITY CONTROL PROGRAM**

- A. Perform quality control observations and testing as required in each section of the Specifications and where indicated on the Drawings.
- B. Provide a quality control program that includes the following phases for each definable Work task. A definable Work task is one which is separate and distinct from other tasks, has separate control requirements, may be provided by different trades or disciplines, or may be Work by the same trade in a different environment.

1. Planning Phase: Perform the following before beginning each definable Work task:
  - a. Review the contract drawings.
  - b. Review submittals and determine that they are complete in accordance with the Contract Documents.
  - c. Check to assure that all materials and/or equipment have been tested, submitted, and approved.
  - d. Examine the work area to assure that all required preliminary Work has been completed and complies with the Contract Documents.
  - e. Examine required materials, equipment, and sample Work to assure that they are on hand, conform to submittals, and are properly stored.
  - f. Review requirements for quality control inspection and testing.
  - g. Discuss procedures for controlling quality of the Work. Document construction tolerances and workmanship standards for the Work task.
  - h. Check that the portion of the plan for the Work to be performed incorporates submittal comments.
  - ~~i. Discuss results of planning phase with the Engineer. Conduct a meeting attended by the Quality Control Manager, the Engineer, superintendent, other quality control personnel as applicable, and the foreman responsible for the Work task. Instruct applicable workers as to the acceptable level of workmanship required in order to meet the requirements of the Contract Documents. Document the results of the preparatory phase actions by separate meeting minutes prepared by the Quality Control Manager and attached to the quality control report.~~
  - ~~j. Do not move to the next phase unless results of investigations required for the planning phase indicate that requirements have been met.~~
2. Work Phase: Complete this phase after the Planning Phase:
  - a. Notify the Engineer at least 24 hours in advance of beginning the Work and discuss the review of the planning effort to indicate that requirements have been met.
  - b. Check the Work to ensure that it is in full compliance with the Contract Documents.
  - c. Verify adequacy of controls to ensure full compliance with Contract Documents. Verify required control inspection and testing is performed.
  - d. Verify that established levels of workmanship meet acceptable workmanship standards. Compare with required sample panels as appropriate.
  - e. Repeat the Work phase for each new crew to work on-site, or any time acceptable specified quality standards are not being met.
3. Follow-up Phase: Perform daily checks to assure control activities, including control testing, are providing continued compliance with contract requirements:
  - a. Make checks daily and record observations in the quality control documentation.

- b. Conduct follow-up checks and correct all deficiencies prior to the start of additional Work tasks that may be affected by the defective Work. Do not build upon nor conceal non-conforming Work.
  - c. Conduct a review of the Work 1 month prior to the expiration of the correction period prescribed in the General Conditions with the Owner and Engineer. Correct defects as noted during the review.
- C. Conduct additional planning and Work phases if:
- 1. The quality of on-going Work is unacceptable.
  - 2. Changes are made in applicable quality control staff, on-site production supervision or work crew.
  - 3. Work on a task is resumed after a substantial period of inactivity.
  - 4. Other quality problems develop.

### 3.02 CAST-IN-PLACE CONCRETE TESTING

- A. Testing Agency: Engage a qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article.
- B. Tests: Perform according to ACI 301.
  - 1. Testing Frequency: One composite Sample shall be obtained for each day's pour of each concrete mix exceeding 5 cubic yards but less than 25 cubic yards, plus one set for each additional 50 cubic yards or fraction thereof.

### 3.03 LEAKAGE TESTS FOR STRUCTURES

- A. Test structures that will contain water on a full time or intermittent basis for leaks. Perform tests prior to installing equipment or materials within the structure. In the event that the structure fails to pass the test, drain the structure, repair the leaks, re-fill, and re-test the structure. Repeat tests until the structure passes the test. The Owner may repeat the test at any time during the correction period established in the General Conditions.
- B. Test the structure for leakage using the following procedure:
  - 1. Determine the evaporation allowance for loss of water.
    - a. Use a standard circular pan procedure established by the U.S. Weather Bureau to measure evaporation rate.
    - b. Calculate evaporation allowance by multiplying the evaporation rate in gallons per 24 hours per square foot of surface area by the open surface area of the water in the structure.
  - 2. Calculate the allowable leakage for the structure. Allowable leakage is calculated as 0.03 gallons per square foot of concrete area in contact with the water per 24 hours.
  - 3. Fill the structure to the overflow level with water at a rate not to exceed 2 feet per hour.
  - 4. Allow the structure to set for a minimum of 72 hours.
  - 5. Observe the perimeter of the structure and identify all leaks.

6. Repair structure walls and floors where leaks have been identified.
  7. Mark the water level at the structure wall. Measure the fall in water level over a 24-hour period to the nearest 1/8 inch at least twice a day to determine the quantity of water lost. Provide a stilling well for measurement if required to allow accurate measurement.
  8. Calculate the amount of water lost during this time.
  9. Compare the amount of water lost to the allowable loss.
- C. Drain the structure, determine the sources of leakage and repair if the amount of water lost exceeds the allowable leakage plus the evaporation allowance.

### 3.04 PIPING SYSTEMS

#### A. Test Requirements:

1. Perform test on piping systems including piping installed between or connected to existing pipe.
2. Conduct tests on buried pipe to be hydrostatically tested after the trench is completely backfilled. If field conditions permit and if approved by the Engineer, partially backfill the trench and leave the joints open for inspection and conducting of the initial service leak test. Do not conduct the acceptance test until backfilling is complete.
3. Pneumatically test the buried piping and expose joints of the buried piping for the acceptance test.
4. Conduct the test on exposed piping after the piping is completely installed, including supports, hangers, and anchors, but prior to insulation and coating application.
5. Do not perform testing on pipe with concrete thrust blocking until the concrete has cured at least 5 days.
6. Determine and remedy the cause of the excessive leakage for any pipe failing to meet the specified requirements for water or air tightness.
7. Tests must be successfully completed and reports filed before piping is accepted.
8. ~~Submit a comprehensive plan and schedule for testing to the Engineer for review at least 10 days prior to starting each type of testing.~~ **Provide a minimum of 72 hours notice to the Owner prior to testing.**
9. Remove and dispose of temporary blocking material and equipment after completion and acceptance of the piping test.
10. Repair any damage to the pipe coating.
11. Clean pipelines so they are totally free flowing prior to final acceptance.
12. Test piping independently from tests on structures.
13. ~~Test method and test pressure depend upon the application of the piping.~~
  - a. ~~Pressure pipe is defined as piping that is part of a pumped or pressurized system. Perform test for pressure pipe per the procedures indicated in Paragraph B of this section.~~

- b. ~~Chemical processing lines are to be tested as pressure pipe regardless of the operating conditions. The test pressure is to be 1.5 times the pressure rating of the pipe.~~
- c. ~~Process piping between hydraulic structures is to be considered as pressure pipe. Perform the test for this pipe per Paragraph B of this section. The test pressure is to be the maximum hydrostatic head plus 10 feet. The maximum hydrostatic head is the difference in elevation of the pipe at its lowest point and the maximum top of the wall.~~

**B. ~~Pressure and Leakage Tests of Pressure Piping:~~**

1. ~~Perform hydrostatic pressure and leakage tests using methods, and per performance requirements of Section 5 of AWWA C600 regardless of pipe material tested.~~
  - a. ~~The pressure required for hydrostatic pressure test shall be 50 percent above the normal working pressure, or as indicated on the drawings. If the normal working pressure cannot be determined, use the pipe pressure rating as the normal working pressure.~~
  - b. ~~Provide temporary plugs and blocking necessary to maintain the required test pressure. Where piping is cast in the walls for a structure, brace the walls prior to testing as required to prevent load of test pressure from being imposed upon the structure.~~
  - c. ~~Provide corporation cocks at least 3/4 inch in diameter, pipe riser, and angle globe valves at each pipe dead-end in order to bleed air from the line.~~
  - d. ~~Duration of pressure test shall be at least 4 hours.~~
  - e. ~~Repair any visible leaks regardless of the total leakage shown by the test.~~
  - f. ~~Repair pipelines which fail to meet the test and retest as necessary until the results conform to the test requirements.~~
  - g. ~~Remove and replace defective materials, pipes, valves, and accessories.~~
  - h. ~~Test the pipelines in sections by shutting valves or installing temporary plugs as necessary.~~
  - i. ~~Fill the pipeline with water and remove the air.~~
  - j. ~~Maintain the test pressure in the pipe for the entire test period by means of a force pump.~~
  - k. ~~Accurately measure the water required to maintain the pressure. The amount of water required is a measure of the leakage.~~

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2. The maximum allowable leakage is determined by the following formula:

$$L = \frac{SD(P)^{1/2}}{F}$$

Equation Term	Represents	Measure
L	Maximum allowable leakage	gallons per hour
S	Length of pipe tested	feet
D	Nominal diameter of the pipe	inches
P	Test pressure	pounds per square inch gauge
F	Pipe factor	
	<del>Use 148,000 Ductile Iron Pipe and PVC Pipe.</del>	
	<del>Use 133,200 for all other pipe types.</del>	

a. ~~Leakage is defined as the volume of water provided to maintain the test pressure after the pipe has been filled with water, the air expelled and the pipe brought to test pressure.~~

b. ~~Pipe with visible leaks or leakage exceeding the maximum allowable leakage is considered defective and must be corrected.~~

C. Hydrostatic Leak Test-Gravity Flow Sewer Lines:

1. Perform hydrostatic leak tests after backfilling.
2. The length of the pipe to be tested shall be such that the head over the crown of the upstream end is not less than 2 feet or 2 feet above the ground water level whichever is higher and the head over the downstream crown is not more than 6 feet.
3. Plug the pipe by pneumatic bags or mechanical plugs so that the air can be released from the pipe while it is being filled with water.
4. Continue the test for 1 hour and make provisions for measuring the amount of water required to maintain the water at a constant level during this period.
5. Remove the jointing material, and remake the joint if any joint shows any visible leakage or infiltration.
6. Remove and replace any defective or broken pipes.
7. Determine the maximum allowable leakage or infiltration by the following formula:

$$L = \frac{CDS}{126720}$$

Equation Term	Represents	Measure
L	Maximum allowable leakage	gallons per hour
S	Length of pipe tested	feet



D	Nominal diameter of the pipe	inches
C	Infiltration / exfiltration rate	
	Use 50 for C outside of 25 year floodplain.	
	Use 10 for C within 25 year floodplain.	

8. Determine the rates of infiltration by means of V-Notch weirs, pipe spigot, or plugs in the end of the pipe. Methods, times, and locations are subject to the Engineer's approval.
9. Pipe with visible leaks or infiltration or exceeds the maximum allowable leakage or infiltration is considered defective and must be corrected.

D. Low Pressure Air Test- Gravity Flow Sewer Lines:

1. Use air test in lieu of the hydrostatic test if desired, or if pipeline grades do not allow filling the entire pipeline segment or manhole to the indicated depth.
2. Perform low-pressure air tests, using equipment specifically designed and manufactured for the purpose of testing sewer pipelines using low-pressure air. Test is to conform to procedure described in ASTM F1417 except for testing times. The following test times are required:

Pipe Diameter (inches)	Minimum Time (seconds)	Length for Minimum Time (feet)	Time for Long Length (seconds)
6	340	398	0.855 (L)
8	454	298	1.520 (L)
10	567	239	2.374 (L)
12	680	199	3.419 (L)
15	850	159	5.342 (L)
18	1020	133	7.693 (L)
21	1190	114	10.471 (L)
24	1360	100	13.676 (L)
27	1530	88	17.309 (L)
30	1700	80	21.369 (L)
33	1870	72	25.856 (L)

- a. Provide the equipment with an air regulator valve or air safety valve set to an internal air pressure in the pipeline that cannot exceed 6 psig.
- b. Pass air through a single control panel.
- c. Provide pneumatic plugs that have a sealing length equal to or greater than the circumference of the pipe to be tested.
- d. Provide pneumatic plugs that resist internal test pressures without requiring external bracing or blocking.

- e. Provide an air compressor of adequate capacity for charging the system.
- 3. Perform air test only on lines less than 36 inches in diameter. Air tests for pipes larger than 36 inches may be air tested at each joint.
- 4. Check connections for leakage with a soap solution. Release the air pressure, repair the leak, and retest with soap solution until results are satisfactory, before resuming air test if leaks are found.
- 5. Determine the shortest allowable time for the pressure to drop from 3.5 pounds per square inch to 2.5 pounds per square inch by the following formula:

$$T = \frac{0.0850DK}{Q}$$

Equation Term	Represents	Measure
T	Time for the pressure to drop 1.0 pound per square inch gauge	seconds
K	Factor equal to 0.000419DL, but not less than 1.0	
D	Average inside diameter of the pipe	inches
L	Length of line of the same pipe size	feet
Q	Rate of loss. Use 0.0015 cubic feet per minute per square foot of internal surface	

E. Air Test for Individual Joints:

- 1. Lines 36 inches and larger may be tested at individual joints.
- 2. The shortest allowable time for the pressure to drop from 3.5 pounds per square inch gauge to 2.5 pounds per square inch gauge is 10 seconds for all pipe sizes.

F. Deflection Testing for Pipe:

- 1. Perform deflection tests on flexible and semi-rigid pipe in accordance with NCDEQ requirements.
  - a. The maximum allowable deflection of pipe measured as the reduction in vertical inside diameter is 5.0 percent unless specified otherwise.
  - b. Conduct test after the final backfill has been in place a minimum of 30 days.
  - c. Thoroughly clear the lines before testing.
- 2. Perform test by pulling a properly sized mandrel through the line. Measure deflection from the inside of the pipe.
- 3. Excavate and repair pipe with deflections in excess of the maximum allowable deflection.

**END OF SECTION**

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