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***SECTION 5***  
***SPECIFICATIONS***

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## SECTION 011100 - SUMMARY OF WORK

### PART 1 - GENERAL

#### 1.1 LOCATION OF THE PROJECT

- A. The project is located within the Noteman Road area of the Village of Plain City on the following streets:
  - 1. Noteman Road.
  - 2. Shepper Avenue.
  - 3. Converse Avenue

#### 1.2 PROJECT DESCRIPTION

- A. The project consists of storm sewers, manholes, inlets, rock channel protection, sanitary sewer rehabilitation, waterline, and pavement restoration.
- B. Sanitary sewer rehabilitation work consists of cleaning of sewers, televising, cutting of protruding mineral deposits, cured-in-place pipe lining, connection reinstatements, manhole replacement, preservation of utilities and landscaping, cleaning rocks and debris from pipe, ensuring existing VCP is as round as possible, and smoothing jagged edges that could rip a cured-in-place pipe (CIPP) during installation. Site restoration to match existing conditions or better, and utility coordination with private and public utilities.

#### 1.3 SPECIFICATIONS

- A. In general, these Specifications describe the work to be performed by the various trades, other than work specifically excluded. It shall be the responsibility of the Contractor and Subcontractors to perform all work incidental to their trade, whether or not specific mention is made of each item, unless such incidentals are included under another Item.
- B. It is advised that the Contractor and all Subcontractors familiarize themselves with the contents of the complete Specifications, particularly for the trades preceding, following, related or adjacent to their work.

#### 1.4 LOCATION OF WORK

- A. The location of manholes and pipes where sanitary sewer rehabilitation work is to be done under this Contract is shown on the below map. The work to be done is listed in the table on the subsequent pages.

END OF SECTION 011100

## SECTION 011419 – USE OF SITE

### PART 1 - GENERAL

#### 1.1 GENERAL

- A. The Contractor will be allowed the use of as much of the site designated for the improvements as is necessary for his operation.

#### 1.2 USE OF STREETS

- A. During the progress of the work, the Contractor shall make ample provisions for both vehicle and pedestrian traffic on any public street and shall indemnify and save harmless the Owner from any expense whatsoever due to their operations over said streets. The Contractor shall also provide free access to all the fire hydrants, water, and gas valves located along the line of his work. Gutters and waterways must be kept open or other provisions made for the removal of storm water. Street intersections may be blocked only one-half at a time, and the Contractor shall lay and maintain temporary driveways, bridges and crossings, such as in the opinion of the Engineer are necessary to reasonably accommodate the public.
- B. In the event of the Contractor's failure to comply with these provisions, the Owner may cause the same to be done, and may deduct the cost of such work from any monies due the Contractor under this Agreement, but the performance of such work by the Owner at its instance shall serve in no way to release the Contractor from his general or particular liability for the safety of the public or the work.
- C. The Contractor shall repair at no cost to the Owner, all existing roads, parking areas, grassed areas that are damaged due to the execution of his work. The Contractor shall remove daily all mud, soil and debris that may be tracked onto existing streets, drives, or walks by his equipment or that of subcontractors or suppliers.

#### 1.3 CLOSING STREETS TO TRAFFIC

The Contractor may with the approval of the Engineer, close streets, or parts of streets, to vehicular traffic. The streets are to remain closed as long as the construction work or the condition of the finished work requires or as determined by the Engineer. The Engineer shall be the judge of how many streets or parts of streets it is necessary for the Contractor to close at any time, and may refuse to permit the closing of additional streets to traffic until the majority of the work on the closed streets is completed and they are opened to traffic.

#### 1.4 RIGHTS-OF-WAY

- A. Whenever it is required to perform work within the limits of public or private property or in rights-of-way, such work shall be done in conformity with all agreements between the Owner and the owners of such. Care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said public or private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.
- B. The Contractor shall not (except after consent from the proper parties) enter or occupy with men, tools or equipment, any land outside the rights-of-way or property of the Owner.
- C. When the Contractor performs construction within 10 ft. of a right-of-way or easement line, he shall place tall stakes properly identified at points of change in width or direction of the right-of-way or easement line and at points along the line so that at least two stakes can be seen distinctly from any point on the line.

#### 1.5 EASEMENTS

- A. Where the work is to be constructed upon easements, such easements will be secured by the Owner without cost to the Contractor. The Contractor shall not enter upon or occupy any private property outside of the limits of the easements furnished.
- B. Care shall be taken to avoid injury to the premises entered, which premises shall be left in a neat and orderly condition by the removal of rubbish and the grading of surplus materials, and the restoration of said public or private property to the same general conditions as pertained at the time of entry for work to be performed under this contract.

#### 1.6 PROTECTING EXISTING BUILDINGS, STRUCTURES AND ROADWAYS

- A. The Contractor shall, at his own expense, shore up and protect any buildings, roadways, utilities or other public or private structures which may be encountered or endangered in the prosecution of the work, and that may not be otherwise provided for, and he shall repair and make good any damages caused to any such property by reason of his operations. All existing fences removed due to the prosecution of the work shall be replaced by the Contractor. No extra payment will be made for said work or material, but the cost of this work must be included in the price stipulated for the work to be done under this contract.

#### 1.7 SITE FACILITIES

- A. The Contractor shall furnish and place sufficient quantities of portable toilet facilities at locations convenient for use by the Contractor's personnel, Subcontractors, the Engineer, and the Owner.

1.8 RESTORATION

- A. The contractor shall restore all areas per the plans and specifications and if not specified, at least to the condition existing prior to the start of work.

END OF SECTION 011419

## SECTION 011423 - ADDITIONAL WORK, OVERTIME

### PART 1 - GENERAL

#### 1.1 NIGHT, SUNDAY AND HOLIDAY WORK

- A. No work will be permitted at night, Sunday or legal holidays except as noted on the plans or in the case of emergency and then only upon written authorization of the Engineer. Where no emergency exists, but the Contractor feels it advantageous to work at night, Sunday or legal holidays, the Contractor shall notify the Engineer at least two (2) days in advance, requesting written permission. Any work performed during the absence of the Engineer will be done at the Contractor's risk and responsibility and may be subject to rejection upon later inspection.

END OF SECTION 011423

## SECTION 012513 – PRODUCT SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 MATERIALS AND EQUIPMENT

- A. In the specifications and on the Engineer's drawings, are specified and shown certain pieces of equipment and materials deemed most suitable for the service anticipated. This is not done to eliminate other equipment and materials equally as good and efficient. The Contractor shall prepare his bid on the particular materials and equipment specified. Following the award of the contract, should the Contractor desire to use other equipment and materials, he shall submit to the Owner a written request for such change and state the advantage to the Owner and the savings or additional cost involved by the proposed substitution. The determination as to whether or not such change will be permitted rests with the Owner and the Engineer.
- B. Each major item of equipment shall be inspected by a manufacturer's representative during installation and upon completion of the work. The Contractor shall supply the Engineer with a certificate of such inspection.

END OF SECTION 012513

## SECTION 013119 - PROJECT MEETINGS

### PART 1 - GENERAL

#### 1.1 PRECONSTRUCTION MEETING

- A. Prior to the Contractor beginning any work on the project, the Owner will schedule and hold a preconstruction meeting to discuss all aspects of the contract work.
- B. The Contractor shall be present and be prepared to comment in detail on all aspects of his work.
- C. The Contractor shall bring to the preconstruction meeting a proposed construction progress schedule, erosion control plan, quality control program, concrete mix designs, asphalt mix designs (JMF), etc. Approval of each by the Engineer is required prior to the start of any work.
- D. Included in the construction progress schedule shall be an implementation sequence of the proposed erosion control efforts required by the contract.

END OF SECTION 013119



## SECTION 013216 – CONSTRUCTION PROGRESS SCHEDULE

### PART 1 - GENERAL

#### 1.1 PROGRESS SCHEDULE

- A. Immediately after signing the Contract, the General Construction Contractor shall prepare a graphic progress schedule, indicating the work to be executed during each month and the rate of expected progress to secure completion on the agreed-upon completion date. The progress schedule shall be approved by the Engineer and Owner prior to starting work on the site. Copies of such graphic progress charts, upon which has been indicated the actual progress, shall be furnished to the Engineer with each requisition for payment.
- B. Should the rate of progress fall materially behind the scheduled rate of progress, and unless the delay is authorized by the Engineer, each offending Contractor shall furnish additional labor, work overtime, or take other necessary means required for completion of the work on the scheduled date. No additional compensation beyond the set Contract price shall be paid for action taken or overtime expense incurred in maintaining scheduled progress.

END OF SECTION 013216

## SECTION 013223.02 – SURVEY AND LAYOUT DATA

### PART 1 - GENERAL

#### 1.1 REFERENCE POINTS AND STAKING

- A. The Contractor shall be responsible for surveying and laying out the work and shall protect and preserve the established reference points and shall make no changes or relocations without the prior written approval of the Engineer. They shall report to the Engineer whenever any reference point is lost or destroyed or requires relocation because of necessary changes in grades or locations. The Contractor shall replace and accurately relocate all reference points so lost, destroyed or moved.

#### 1.2 LAYOUT OF WORK

- A. The Contractor shall lay out their work and be responsible for correct locations, elevations and dimensions of all work executed by him under this Contract. The Contractor must exercise proper precautions to verify the figures shown on the Drawings before laying out the work and will be held responsible for any error resulting from their failure to exercise such precaution. The Contractor shall insure the new construction aligns with any existing work.

END OF SECTION 013223.02

## SECTION 013236 – VIDEO MONITORING AND DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 SCOPE

- A. Provide all labor, materials, equipment, and services, and perform all operations necessary to furnish to the Owner a complete color audio-video record of the surface features within the proposed construction zone of influence. This record shall include, but not be limited to, all audio-video DVDs or digital file on a flash drive, storage cases, video logs, and indexes. The purpose of this coverage shall be to accurately document the pre-construction condition of these surface features.

#### 1.2 QUALIFICATIONS

- A. The video documentation shall be done by a responsible commercial firm known to be skilled and regularly engaged in the business of pre-construction color audio-video documentation. The firm shall furnish such information as the Owner deems necessary to determine the ability of that firm to perform the work in accordance with the Contract specifications.

#### 1.3 PRODUCTS

- A. The color audio-video recording delivered to the Owner shall be on a high quality DVD or on a flash drive with digital mp4 files.

END OF SECTION 013236

## SECTION 013319 - FIELD TEST REPORTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes, but is not limited to, services performed by a testing laboratory. Laboratory services covered under this section are for testing materials used for field constructed elements of the work. Performance testing of manufactured items and shop fabricated materials shall be covered under their respective specification section.
- B. All testing performed under this item shall be for the protection and benefit of the Owner and shall not be construed by the Contractor as a comprehensive quality control program intended to protect the Contractor, his subcontractors, or his suppliers. The testing frequency and types of testing shall be at the discretion of the Owner.
- C. Inspections, tests, and related actions specified in this section and elsewhere in the contract documents are not intended to limit the Contractor's own quality control procedures and testing, which facilitate overall compliance with requirements of the contract documents. Requirements for the Contractor to provide quality control services as required by the Engineer, the Owner, governing authorities, or other authorized entities are not limited by the provisions of this Section.
- D. The Contractor is required to cooperate with the testing laboratories performing required inspections, test, and similar services and the Engineer or his representative.
- E. Materials and installed work may require testing or retesting at any time during progress of work. Retesting of rejected materials or installed work shall be done at Contractor's expense.

#### 1.2 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. The Contract Documents may include testing requirements furnished under other Sections. Work elements which may include other testing requirements are:
  - 1. Sanitary sewer systems.

#### 1.3 SELECTION AND PAYMENT

- A. The Owner will employ and pay for services of a testing laboratory to perform specified testing separate and apart from this contract. Payment for the samples or materials submitted shall be considered incidental to the related work bid item.

- D. Employment of testing laboratory in no way relieves the Contractor of the obligation to perform work in accordance with requirements of the contract documents.
- E. The testing laboratory and their personnel shall be under the direction of the Engineer's on-site representative, regardless of who employs their services.

#### 1.4 REFERENCES

- A. AASHTO T-19, Standard Method of Test for Unit Weight and Voids in Aggregate.
- B. AASHTO T-37, Standard Method of Test for Sieve Analysis of mineral Filler for Road and Paving Materials.
- C. AASHTO T-230, Standard Method of Test for Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures.
- D. ASTM C-29, Standard Method of Test for Unit Weight and Voids in Aggregate.
- E. ASTM C-31, Standard Practice for Making and Curing Concrete Test Specimens in the Field.
- F. ASTM C-33, Standard Specification for Concrete Aggregates.
- G. ASTM C-39, Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.
- H. ASTM C-40, Test Method for Organic Impurities in Fine Aggregates for Concrete.
- I. ASTM C-42, Standard Test Methods for Obtaining and Testing Drilled Cored and Sawed Beams of Concrete.
- J. ASTM C-88, Standard Test Method for Soundness of Aggregate by use of Sodium Sulfate or Magnesium Sulfate.
- K. ASTM C-94, Standard Specification for Ready-Mixed Concrete.
- L. ASTM C-117, Standard Test Method for Materials Finer than 75-um (No. 200) Sieve in Mineral Aggregates by Washing.
- M. ASTM C-136, Standard Method for Sieve Analysis of Fine and Course Aggregate.
- N. ASTM C-142, Test Method for Clay Lumps and Friable Particles in Aggregate.
- O. ASTM C-143, Standard Test Method for Slump of Hydraulic Cement Concrete.
- P. ASTM C-172, Standard Practice for Sampling Freshly Mixed Concrete.

- Q. ASTM C-173, Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
- R. ASTM C-231, Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
- S. ASTM C-535, Standard Test Method for Resistance to Degradation of Large-Size Course Aggregate by Abrasion and Impact in the Los Angeles Machine.
- T. ASTM C-1064, Standard Test Method for Temperature of Freshly Mixed Portland Cement Concrete.
- U. ASTM D-698, Standard Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate Mixtures Using 5.5-lb. (2.49-kg) Rammer and 12-inc. (305-mm) Drop.
- V. ASTM D-2487, Standard Test Method for Classification of Soils for engineer purposes.
- W. ASTM D-2940, Standard Specification for Graded Aggregate Material for Bases or Subbases for Highways or Airports.
- X. ASTM D-4253, Standard Test Method for Maximum Index Density and Unit Weight of Soils Using a Vibratory Table.
- Y. ASTM D-4254, Standard Test Method for Minimum Index Density and Unit Weight of Soils and Calculation of Relative Density.
- Z. ASTM D-4832, Standard Test Method for Preparation and Testing of Controlled Low Strength Material (CLSM) Test Cylinders.
- AA. ODOT Supplement 1021, Method of Test for Determination of the Percent of Fractured Pieces in Gravel.
- AB. ODOT Supplement 1029, Method of Test for Determining the Percentage of Deleterious Materials in Course Aggregate.
- AC. ODOT Supplement 1036, Method of Test for Determination of Percent Air Voids in Compacted Dense Bituminous Paving Mixtures.
- AD. ODOT Supplement 1044, Mix Design Method for Bituminous Aggregate Base.
- AE. Uni-Bell PVC Pipe Association UNI-B-6-98 for Low Pressure Air Testing of Installed Sewer Pipe.
- AF. ASTM – C969 – Standard practice for infiltration and exfiltration acceptance of installed concrete sewer pipe.

## 1.5 SUBMITTALS

- A. Submit a sample test report for review by the Engineer to demonstrate conformance with Article 3.2 herein.

## 1.6 QUALITY ASSURANCE

- A. Except as otherwise indicated, the testing laboratory engaged shall be prequalified by the Ohio Department of Transportation for the types of services specified herein.
- B. The field personnel utilized to perform all field-testing and preparation shall be certified for those tests being performed.

## 1.7 RESPONSIBILITIES

- A. Testing Laboratory Responsibilities:
  - 1. Provide qualified personnel at the site. Cooperate with the Engineer and Contractor in performance of services.
  - 2. Perform specified sampling and testing of products in accordance with the specified standards.
  - 3. Ascertain compliance of materials and mixes with requirements of the contract documents.
  - 4. Immediately notify the Engineer and Contractor of observed irregularities or nonconformance of work or products.
  - 5. Perform additional tests required by the Engineer.
  - 6. Testing personnel are to report to the Engineer or his representative upon arrival on site for instructions and requirements. Prior to leaving the site, furnish the Engineer or his representative all test results whether in a formal or informal format.
  - 7. Attend preconstruction meetings and progress meetings.
- B. Contractor Responsibilities:
  - 1. Provide access to materials proposed to be used which require testing.
  - 2. Cooperate with laboratory personnel and provide access to the work (*and to manufacturers' facilities*).
  - 3. Provide incidental labor and facilities:
    - a. To provide access to work to be tested.
    - b. To obtain and handle samples at the site or at the source of products to be tested.
    - c. To facilitate tests.
    - d. To provide storage and curing of test samples as required by the testing laboratory.
  - 4. Notify the Engineer 24 hours prior to expected time for operations requiring testing services for scheduling purposes. Materials will not be permitted to be placed without the proper testing being performed in conformance with this Section.

## 1.8 LIMITS OF LABORATORY AUTHORITY

- A. The laboratory may not release, revoke, alter, or enlarge the requirements of the contract documents.
- B. The laboratory may not approve or accept any portion of the work.
- C. The laboratory may not assume any duties of the Contractor.
- D. The laboratory has no authority to stop the work.

## PART 2 – PRODUCTS (NOT APPLICABLE)

## PART 3 – EXECUTION

### 3.1 SEQUENCING AND SCHEDULING

- A. The Contractor shall coordinate the sequence of work activities so as to accommodate required testing and shall allow sufficient time for testing of materials by the laboratory so as to cause no delay in the work or the work of any other Contractor. In addition, the Contractor shall coordinate his work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests.

### 3.2 LABORATORY TEST RESULTS

- A. The testing laboratory shall submit a certified written report of each inspection, test, or similar service concurrently to the Owner, Engineer, and Contractor.
- B. Written reports of each inspection, test, or similar service shall include, but not be limited to, the following:
  - 1. Name of testing laboratory.
  - 2. Project name and construction contract reference number.
  - 3. Dates and locations of samples and tests or inspections.
  - 4. Date of report.
  - 5. Names of individuals making the inspection or test.
  - 6. Designation of the work and test method.
  - 7. Test results.
  - 8. Notation of significant ambient conditions at the time of sample taking and testing.

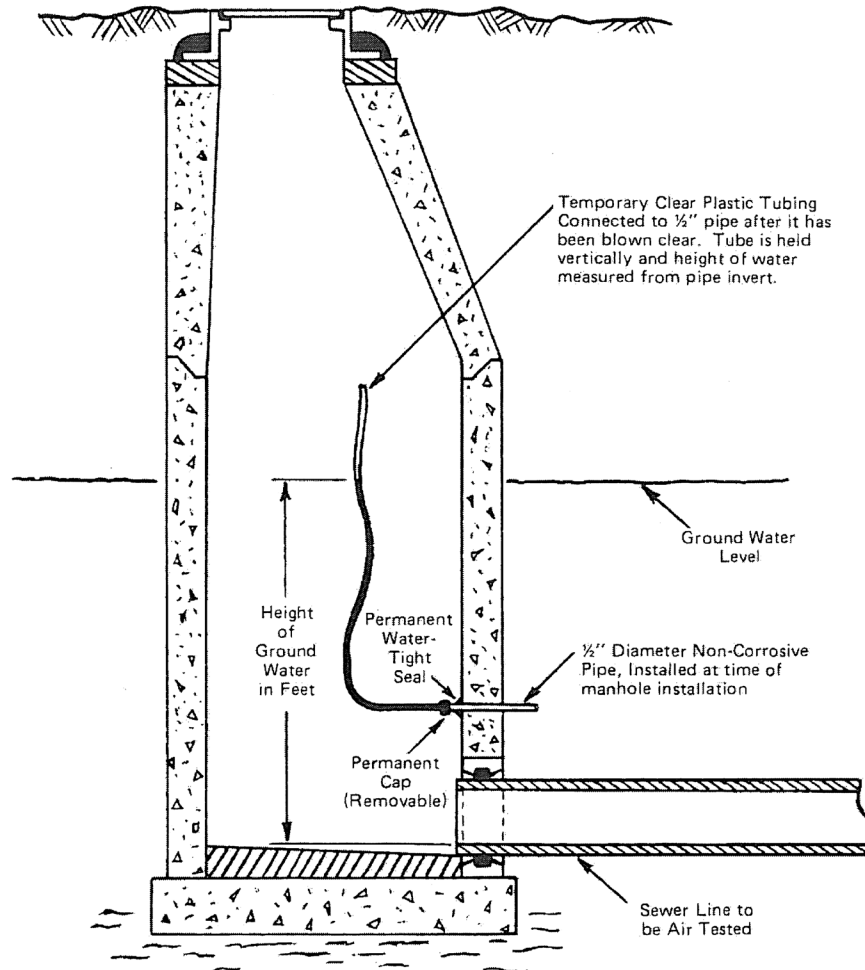
END OF SECTION 013319



UNI-B-6-98

FIGURE NO. 1

**MANHOLE CROSS-SECTIONAL VIEW  
OF THE PROPER METHOD FOR  
DETERMINING GROUND WATER HEIGHT**



## SECTION 013323 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

### PART 1 - GENERAL

#### 1.1 GENERAL

- A. The Contractor shall submit detailed drawings, acceptable catalog data, specifications and material certifications for all equipment and materials specified or required for the proper completion of the work.
- B. The intent of these items is to demonstrate compliance with the design concept of the work and to provide the detailed information necessary for the fabrication, assembly and installation of the work specified. It is not intended that every detail of all parts of manufactured equipment be submitted, however sufficient detail will be required to ascertain compliance with the specifications and establish the quality of the equipment proposed.

Shop Drawings shall be sufficiently clear and complete to enable the Engineer/Architect and Owner to determine that items proposed to be furnished conform to the specifications and that items delivered to the site are actually those that have been reviewed.

- C. It is emphasized that the Engineer/Architect's review of Contractor's submitted data is for general conformance to the contract drawings and specifications but subject to the detailed requirements of drawings and specifications. Although the Engineer/Architect may review submitted data in detail, such review is an effort to discover errors and omissions in Contractor's drawings. The Engineer/Architect's review shall in no way relieve the Contractor of their obligation to properly coordinate the work and to Engineer/Architect the details of the work in such manner that the purposes and intent of the contract will be achieved. Such review by the Engineer/Architect shall not be construed as placing on him or on the Owner any responsibility for the accuracy and for proper fit, functioning or performance of any phase of the work included in the contract.
- D. Shop Drawings shall be submitted in proper sequence and with due regard to the time required for checking, transmittal and review so as to cause no delay in the work. The Contractor's failure to transmit appropriate submittals to the Engineer/Architect sufficiently in advance of the work shall not be grounds for time extension.
- E. The Contractor shall submit Shop Drawings for all fabricated work and for all manufactured items required to be furnished in the Contract in accordance with the General Provisions and as specified herein. Shop Drawings shall be submitted in sufficient time to allow at least twenty-one (21) calendar days after receipt of the Shop Drawings from the Contractor for checking and processing by the Engineer/Architect.
- F. It is the responsibility of each Prime Contractor to furnish to all other Prime Contractors and especially the General Construction Contractor reviewed Shop Drawings for guidance in interfacing the various trades; i.e., sleeves, inserts, anchor bolts, terminations, and space requirements.

- G. No work shall be performed requiring Shop Drawings until same have been reviewed by Engineer/Architect.
- H. Accepted and reviewed Shop Drawings shall not be construed as approval of changes from Contract plan and specification requirements.
- I. The Engineer/Architect will review the first and second Shop Drawing item submittals at no cost to the Contractor. Review of the third submittal and any subsequent submittal will be at the Contractor's expense. Payment will be deducted from the Contract amount at a rate of 2.8 times direct labor cost plus expenses.

## 1.2 SUBMITTAL PROCEDURE

- A. All required submissions shall be made to the Engineer/Architect by the Prime Contractor(s) only. Any data prepared by subcontractors and suppliers and all correspondence originating with subcontractors, suppliers, etc., shall be submitted through the Contractor.
- B. Contractor shall review and approve all Shop Drawings prior to submission. Contractor's approval shall constitute a representation to Owner and Engineer/Architect that Contractor has either determined and verified all quantities, dimensions, field construction criteria, materials, catalog numbers, and similar data or assumes full responsibility for doing so, and that Contractor has reviewed or coordinated each Shop Drawing or sample with the requirements of the work and the Contract Documents.
- C. Submittal Preparation: Mark each submittal with a permanent label or page for identification. Provide the following information on the label for proper processing and recording of action taken:
  - 1. Location
  - 2. Project Name
  - 3. Contract
  - 4. Name and Address of Engineer/Architect
  - 5. Name and Address of Contractor
  - 6. Name and Address of Subcontractor
  - 7. Name and Address of Supplier
  - 8. Name of Manufacturer
  - 9. Number and Title of appropriate Specification Section
  - 10. Drawing Number and Detail References, as appropriate.
  - 11. Submittal Sequence or Log Reference Number.
    - a. Provide a space on the label for the Contractor's review and approval markings and a space for the Engineer/Architect's "Action Stamp".
- D. Each Shop Drawing, sample and product data submitted by the Contractor shall have affixed to it the following Certification Statement including the Contractor's Company name and signed by the Contractor:

Certification Statement: By this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements.

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

\_\_\_\_\_  
Company

- E. Shop Drawings shall be submitted in not less than six (6) copies to the Engineer/Architect at the address specified at the Preconstruction Conference. Single mylar or sepia reproducible copies of simple Shop Drawings may be submitted with prior approval of the Engineer/Architect.
- F. At the time of each submission, Contractor shall in writing identify any deviations that the Shop Drawings or samples may have from the requirements of the Contract Documents.
- G. Drawings shall be clean, legible and shall show necessary working dimensions, arrangement, material finish, erection data, and like information needed to define what is to be furnished and to establish its suitability for the intended use. Specifications may be required for equipment or materials to establish any characteristics of performance where such are pertinent. Suitable catalog data sheets showing all options and marked with complete model numbers may, in certain instances, be sufficient to define the articles which it is proposed to furnish.
- H. For product which require submittal of samples, furnish samples so as not to delay fabrication, allowing the Engineer reasonable time for the consideration of the samples submitted. Properly label samples, indicating the material or product represented, its place of origin, the names of the vendor and Contractor and the name of the project for which it is intended. Ship samples prepaid. Accompany samples with pertinent data required to judge the quality and acceptability of the sample, such as certified test records and, where required for proper evaluation, certified chemical analyses.

### 1.3 REVIEW PROCEDURE

- A. Engineer/Architect will review with reasonable promptness all properly submitted Shop Drawings. Such review shall be only for conformance with the design concept of the Project and for compliance with the information given in the plans and specifications and shall not extend to means, methods, sequences, techniques or procedures of construction or to safety precautions or programs incident thereto.
- B. The review of a separate item as such will not constitute the review of the assembly in which the item functions. The Contractor shall submit entire systems as a package.
- C. All Shop Drawings submitted for review shall be stamped with the Engineer/Architect's action and associated comments.

- D. Except for submittals for record, information or similar purposes, where action and return is required or requested, the Engineer/Architect will review each submittal, mark to indicate action taken, and return accordingly. Compliance with specified characteristics is the Contractor's responsibility.

Action Stamp: The Engineer/Architect will stamp each submittal with a uniform, self-explanatory action stamp. The stamp will be appropriately marked, as follows, to indicate the action taken:

1. If Shop Drawings are found to be in general compliance, such review will be indicated by marking the first statement.
  2. If only minor notes in reasonable number are needed, the Engineer/Architect will make same on all copies and mark the second statement. Shop Drawings so marked need not be resubmitted.
  3. If the submitted Shop Drawings are incomplete or inadequate, the Engineer/Architect will mark the third statement, request such additional information as required, and explain the reasons for revision. The Contractor shall be responsible for revisions, and/or providing needed information, without undue delay, until such Shop Drawings are acceptable. Shop Drawings marked with No. 3 shall be completed resubmitted.
  4. If the submitted Shop Drawings are not in compliance with the Contract Documents, the Engineer/Architect will mark the fourth statement. The Contractor will be responsible to submit a new offering conforming to specific products specified herein and/or as directed per review citations.
- E. No submittal requiring a Change Order for either value or substitution or both, will be returned until the Change Order is approved or otherwise directed by the Owner.

# APPLICATION FOR USE OF SUBSTITUTE ITEM

TO: \_\_\_\_\_

PROJECT: \_\_\_\_\_

SPECIFIED ITEM:

| Page | Paragraph | Description   |
|------|-----------|---|
| A.   |           | The undersigned requests consideration of the following as a substitute item in accordance with Article 6.05 of the General Conditions.   |
| B.   |           | Change in Contract Price (indicate + or -) \$ _____   |
| C.   |           | Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323. |
| D.   |           | Attached data also includes a description of changes to the Contract Documents that the proposed substitution will require for its proper installation.   |

The undersigned certifies that the following paragraphs, unless modified by attachments are correct:

1. The proposed substitute does not affect dimensions shown on Drawings.
2. The undersigned will pay for changes to the building design, including engineering design, detailing, and construction costs caused by the requested substitution.
3. The proposed substitution will have no adverse affect on other contractors, the construction schedule, or specified warranty requirements. (If proposed substitution affects construction schedule, indicate below using + or -)

\_\_\_\_\_ CONSECUTIVE CALENDAR DAYS

4. Maintenance and service parts will be locally available for the proposed substitution.

The undersigned further states that the function, appearance, and quality of the proposed substitution are equivalent or superior to the specified item, and agrees to reimburse the OWNER for the charges of the ENGINEER for evaluating this proposed substitute item.

E. Signature:

Firm:

Address:

Telephone:

Date:

Attachments:

For use by ENGINEER:

\_\_\_\_\_ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

\_\_\_\_\_ Accepted as evidenced by included CHANGE ORDER.

\_\_\_\_\_ Not accepted as submitted. See Remarks.

\_\_\_\_\_ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

\_\_\_\_\_ Not accepted. Do not resubmit.

By:

Date:

Remarks:

# APPLICATION FOR USE OF "OR-EQUAL" ITEM

TO: \_\_\_\_\_

PROJECT: \_\_\_\_\_

SPECIFIED ITEM:

| Page | Paragraph | Description |
|------|-----------|-------------|
|------|-----------|-------------|

A. The undersigned requests consideration of the following as an "or-equal" item in accordance with Article 6.05 of the General Conditions.

B. Change in Contract Price (indicate + or -) \$ \_\_\_\_\_

C. Attached data includes product description, specifications, drawings, photographs, references, past problems and remedies, and performance and test data adequate for evaluation of the request; applicable portions of the data are clearly identified. For consideration of the attached data as SHOP DRAWINGS, submittal shall be in accordance with requirements of Section 013323.

D. Signature: \_\_\_\_\_

Firm: \_\_\_\_\_

Address: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Telephone: \_\_\_\_\_

Date: \_\_\_\_\_

Attachments: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

For use by ENGINEER:

\_\_\_\_\_ Accepted as evidenced by affixed SHOP DRAWING REVIEW stamp.

\_\_\_\_\_ Accepted as evidenced by included CHANGE ORDER.

\_\_\_\_\_ Not accepted as submitted. See Remarks.

\_\_\_\_\_ Acceptance requires completion of submittal as required for SHOP DRAWINGS.

\_\_\_\_\_ Not accepted. Do not resubmit.



By: \_\_\_\_\_ Date: \_\_\_\_\_

Remarks: \_\_\_\_\_  
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END OF SECTION 013323

## SECTION 013326 – PRODUCT TESTING AND CERTIFYING

### PART 1 - GENERAL

#### 1.1 QUALITY OF MATERIALS

- A. Where the specifications call for mill or shop tests, the Contractor shall furnish duplicate copies of attested manufacturer's certificates showing details of quality or performance sufficient to demonstrate conformity to contract requirements. Mill, shop or witness tests shall be subject to view by the Engineer's representative, but the Engineer's representation shall not relieve the Contractor from the necessity of furnishing certificates specified. The Engineer shall be notified by the Contractor in writing, sufficiently in advance of the time of making tests, so that proper arrangements may be made. Waiving of witness of tests by the Engineer may be in writing only by the Engineer. All costs for travel, lodging, food and transportation that are necessary for the Engineer's representative and the Owner's representative to attend witness tests shall be included in the Contractor's bid for those item(s) specifically designated as being subject to witness testing.
- B. Unless otherwise specified, all materials, equipment and articles shall be erected, installed, applied, or connected, used, cleaned and conditioned in accordance with the printed instructions and directions of the manufacturer.
- C. The installation shall be so made that its several component parts will function together as a workable system. It shall be complete with all accessories necessary for its operation and shall be left with all equipment properly adjusted and in working order.
- D. The work shall be executed in conformity with the best practice and so as to contribute to efficiency of operation, minimum maintenance, accessibility and sightliness. It shall also be executed so that the installation will conform and accommodate itself to the building structure, its equipment and usage.
- E. Whenever in the contract documents a particular brand, make of material, device or equipment is shown or specified, such brand, make of material, device or equipment is to be regarded merely as a standard and such trade name shall be followed by "or equal".

#### 1.2 QUALITY ASSURANCE

- A. The equipment and materials to be furnished under this Contract shall be the products of well established and reliable firms which have had ample experience for at least five (5) years in the manufacture of equipment or materials similar in design and of equal quality to that specified. If required, the manufacturer shall submit a list of installations of similar equipment which have been in successful operation for at least five (5) years.

1.3 EXPERIENCE CLAUSE REQUIREMENT AND PERFORMANCE BONDS FOR MANUFACTURER

- A. For every piece of equipment furnished under this Contract, the manufacturer will be required to have a minimum of five (5) years of experience in providing this specific type of equipment. In lieu of this experience requirement, the manufacturer will be required to provide performance bond(s) for the faithful performance of the equipment and guarantee payment in a sum of not less than one hundred and fifty percent (150%) of the total equipment price for the completed work for that item. In the absence of verifiable experience, the manufacturer will be required to provide the performance bond(s) for the same number of years that the manufacturer was found lacking in experience from the specified five (5) year period. The performance bond(s) shall be from an approved surety company, to the satisfaction of the Owner's Law Director.
- B. Agents of bonding companies which write bonds for the performance and payment of the contract shall furnish power of attorney bearing the seal of the company, evidencing such agent's authority to execute the particular type of bond to be furnished, and evidencing also the right of the surety company to do business in the State of Ohio. Copy of this proof shall be attached to each copy of the contract.
- C. The bond shall be purchased through a surety company with a local agent upon whom service of process can be made.
- D. In event of failure of surety or co-surety, the manufacturer shall immediately furnish a new bond, as required herein. The manufacturer's bond will not be released until all provisions of the contract have been fulfilled.
- E. The surety used for the bid bond and performance bond shall be listed in the latest U.S. Treasury Circular 570 and the Penal Sums shall be within the maximum specified for such company in said Circular 570.

END OF SECTION 013326

## SECTION 013543 - ENVIRONMENTAL PROTECTION

### PART 1 - GENERAL

#### 1.1 UNNECESSARY NOISE, DUST AND ODORS

- A. The Contractor's performance of this contract shall be conducted so as to eliminate all unnecessary noise, dust and odors.

#### 1.2 SEWAGE, SURFACE AND FLOOD FLOWS

- A. The Contractor shall take whatever action is necessary to provide all necessary tools, equipment and machinery to adequately handle all sewage, surface flows and flood flows which may be encountered during the performance of the work. The entire cost of and liability for handling such flows is the responsibility of the Contractor and shall be included in the price for the appropriate item.

#### 1.3 WORK IN FREEZING WEATHER

- A. Written permission from the Engineer shall be obtained before any work is performed which, in the judgment of the Engineer, may be affected by frost, cold, or snow. When work is performed under such conditions, the Contractor shall provide facilities for heating the materials and for protecting the finished work.

#### 1.4 POLLUTION CONTROL

- A. It shall be the responsibility of the Contractor to prevent or limit pollution of air and water resulting from his operations.
- B. The Contractor shall perform work required to prevent soil from eroding or otherwise entering onto all paved areas and into natural watercourses, ditches, and public sewer systems. This work shall conform to all local ordinances and/or regulations, if any, and if not otherwise regulated by local ordinances or regulations shall at a minimum conform to the Ohio EPA General Storm Water NPDES Permit for Construction Activities and the Ohio Department of Natural Resources Rainwater and Land Development manual. This work may consist of but not be limited to construction and continual maintenance of silt fence, bio bag filters, sedimentation traps, stilling basins, check dams, temporary seeding, temporary mulching, erosion mats and other means to clarify waters containing suspended materials from excavations, embankments, cleared and grubbed or stripped areas, stockpiles, well points, and disposal sites and shall be commensurate with the contractor's schedule, sequence of work, means and methods. If a SWPPP plan is not required for the project, the contractor shall at a minimum submit a plan of his proposed erosion control prevention methods for approval by the Owner and/or other regulatory authorities having jurisdiction prior to starting any construction activities which may cause erosion.

- C. Water containing suspended material from any part of the Contractor's operations shall be clarified before discharging into drains or streams.
- D. The Contractor shall perform work required to prevent dust attributable to his operations from entering the atmosphere. Dust on unsurfaced streets or parking areas and any remaining dust on surfaced streets shall be controlled with water and/or calcium chloride dust palliative as needed.
- E. The Contractor shall construct and maintain filers, sedimentation traps or stilling basins with overflows to clarify waters containing suspended materials from fill areas, excavations, deep wells, well points, and disposal sites before discharging to drains or streams.
  - 1. Silt barriers shall be placed around stockpiles of soil material susceptible to erosion unless temporary seeding is used instead.
- F. The pollution control work shall conform to applicable portions of ODOT Item 207 and 616.
- G. Any material removed from sanitary or storm sewers shall be disposed in accordance with all applicable regulations.

END OF SECTION 013543

## SECTION 014126 - GENERAL REGULATIONS AND PERMITS

### PART 1 - GENERAL

#### 1.1 REGISTRATION

All Contractors shall be registered with the Owner.

#### 1.2 ARCHAEOLOGICAL DISCOVERIES

Contractors and subcontractors are required under O.R.C. Section 149.53, to notify the Ohio Historical Society and the Ohio Historic Site Preservation Board of Archaeological Discoveries located in the project area, and to cooperate with those entities in archaeological and historic surveys and salvage efforts if such discoveries are uncovered within the project area.

Contact: Ohio's State Historic Preservation Office  
Diana Welling, Resource Protection & Review Department Manager  
Phone: 1-614-298-2000  
Email: [dwelling@ohiohistory.org](mailto:dwelling@ohiohistory.org)

Should archaeological discoveries or other activities delay progress of the work, an adjustment in contract time will be made.

END OF SECTION 014126

## SECTION 014223 - INDUSTRY STANDARDS

### PART 1 - GENERAL

#### 1.1 ABBREVIATIONS

- A. Abbreviations, as used, designate the following:

|        |   |  |
|--------|---|--|
| AASHTO | - | American Association of State Highway and Transportation Officials |
| ACI    | - | American Concrete Institute  |
| AIEE   | - | American Institute of Electrical Engineers                         |
| AISC   | - | American Institute of Steel Construction                           |
| ANSI   | - | American National Standards Institute                              |
| ASTM   | - | American Society of Testing and Materials                          |
| AWWA   | - | American Water Works Association                                   |
| CMS    | - | Construction and Material Specifications                           |
| NASSCO | - | National Association of Sewer Service Companies                    |
| NEMA   | - | National Electrical Manufacturers Association                      |
| ODOT   | - | Ohio Department of Transportation                                  |
| ORC    | - | Ohio Revised Code  |
| UL     | - | Underwriters Laboratories, Inc.                                    |

#### 1.2 REFERENCE TO OTHER SPECIFICATIONS

- A. Where reference is made to specifications such as ASTM, AWWA or AASHTO, the latest edition shall be used, unless otherwise noted on the plans or in the specifications.

#### 1.3 CODES AND STANDARDS

- A. All work provided for by these specifications must be installed according to the provisions of the State and local building codes, subject to inspection and acceptance by the State and local inspectors.

END OF SECTION 014223

## SECTION 014323 - QUALIFICATIONS OF TRADESMEN

### PART 1 - GENERAL

#### 1.1 CHARACTER OF WORKMEN AND EQUIPMENT

- A. The Contractor shall employ competent and efficient workmen for every kind of work. Any person employed on the work who shall refuse or neglect to obey directions of the Engineer or their representative, or who shall be deemed incompetent or disorderly, or who shall commit trespass upon public or private property in the vicinity of the work, shall be dismissed when the Engineer so orders, and shall not be re-employed unless express permission be given by the Engineer. The methods, equipment and appliances used on the work and the labor employed shall be such as will produce a satisfactory quality of work, and shall be adequate to complete the contract within the specified time limit.
  
- B. In hiring of employees for the performance of work under this Contract, or any Subcontract hereunder, no Contractor or Subcontractor, nor any person acting on behalf of such Contractor or Subcontractor, shall, by reason of race, sex, creed or color, discriminate against any citizen of the State of Ohio in the work to which the employment relates. No Contractor, Subcontractor, nor any person on their behalf shall, in any manner, discriminate against or intimidate any employee hired for the performance of work under this contract on account of race, creed, sex or color.

END OF SECTION 014323



## SECTION 015136 - TEMPORARY WATER AND DISTRIBUTION

### PART 1 - GENERAL

#### 1.1 WATER

- A. The Contractor shall be responsible for an adequate supply of water suitable for their use for construction and drinking. At their own expense, they shall provide and maintain adequate supplies and supply lines in such locations and installed in such a manner as may be satisfactory to the Engineer.

END OF SECTION 015136

## SECTION 015213 - FIRST AID

### PART 1 - GENERAL

#### 1.1 AID TO THE INJURED

The Contractor shall keep in their office and on the work site, all articles necessary for giving "First Aid to the Injured". They shall also have standing arrangements for the immediate removal and hospital treatment of any employee or other person who may be injured on the work site.

END OF SECTION 015213

## SECTION 015526 - TEMPORARY TRAFFIC CONTROL DEVICES

### PART 1 - GENERAL

#### 1.1 BARRICADES, SIGNS AND LIGHTS

- A. The Contractor shall employ watchmen on the work when and as necessary. The Contractor shall erect and maintain such strong and suitable barriers and such lights as will effectively prevent the occurrence of any accident to health, limb or property. Lights shall be maintained between the hours of one-half (1/2) hour after sunset and one-half (1/2) hour before sunrise.
- B. No manhole, trench, excavation will be left open awaiting connection or removal at a later date by the Contractor's forces or others but shall be temporarily backfilled and resurfaced if applicable with a temporary pavement passable to traffic at no additional cost to the Owner.
- C. In addition to other safety requirements, a minimum of four (4) foot high fence will be incorporated around any shaft or manhole or other excavation left open at the end of a day's work.

#### 1.2 MAINTENANCE OF TRAFFIC

- A. The Contractor is required to provide maintenance of traffic in conformance with the Ohio Manual of Uniform Traffic Control Devices and Item 614 of the current Construction and Material Specifications of the Ohio Department of Transportation.
- B. This work shall include providing suitable and satisfactorily trained and properly attired flagmen for use at any location where existing roadway is narrowed to a width of less than 2 full lanes (18 feet).
- C. The Contractor is also responsible for maintaining local access to all residences and businesses along the route of the sewer and to provide whatever temporary materials are necessary to provide a safe, adequate drive surface.
- D. At all boring locations, Contractor shall provide suitable flashers, barricades, and traffic control devices as may be deemed necessary by the Engineer or the responsible authority in the case of the Department of Transportation, Turnpike Commission, or Conrail. This may extend to maintain facilities on a 24-hour basis until such time as the areas are completely backfilled.
- E. During the progress of the work, the Contractor shall maintain two-way traffic at all times, besides when resurfacing. Any partial or temporary road closures shall be first approved by the Owner in writing.

END OF SECTION 015526

## SECTION 016600 - PRODUCT HANDLING AND PROTECTION

### PART 1 - GENERAL

#### 1.1 DELIVERY AND STORAGE OF MATERIALS

- A. The Contractor shall be responsible for delivery and storage of all materials.
- B. The Contractor shall coordinate with the Engineer on the arrangement for storing construction materials and equipment. Deliveries of all construction materials and equipment should be made at suitable times.
- C. The Contractor shall store all materials required for the performance of this contract at sites designated by the Engineer.
- D. All stockpiles shall be neat, compact, completely safe, and barricaded with warning lights if necessary.
- E. Precautions shall be taken so that no shade trees, shrubs, flowers, sidewalks, driveways or other facilities will be damaged by the storage of materials. The Contractor shall be responsible for the restoration of all stockpile sites to their original condition.
- F. Materials, tools and machinery shall not be piled or placed against shade trees, unless they shall be amply protected against injury therefrom. All materials, tools, machinery, etc. stored upon public thoroughfares must be provided with red lights at night time so as to warn the traffic of such obstruction.
- G. Materials shall be so stored as to assure the preservation of their quality and fitness for the work. Stored materials, even though approved before storage, shall again be inspected prior to their use in the work. Stored materials shall be located so as to facilitate their prompt inspection. Approved portions of the construction site may be used for storage purposes and for the placing of the Contractor's plant and equipment, but any additional space required therefore must be provided by the Contractor at his expense. Private property shall not be used for storage purposes without written permission of the property owner or lessee, and copies of such written permission shall be furnished the Engineer. All storage sites shall be restored to their original condition by the Contractor at his expense.

END OF SECTION 016600

## SECTION 017800 - FINAL COMPLIANCE AND SUBMITTALS

### PART 1 - GENERAL

- 1.1 The following forms and related sign-offs shall be documented in accordance with provisions of the contract. These forms shall be completed by the Contractor and approved by the Owner before final retainer is approved for release. Forms for Items A to E will be attached to the Contractor's executed copy of the contract.
- A. Certificate of Substantial Completion (To be submitted at time of Substantial Completion).
  - B. Contractor's Certification of Completion.
  - C. Contractor's Affidavit of Prevailing Wage.
  - D. Consent of Surety Company for Final Payment.
  - E. Affidavit of Final Acceptance Date and Correction Period.
  - F. Certificate of Insurance verifying completed operations insurance coverage.

END OF SECTION 017800

## SECTION 017821 - CLEANING AND PROTECTION

### PART 1 - GENERAL

#### 1.1 GENERAL

- A. On or before the completion date for the work, the Contractor shall tear down and remove all temporary structures built by them, all construction plant used by them, and shall repair and replace all parts of existing embankments, fences or other structures which were removed or injured by their operations or by the employees of the Contractor. The Contractor shall thoroughly clean out all buildings, sewers, drains, pipes, manholes, inlets and miscellaneous and appurtenant structures, and shall remove all rubbish leaving the grounds in a neat and satisfactory condition.
- B. As circumstances require and when ordered by the Engineer, the Contractor shall clean the road, driveway, and/or sidewalk on which construction activity under this contract has resulted in dirt or any other foreign material being deposited with an automatic self-contained mechanical sweeper with integral water spray, vacuum and on-board or supplementary containment.
- C. Failure to comply with this requirement when ordered by the Engineer or his representative, may serve as cause for the Engineer to stop the work and to withhold any monies due to the Contractor until such order has been complied with to the satisfaction of the Engineer.
- D. As the work progresses, and as may be directed, the Contractor shall remove from the site and dispose of debris and waste material resulting from his work. Particular attention shall be given to minimizing any fire and safety hazard from form materials or from other combustibles as may be used in connection with the work, which should be removed daily.

END OF SECTION 017821

## SECTION 017839 - PROJECT RECORDS, DRAWINGS

### PART 1 - GENERAL

#### 1.1 RECORD DRAWINGS

- A. The Contractor shall furnish an authentic set of marked-up drawings showing the installation insofar as the installation shall have differed from the Engineer's drawings. The drawings shall be delivered to the Engineer for making revisions to the original drawings immediately after final acceptance by the Owner.

#### 1.2 SERVICE CONNECTION RECORDS

- A. The Contractor shall record the location of all service and property connections, new or existing, made to utilities constructed under this contract. Such records shall be turned over to the Owner upon completion of the work. The cost of making such records shall be included in the various unit or lump sum prices stipulated for the various items of the work.
- B. The location of each water connection as measured along the water line from the nearest fire hydrant.

END OF SECTION 017839

## SECTION 330130 - MISCELLANEOUS TEMPORARY FACILITIES

### PART 1 - GENERAL

#### 1.1 MAINTENANCE OF SANITARY FLOWS

- A. The Contractor for this contract shall be responsible for maintaining all sanitary flows through the existing sanitary sewerage systems. Provisions shall be made for temporary pumping and/or storage of sanitary flows during periods of sewer and manhole reconstruction, or when flows must be interrupted to make connections to the new facilities as directed by the Engineer.

END OF SECTION 330130



## SECTION 330130.01- SEWER COLLECTION SYSTEM REHABILITATION DEFINITIONS

### PART 1 - GENERAL

#### 1.1. RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specifications, apply to work of this section.

#### 1.2 DESCRIPTION OF WORK

- A. The work covered by this project shall include the furnishing of all labor, equipment, materials, and supervision; and performing all work necessary to investigate, rehabilitate, and/or replace the designated sewer lines, manholes, etc., all in accordance with the specifications. The work shall consist of, but not necessarily be limited to, performing the following work tasks where specified:

1. Sewer Line Cleaning
2. Sewer Flow Control
3. Television Inspection
4. Sewer Pipe Joint Testing
5. Sewer Pipe Joint Sealing
6. Sewer Manhole Rehabilitation
7. Sewer Manhole Replacement
8. Sewer Manhole Separation
9. Sliplining of Sewers
10. Cured-in-Place Pipe Installation
11. Fold-and-Formed Pipe Installation
12. Sewer Point Repairs
13. Service Lateral Sealing and Televising

- B. The area of work and the type of repair/rehabilitation to be performed shall be at those locations shown on the tables or drawings in the Specific Project Requirements section of these specifications.

#### 1.3 DEFINITIONS

- A. Wherever used in these specifications, the following words and terms shall have the meanings indicated:
  1. AREAWAY: A paved surface, serving as an entry area to a basement or subsurface portion of a building, which is provided with some form of drainage device that may be connected to a sewer line.
  2. AVAILABLE WATER: Water necessary for the performance of work, which may be taken only from fire hydrant(s) approved by the Owner, given conditions of traffic and terrain which are compatible with the use of the hydrant for performance of work.

3. **BUILDING SEWER:** The conduit which connects building wastewater sources to the public or street sewer (referred to also as "house sewer," "building connection," "lateral," or "service connection"), including lines serving homes, public buildings, commercial establishments, and industry structures. In this specification, the building sewer is referred to in two sections:
  - a. The section between the building and the property line, right-of-way line, or to a point specified and supervised by the Owner's designated representative.
  - b. The remaining section to the collector sewer, including the connection thereto.
4. **BYPASS:** An arrangement of pipes, conduits, gates, and valves whereby the flow may be passed around a hydraulic structure or appurtenance. Also, a temporary setup to route flow around a specified part of a sewer system.
5. **BYPASS PUMPING:** The transportation of sewage flows around a specific sewer pipe line section or sections via any conduit for the purpose of controlling sewage flows in the specified section or sections without flowing or spilling onto public or private property.
6. **CELLAR DRAIN:** A pipe or series of pipes which collect wastewater which leak, seep, or flow into subgrade parts of structures and discharge them into a building sewer, or by other means dispose of such wastewater into sanitary, combined or storm sewers.
  - a. Referred to also as a "basement drain."
7. **CHANGE ORDER:** A written order to the Contractor authorizing an addition, deletion, or revision in the work within the general scope of work of the agreement, or authorizing an adjustment in the agreement price or agreement time.
8. **COLLECTOR SEWER:** A sewer located in the public way which collects the wastewater discharged through building sewers and conducts such flows into larger interceptor sewers and pumping and treatment works.
  - a. Referred to also as "street sewer."
9. **COMBINED SEWER:** A sewer intended to serve as both a sanitary sewer and a storm sewer, or as both an industrial sewer and a storm sewer.
10. **COMPRESSION GASKET:** A device which can be made of several materials in a variety of cross sections and which serves to secure a tight seal between two pipe sections (e.g., "O"-rings).
11. **CORBEL OR CONE:** That portion of a manhole structure which slopes upward and inward from the barrel of the manhole to the manhole cover frame.
12. **CREW:** The number of persons required for the performance of work at a site as determined by the Contractor in response to task difficulty and safety considerations at the time or location of the work
13. **DEBRIS:** Soil, rocks, sand, grease, roots, etc., in a sewer line excluding items mechanically attached to the line such as protruding service connections, protruding pipe, joint materials, and the like.

14. EASEMENT: A liberty, privilege, or advantage without profit which the owner of one parcel of land may have in the land of another. In this agreement, all land, other than public streets, in which the Owner has sewer system lines or installations and right of access to such lines or installations.
15. EASEMENT ACCESS: Areas within an easement to which access is required for performance of work.
16. ENGINEER: The engineer (a person, joint venture, firm, or corporation) who works for or under a contract or subagreement with the Owner and is designated by the Owner as the Engineer of Record under the prime contract.
17. EXFILTRATION: The leakage or discharge of flows being carried by sewers out into the ground through leaks in pipes, joints, manholes, or other sewer system structures; the reverse of "infiltration".
18. EXISTING LINEAR FEET: The total length of existing sewer pipe in place within designated sewer systems as measured from center of manhole to center of manhole from maps or in the field.
19. FLOW CONTROL: A method whereby normal sewer flows or a portion of normal sewer flows are blocked, retarded, or diverted (bypassed) within certain areas of the sewer collection system.
20. FOUNDATION DRAIN: A pipe or series of pipes which collect groundwater from the foundation or footer of structures and discharge it into sanitary, storm, or combined sewers, or to other points of disposal for the purpose of draining unwanted waters away from such structures.
21. GROUTING: The joining together of loose particles of soil in such a manner that the soil so grouped becomes a solid mass which is impervious to water (see also SEWER PIPE JOINT SEALING).
22. HYDRAULIC CLEANING: Techniques and methods used to clean sewer lines with water, e.g.; water pumped in the form of a high-velocity spray and water flowing by gravity or head pressure. Devices include high-velocity jet cleaners, collapsible dams, etc.
23. INFILTRATION: The water entering a sewer system, including building sewers, from the ground, through such means as, but not limited to, defective pipes, pipe joints, connections, or manhole walls. Infiltration does not include, and is distinguished from, inflow.
24. INFILTRATION/INFLOW (I/I): A combination of infiltration and inflow wastewater volumes in sewer lines, with no way to distinguish either of the basic sources, and with the same effect of usurping the capacities of sewer systems and other sewer system facilities.
25. INFLOW: The water discharged into a sewer system, including service connections, from such sources as, but not limited to, roof leaders; cellar, yard, and area drains; foundation drains; cooling water discharges; drains from springs and swampy areas; manhole covers; cross connections from storm sewers, combined sewers, catch basins; storm waters; surface runoff; street wash water; or drainage. Inflow does not include, and is distinguished from, infiltration.

26. INSPECTOR: The Owner's on-site representative responsible for observation and recording of quantities of work performed as set forth in these specifications.
27. INTERCEPTOR SEWER: A sewer which receives the flow from collector sewers and conveys the wastewater to treatment facilities.
28. INTERNAL PIPE INSPECTION: The television inspection of a preselected sewer line section. A television camera is moved through the line at a slow, uniform rate and a continuous picture is transmitted to an aboveground monitor.
29. INVERT: The floor, bottom or lowest point of a conduit.
30. INVERT LEVEL (ELEVATION): The level (elevation) of the lowest portion of a liquid - carrying conduit, such as a sewer, which determines in part the hydraulic gradient available for moving the contained liquid
31. JOINTS: The means of connecting sectional lengths of sewer pipe into a continuous sewer line using various types of jointing materials. The number of joints depends on the lengths of the pipe sections used in the specific sewer construction work.
32. LINEAR FOOT: Being one foot as measured along the centerline of a sewer line.
33. LONG-TERM MODULUS OF ELASTICITY: The modulus of elasticity of the material after 50 years of service. This value may be extrapolated from a 10,000 hour test of the material.
34. MAJOR BLOCKAGE: A structural defect, collapse, or blockage which prohibits manhole-to-manhole cleaning with commercially available hydraulic or mechanical cleaning equipment.
35. MANHOLE SECTION: The length of sewer pipe connecting two manholes.
36. MECHANICAL CLEANING: Techniques and methods used to clean sewer lines of debris mechanically with devices such as power rodding machines, winch-pulled brushes, bucket machines, etc.
37. OVERFLOW:
  - a. The excess water that overflows the ordinary limits such as the stream banks, the spillway crest, or the ordinary level of a container.
  - b. To cover or inundate with water or other fluid.
38. PHYSICAL PIPE INSPECTION: The crawling or walking through manually accessible pipe lines. The logs for this inspection technique record the information of the kind detailed under Internal Pipe Inspection. This inspection technique is only undertaken when field conditions offer minimal hazard or jeopardy to personnel.
39. PIPE JOINT SEALING: A method of correcting leaking or defective pipe joints which permit infiltration of extraneous water into the sewers by means of applying chemical materials into and/or through the joint area from within the pipe.
40. REGULATOR: A device or apparatus for controlling the quantity of admixtures of sewage and storm water admitted from a combined sewer collector line into an interceptor sewer, or pumping or treatment facilities, thereby determining the amount and quality of the flows discharged through an overflow device to receiving waters or other points of disposal.
41. ROOF LEADER: A drain or pipe that conducts storm water from the roof of a structure downward and thence into a sewer for removal from the property, or onto the ground for runoff or seepage disposal.

42. SANITARY SEWER: A sewer intended to carry only sanitary or sanitary and industrial wastewater from residences, commercial buildings, industrial parks, and institutions.
43. SERVICE CONNECTION: see Building Sewer.
44. SEWER CLEANING: The utilization of hydraulic or mechanical techniques and/or devices to dislodge, transport, and remove debris from sewer lines.
45. SEWER PIPE: A length of conduit, manufactured from various materials and in various lengths, that when joined together can be used to transport wastewater from point of origin to a treatment works. Materials include, but are not limited to: Acrylonitrile-butadiene-styrene (ABS); Asbestos-Cement (AC); Brick Pipe (BP); Concrete Pipe (CP); Cast Iron Pipe (CIP); Ductile Iron Pipe (DIP); Polyethylene (PE); Polyvinylchloride (PVC); Reinforced Concrete Pipe (RCP); Reinforced Plastic Mortar (RPM); Steel Pipe (SP); Vitrified Clay Pipe (VCP).
46. SITE: Any location where work has been or will be done.
47. SITE ACCESS: An adequately clear area of a size sufficient to accommodate personnel and equipment required at the location where work is to be performed, including roadway or surface sufficiently unobstructed to permit conveyance of vehicles from the nearest paved roadway to the work location.
48. SPRING LINE: The horizontal midpoint of a sewer pipe.
49. STORM SEWER: A sewer intended to carry only storm waters, surface runoffs, street wash water, and drainage.
50. STREET ACCESS: Areas normally used for public vehicular traffic (including roads, streets, or areas within existing rights-of-way or easements) to which safe access is required for performance of work.
51. SUBCONTRACTOR: An individual, firm, or corporation having a direct contract with the Contractor for performance of part of the work.
52. SURCHARGE: When the sewer flow exceeds the hydraulic carrying capacity of the sewer line.
53. SURCHARGE CONDITION: When the sewer flow depth equals or exceeds the diameter of the discharging sewer line or lines.
54. SWALE (DIP, SAG): A significant deviation in pipe grade such as to cause entrapment of solids, semisolids, and liquids, thereby impeding the accuracy and/or effectiveness of flow measurements, cleaning, and internal inspection.

END OF SECTION 330130.01

## SECTION 330130.02 - SEWER LINE CLEANING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specifications, apply to work of this section.
- B. Other Sections Referenced:
  - 1. Section 330130.01 - Sewer Collection System Rehabilitation Definitions

#### 1.2 DESCRIPTION OF WORK

- A. The intent of sewer line cleaning is to remove foreign materials from the lines and restore the sewer to a minimum of 95% of the original carrying capacity or as required for proper lining of the pipe or seating of internal pipe joint sealing packers. Since the success of the other phases of work depends a great deal on the cleanliness of the lines, the importance of this phase of the operation is emphasized. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. If in the course of normal cleaning operations, damage does result from pre-existing and unforeseen conditions such as broken pipe, the Contractor will not be held responsible.

#### 1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

#### 1.4 SUBMITTALS

- A. Equipment Data: Submit a listing of equipment to be used on the project. Provide equipment operating instructions if requested by the Owner.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. All equipment and material shall be of a type that has been in general use for a period of five (5) years. Work performed with experimental equipment or material will not be permitted without prior written consent of the Owner.

## 2.2 CLEANING EQUIPMENT

- A. **Hydraulically Propelled Equipment:** The equipment used shall be of a movable dam type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure removal of grease. If sewer cleaning balls or other equipment which cannot be collapsed is used, special precautions to prevent flooding of the sewers and public or private property shall be taken.
- B. **High-Velocity Jet (Hydrocleaning) Equipment:** All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15 to 45 degrees in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps and hydraulically driven hose reel.
- C. **Mechanically Powered Equipment:** Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

## PART 3 - EXECUTION

### 3.1 CLEANING PRECAUTIONS

- A. During sewer cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard the flow in the sewer line are used, precautions shall be taken to ensure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer.
- B. When possible, the flow of sewage in the sewer shall be utilized to provide the necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, the water shall be conserved and not used unnecessarily.
- C. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.

### 3.2 SEWER CLEANING

- A. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. Selection of the equipment used shall be based on the conditions of lines at the time the work commences. The equipment and methods selected shall be satisfactory to the Engineer. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes.
- B. If cleaning of an entire section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or the equipment fails to traverse the entire manhole section, it will be assumed that a major blockage may exist, the cleaning effort shall be suspended, and the Engineer shall be notified.

### 3.3 ROOT REMOVAL

- A. Roots shall be removed in the manhole sections where root intrusion occurs. Special attention should be used during the cleaning operation to assure complete removal of roots from the joints. Any roots which could prevent proper lining of the pipe, prevent the seating of a pipe joint packer, or prevent the proper application of chemical sealants shall be removed.
- B. Mechanical procedures may include the use of equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners.
- C. Chemical root treatment shall be used only when directed by the Owner.
  - 1. The Contractor's attention is directed to the safety requirements and precautions associated with the use of the root treatment material. The Contractor shall use precautions for the protection of all persons, vegetation, animals and property. The Contractor is responsible for damage to private property and vegetation.
  - 2. The Contractor is required to be knowledgeable of and in compliance with federal and state requirements relative to the root treatment material and its use. Compliance with federal and state law shall supersede compliance with the provisions of this contract.
  - 3. All mixing/application procedures for chemical root treatment shall be consistent with the latest standards, requirements and recommendations of the manufacturer of the chemical root treatment material used. Mixing and application of the root treatment material shall be done under the supervision of a state-certified pesticide (herbicide) applicator as required by law.
  - 4. When the root tips are damaged or removed by sewer line cleaning, chemical treatment will be less effective. Consequently, no mechanical cleaning is recommended in lines prior to chemical root treatment unless extensive grease, root masses, or debris preclude proper application of the material.



5. Sewer service shall generally not be interrupted during root treatment. In situations where it is necessary to shut down upstream pumping stations or block/bypass upstream flows, the Contractor shall coordinate their activities with the Engineer and Owner and do the work at night or during periods of low flow.
  6. All materials shall be delivered to the site in undamaged, unopened containers bearing the manufacturer's original label. Mixing of the root treatment material shall be done no more than 12 hours prior to use. The water used shall be clear and free of acid, alkali, oxidizing agents, oil, or other organic materials. Mixing water temperature shall be between 40°F and 80°F.
  7. Where conditions permit, the volume of foam shall be sufficient to completely fill the air space above the flow, manhole to manhole. In all cases, the volume of foam delivered to the sewer line shall be sufficient to attach to and permeate all root masses.
  8. The foam shall be applied at sufficient pressure to penetrate a minimum of 5 feet into service connections.
  9. Root Removal: The Contractor shall wait a minimum of 90 days from application of the foam to removal of roots unless otherwise directed by the Engineer.
- D. All roots must be removed prior to grouting or lining. If roots are detected during either of grouting or lining, the Contractor shall remove their equipment and reclean the line to ensure root removal. This work shall be performed at no additional cost to the Owner if the manhole section was previously cleaned as a pay item.

### 3.4 MATERIAL REMOVED

- A. All sludge, dirt, sand, rocks, grease, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned.
- B. Passing material from manhole section to manhole section, which could cause line stoppages, accumulations of sand in wet wells, or damage pumping equipment, shall not be permitted.
- C. When necessary or when directed by the Engineer, an approved dam or weir shall be constructed in the downstream manhole in such a manner that solids and debris will be trapped and retained. The cost of such a dam or weir shall be included in the cost of cleaning.

### 3.5 DISPOSAL OF MATERIALS

- A. All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of at a location approved by the Owner.
- B. Trucks hauling solids or semisolids from the site shall be watertight so that no leakage or spillage will occur.
- C. All materials shall be removed from the site no less often than at the end of each workday.

- D. Under no circumstances will the Contractor be allowed to accumulate debris, etc., on the site of work beyond the stated time, except in totally enclosed containers and as approved by the Owner.

### 3.6 FINAL ACCEPTANCE

- A. Acceptance of sewer line cleaning shall be made upon the successful completion of the television inspection and shall be to the satisfaction of the Owner.
- B. If CCTV inspection shows the cleaning to be unsatisfactory, the Contractor shall be required to reclean and reinspect the sewer line at no additional expense to the Owner.
- C. In areas where television inspection is not performed, the Engineer may require the Contractor to pull a double squeegee (with each squeegee the same diameter as the sewer) through each manhole section as evidence of adequate cleaning.

END OF SECTION 330130.02

## SECTION 330130.03 - SEWER FLOW CONTROL

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specifications, apply to work of this Section.
- B. Other Sections Referenced:
  - 1. Section 330130.01 - Sewer Collection System Rehabilitation Definitions

#### 1.2 DESCRIPTION OF WORK

- A. The intent of this work is to control the flow in the sewer to enable the successful inspection, rehabilitation or replacement of the pipe.
- B. Depth of flow shall not exceed that shown below for the respective pipe sizes when performing television inspection, joint testing and/or sealing.

##### Pipe Diameter Maximum Depth of Flow

|    |                |   |                      |
|----|----------------|---|----------------------|
| 1. | 6" - 10" Pipe  | - | 25% of pipe diameter |
| 2. | 12" - 24" Pipe | - | 33% of pipe diameter |
| 3. | 27" & up Pipe  | - | 40% of pipe diameter |

- C. Flow shall be controlled or bypassed from sewer sections being lined or replaced. The methods used shall be in accordance with the work being performed.

#### 1.3 QUALITY ASSURANCE

- A. When flow in a sewer line is plugged, blocked, or bypassed; sufficient precautions must be taken to protect the sewer lines from damage that might result from sewer surcharging. Further, precautions must be taken to insure that sewer flow control operations do not cause flooding or damage to public or private property being served by the sewers involved.

#### 1.4 SUBMITTALS

- A. The Contractor shall submit a written request for Sewer Flow Control, specify the method and equipment to be used, and receive approval from the Owner prior to performing the work.

- B. For bypass pumping, submit shop drawings in accordance with the General Requirements showing pumps, piping layout plan and dimensions, schedule of pipe fittings and specials, materials and class for each size and type of pipe, joint details, and any special provisions required for assembly. Provide a wet weather operation plan which describes what procedures will be followed when flow exceeds pumping capacity.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT

- A. Sewer plugs shall be so designed that all or any portion of the sewage can be quickly released.
- B. Pumps bypass pipe, fittings, and joining methods shall be suitable and of a type normally used for raw sanitary sewage.
  - 1. The bypass system shall be of sufficient capacity to handle existing peak dry weather flow plus additional flow that may occur during a rainstorm unless otherwise provided for by an approved wet weather operation plan.
  - 2. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.
  - 3. Bypass piping to be furnished and installed shall include, but not limited to all pipe, fittings, specials, bends, beveled pipe, adapters, bulkheads, stoppers, plugs, joint restraints, joints and jointing materials, and pipe supports. Bypass piping shall be rated to twice the system operating pressure.
- C. Hydrocleaning equipment shall be equipped with high-velocity nozzles capable of pulling flow away from the pipe section being televised. The equipment shall carry its own water tank, auxiliary engines, pumps and hydraulically driven hose reel.

## PART 3 - EXECUTION

### 3.1 FIELD QUALITY CONTROL

- A. The Contractor shall continuously supervise the level of water in the upstream and downstream sewers to ensure that harmful surcharging does not occur. The Contractor shall be responsible for any damage to the system and/or to public or private property resulting from improper execution of flow control measures.

### 3.2 PLUGGING OR BLOCKING

- A. A sewer line plug shall be inserted into the line upstream of the section being worked. During TV inspection, testing and sealing operations, flow shall be reduced to within the limits specified above. After the work has been completed, flow shall be restored to normal.

### 3.3 PUMPING AND BYPASSING

- A. When pumping and bypassing is required, the Contractor shall supply and install the pumps, conduits, and other equipment to divert the flow around the section in which work is to be performed. Under no circumstances will the discharge of raw sewage to other than sanitary sewers be allowed.
- B. The Contractor shall be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system.
- C. The proposed bypassing system shall be set up to allow traffic flow to local residents and businesses.
- D. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.
- E. Make connections to all existing force mains being bypassed.
- F. Install temporary bypass piping with restrained joints at horizontal and vertical changes in direction.
- G. Provide granular material for bedding and encasement of temporary piping when buried below pavement.
- H. Field test bypass piping and obtain approval from the Engineer prior to placing bypass system in service.
- I. Do not remove pumping and bypass system until it is no longer needed and can be replaced by authorized use of completed permanent facilities.

### 3.4 HYDRAULIC FLOW CONTROL

- A. This method shall be used for sewer televising only. The Contractor shall position the high-velocity nozzle no less than five (5) feet ahead of the television camera. Pressures shall be just sufficient to reduce the flow level in front of the camera to the specified depth. The jet nozzle shall be reeled in at the same rate as the forward movement of the television camera to maintain the separation distance.

END OF SECTION 330130.03

## SECTION 330130.04 - SEWER POINT REPAIRS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Other Sections Referenced:
  - 1. Section 330130.01 - Sewer Collection System Rehabilitation Definitions
  - 2. Section 330130.02 - Sewer Line Cleaning
  - 3. Section 330130.17 - Television Inspection
  - 4. Section 329200.19 - Seeding and Mulching
- C. Drawings (see Schedules of Work and Detailed Drawings section of these specifications):
  - 1. "Manhole Replacement Schematics"
  - 2. "Location H32 Detailed Layout"
  - 3. "Location H34 Detailed Layout"
  - 4. "Location H39 Detailed Layout"
  - 5. "Typical Manhole Step Detail"
  - 6. "Trench & Bedding Details"
  - 7. "Type B Pavement Replacement"
- D. Other documents which shall be considered part of and included in these specifications
  - 1. ASTM A 48 Specification for Gray Iron Castings.
  - 2. ASTM A 536 Specification for Ductile Iron Castings.
  - 3. ASTM C 12 Recommended Practice for Installing Vitrified Clay Pipe Lines.
  - 4. ASTM C 76 Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.
  - 5. ASTM C 270 Specification for Mortar for Unit Masonry.
  - 6. ASTM C 425 Specification for Compression Joints for Vitrified Clay Pipe and Fittings.
  - 7. ASTM C 443 Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
  - 8. ASTM C 478 Specification for Precast Reinforced Concrete Manhole Sections.
  - 9. ASTM C 700 Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated.
  - 10. ASTM C 923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipes.

11. ASTM C 990 Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants.
12. ASTM D3034 Specification for Type PSM Poly(VinylChloride)(PVC) Sewer Pipe and Fittings.
13. ASTM D3212 Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.
14. ODOT Construction and Material Specifications.
  - a. Item 603 Pipe Culverts, Sewers and Drains.
  - b. Item 604 Manholes, Catch Basins, Inlets, Inspection Wells, Junction Chambers or Monuments.
  - c. Item 613 Low Strength Mortar Backfill.
  - d. Item 642 Traffic Paint.
15. Ohio Manual of Uniform Traffic Control Devices.

## 1.2 DESCRIPTION OF WORK

- A. Under this section, the Contractor shall replace existing sections of sewers and/or manholes necessary to restore the capacity, structural integrity and functional capabilities of the sewer system. Minimum sewer repairs are six (6) feet in length and may be longer depending on the conditions encountered. Manhole replacement will include sufficient lengths of sewer to reconnect the pipe to the manhole. Defects that could require point repairs include but are not necessarily limited to:
  1. Partial collapse where the pipe has broken and threatens to block the flow.
  2. Broken or protruding tap-in connections that cannot be repaired or cut from within the sewer pipe.
  3. Utility relocation where a utility line may have been constructed through the sewer pipe.
  4. Manhole replacement where the structural condition is questionable or too deteriorated for rehabilitation.
  5. Service connection test-tee replacement or new installation.
  6. Service connection pipe replacement.
- B. Point repairs are normally performed in established urban areas where the construction work is an inconvenience to the residents, business owners and traveling public. Therefore, the means and methods to be employed by the Contractor and the conduct of the Contractor's employees are important to the Owner. Any means, methods, or employee used in the execution of Point Repair work that is too disruptive to the public in the opinion of the Owner shall be modified by the Contractor to the satisfaction of the Owner at no additional cost to the Owner.
- C. Any point repair work performed by the Contractor shall be scheduled such that the excavation will be backfilled within two (2) days of the start of the work, unless additional time is granted by the specifications or granted in writing by the Engineer.

- D. Sewer Point Repairs will only be performed and paid for when the work is authorized in writing by the Engineer.

### 1.3 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of sanitary and/or storm system's products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.
- B. Installer's Qualifications: Firms with at least 3 years of successful installation experience on projects with sanitary and/or storm work similar to that required for project.
- C. Codes and Standards:
  - 1. Plumbing Code Compliance: Comply with applicable portions of National Standard Plumbing Code pertaining to selection and installation of sanitary and/or storm system's materials and products.
  - 2. Environmental Compliance: Comply with applicable portions of local Environmental Agency regulations pertaining to sanitary and/or storm systems.
  - 3. Utility Compliance: Comply with applicable portions of protection, installation and/or inspection requirements for each utility encountered during the construction of the point repair.

### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical product data and installation instructions for sanitary and/or storm system materials and products.
- B. Record Drawings: At project closeout, submit record drawings of installed sanitary and/or storm sewage piping and products, in accordance with requirements of Division 1.
- C. Submit a description of the equipment proposed for the control of the sewer grade. When requested, include catalog data describing the function and the conditions of operation of the equipment. The Engineer shall have the right to disapprove the use of the proposed equipment if in his opinion such equipment will not provide a reliable control system.

### 1.5 SUBSURFACE CONDITIONS

- A. The Contractor shall make whatever test holes he deems necessary to determine the subsurface ground conditions, including the presence of water and rock. No extra compensation shall be allowed the Contractor as the result of subsurface conditions encountered within the project. All proposed test holes shall be approved by the Owner prior to digging.



## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Pipe, fittings, and specials shall be of the size and material being replaced.
  - 1. Vitrified Clay Pipe shall conform to ASTM C 700, with ASTM C 425 joints.
  - 2. Reinforced Concrete Pipe shall conform to ASTM C 76, with ASTM C 443 joints for sanitary sewers or ASTM C 990 joints for storm sewers.
  - 3. PVC pipe and fittings shall conform to ASTM D 3034, with ASTM D 3212 joints.
- B. Manholes shall be precast concrete and shall conform to ASTM C 478.
  - 1. Joints between sanitary manhole sections shall conform to ASTM C 443. Flexible connections for sanitary pipes shall conform to ASTM C 923, "A-Lok" Type as manufactured by A-Lok Products; or an approved equivalent.
  - 2. Joints between storm manhole sections shall conform to ASTM C 990. Cut-out openings for connecting pipes shall be made immediately after the pipe is removed from the casting form.
  - 3. Where pressure tight manhole frames and covers are called for, threaded inserts shall be cast in cones or flat slab tops and holes formed or cored in the adjusting rings to match bolt size and spacing specified for the manhole casting.
- C. Precast concrete collars shall conform to ASTM C 478.
- D. Mortar shall conform to specifications for mortar for Unit Masonry, ASTM C 270 Type S, containing no masonry cement.
  - 1. Mortar shall be composed of one (1) part Portland cement, Type II, to two (2) parts sand by volume.
- E. Materials for nonshrinking grout shall conform to CRD-C "Corps of Engineers Specifications for Non-Shrink Grout". Approved products are "Sauereisen F-100 Grout" by Sauereisen Cements Co.; "Five Star Grout" by U.S. Grout Corporation; "Masterflow 713" by Master Builders; "Euco N-S" by Euclid Chemical Company.
- F. Manhole frames and covers shall comply with the type specified on the manhole typical detail.
  - 1. Ferrous castings shall be of uniform quality free from blowholes, shrinkage or other defects.
  - 2. Metal shall conform to ASTM A 48, Class 35 for gray iron or ASTM A 536, Grade 65-45-12 for ductile iron.
  - 3. Castings shall be smooth and well cleaned by shot blasting.
  - 4. Castings shall be manufactured true to pattern.
- G. Round frames and covers shall have continuously machined bearing surfaces to prevent rocking and rattling.

- H. Other utility conduits, thrust blocks, and other appurtenances shall be of the size and kind being replaced or as approved by the governing utility company and the Engineer.
- I. Low Strength Mortar Backfill shall conform to ODOT 613.03 Type 2.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. **Public Notification:** The Contractor shall notify nearby residents and business owners forty-eight (48) hours in advance of beginning each point repair. The notification shall briefly describe the work to be performed, state the reason for the work, provide emergency phone numbers, and give a time estimate as to when the work will be completed. The language of the notification shall be approved by the Engineer.
- B. **Utility Notification:** Before any excavation work is started, the Contractor shall call the "Ohio Utilities Protection Service", at 1-800-362-2764, 48 hours in advance of the work. Non-member utilities must be contacted directly. The Contractor shall take all necessary precautions, at no additional expense to the Owner, to avoid damage to existing underground and overhead utility lines during the entire project. In the event of damage to existing public and/or private utilities, the agency concerned shall be notified immediately and all repair work shall be executed in accordance with the specifications of the respective agency at no additional expense to the Owner, including any inspection fees or maintenance crews.
- C. **Inspection Scheduling:** The Contractor shall notify the Engineer forty-eight (48) hours in advance of beginning work which requires compaction testing. Work will not begin until testing and/or inspection arrangements have been completed and approved by the Engineer.
- D. **Blasting will not be permitted.**
- E. **Unauthorized Excavations:** All excavations made outside of the lines, grades and replacement limits established by the Engineer, including the excavation, handling, rehandling, backfilling and disposal of such material shall be performed at the Contractor's own expense. This shall include that work caused by cave-ins, slides, swellings or upheavals. All spaces beneath foundations of structures, utilities, pipes or other existing facilities shall be filled with concrete or other acceptable material.
- F. **Noise, Dust and Odor Control:** The Contractor's performance of this Contract shall be conducted so as to eliminate all unnecessary noise, dust and odors. Dust control shall be performed at the Contractor's own expense whenever directed by the Engineer.
- G. The word "rock" wherever used as the name of an excavated material, shall mean boulders and solid masonry larger than one-half cubic yard in volume, of solid ledge rock and masonry which, in the opinion of the Engineer, required for its removal drilling and blasting, wedging, sledging or barring, or breaking up with a power-operated hand tool. No soft or disintegrated rock which can be removed with a hand pick or power-operated excavator or shovel; no loose, shaken or previously blasted rock or broken stone in rock

fillings or elsewhere; and no rock exterior to the minimum limits of measurement, which may fall into the excavation, will be measured or allowed when extra payment for rock excavation is set forth.

### 3.2 PREPARATORY WORK OUTSIDE PAVED AREAS

- A. The Contractor shall clear the work areas of all trees less than six (6) inch caliper, shrubs, hedges, plants and flowers as directed by the Engineer.
- B. Shrubs and hedge plants shall be set aside, appropriately stored, and replanted after backfilling the excavation. Any shrub or hedge plant that dies prior to expiration of the warranty period shall be replaced with new nursery stock.
- C. All refuse and rubbish shall be cleared from the work area and all tree stumps shall be grubbed out. All cleared material and stumps shall be removed from the work area and disposed of in a manner approved by the Engineer.
- D. After clearing, but prior to starting main excavations, the Contractor shall remove from the work area all loam, topsoil and sand found suitable for future top dressing or use.
- E. Such material shall be removed in such a manner that it is clearly separated from the underlying material and shall be stored in such a manner and location as directed by the Engineer.
- F. No extra compensation will be allowed the Contractor for Clearing and Grubbing.

### 3.3 PREPARATORY WORK WITHIN PAVEMENT AREAS

- A. The Contractor shall set up traffic control in accordance with Ohio Manual of Uniform Traffic Control Devices to the satisfaction of the Owner.
- B. The existing pavement shall be neatly saw cut, excavated and disposed of at a location approved by the Owner.

### 3.4 PROTECTION OF EXISTING UTILITIES

- A. Where existing utilities are indicated as being in the line of the point repair section, the Contractor shall carefully expose them so as to cause no damage to them or interruption of their intended use. Existing pipes or conduits crossing the sewer trench, or otherwise exposed shall be adequately braced and supported to prevent any disruption to the line or grade of the utility.
- B. The Contractor shall keep fire hydrants accessible at all times.
- C. Utility services broken or damaged shall be repaired at once to avoid inconvenience to customers. Storm sewers shall not be interrupted overnight. Temporary arrangements, as approved by the Engineer, may be used until any damaged items can be permanently repaired. All items damaged or destroyed by Point Repair construction must be subsequently repaired to the satisfaction of the governing utility company.

### 3.5 INSTALLATION

- A. Where the sewer is located adjacent to, or within any pavement area, the Contractor shall be required to maintain vertical sides on all trenches using full sheeting and bracing if necessary. Maximum top width of trench permitted under such conditions shall be four (4) feet, plus the inside diameter of the pipe unless otherwise specified on the plans or prior approval has been received from the Engineer. In no case will the Contractor be permitted to excavate pipe trenches with sides sloping to the bottom.
- B. All material excavated in trenching and all materials used in construction of the work shall be deposited so as not to endanger the work or create unnecessary annoyance to the public. During the progress of the work, all material piles shall be kept trimmed up and maintained in a neat workmanlike manner. Excavated material in excess of that needed for backfilling shall be disposed of in areas approved by the Owner.
- C. Construction shall be in accordance with ODOT Item 603 Pipe Culverts, Sewers and Drains and with ODOT Item 604 Manholes, Catch Basins, Inlets, Inspection Wells, Junction Chambers or Monuments with the following exceptions:
  - 1. Excavated soil suitable for reuse shall be stockpiled on plywood sheets or other suitable means which will prevent spillage of undesirable subgrade material onto the surrounding lawn area.
  - 2. Bedding material shall be crushed limestone only.
  - 3. Pipe lengths shall not be deflected at the joint to any greater degree than recommended by the manufacturer of the particular joint being used. All pipe deflections shall be performed only with the Engineer's approval.
  - 4. Under pavement areas, Low Strength Mortar Backfill Material shall be placed from the top of the bedding up to the bottom of the pavement. The excavation shall then be plated and reopened to traffic until the low strength mortar obtains sufficient strength to support vehicle loads. In no event shall traffic be permitted on Low Strength Mortar Backfill for less than forty-eight (48) hours after the trench has been backfilled.
  - 5. Near pavement areas, Low Strength Mortar Backfill Material shall be placed from the top of the bedding up to a depth equal to the distance from the edge of the pavement.
  - 6. Outside pavement influence areas, minimum compaction requirements shall be 100% of the maximum dry density of the backfill material.
- D. The replacement pipe shall be laid at a uniform grade between the two points of connection with the existing pipe using the equipment and methodology approved for the control of the sewer grade.

### 3.6 SERVICE CONNECTIONS

- A. In general, where service connections are in the point repair limits or as ordered, provision shall be made in the sewers for service connections by inserting a tilted-up "T" Branch for each service connection with a branch size equivalent to the existing connection where necessary, the Contractor shall construct a riser in such manner, that the top of the riser shall meet and properly receive the existing service connection. Risers are to be encased in Low Strength Mortar Backfill Material.

- B. The Contractor shall connect the new tee or wye branch to the existing service lateral so as to provide a leak free serviceable connection to the building owner.

### 3.7 SERVICE LATERAL POINT REPAIRS AND TEST TEE INSTALLATION

- A. When authorized by the Engineer, the Contractor shall perform a Point Repair to excavate service connections, replace existing pipe or install new pipe, and/or construct a new or replacement test tee to be used for rehabilitation of the service connection.
- B. The Contractor shall determine the alignment of the service connection. The excavation shall be made at a distance from the main line sewer as designated by the Engineer.
  - 1. Perform the excavation and remove six (6) feet of service connection pipe to allow access for video inspection.
  - 2. Clean and televise the service connection to the main line sewer and in the opposite direction through the house in accordance with Service Connection Televising and Rehabilitation.
  - 3. A snow fence type of barricade shall be placed around every open excavation at the end of each work day.
  - 4. Each excavation may be left open for a maximum of two (2) working days unless an extension of time is granted by the Engineer.
  - 5. Reconnect the service connection with a test tee and cap to a height determined by the Engineer.
- C. Based on the results of the television inspection of the service connection, and/or as otherwise authorized by the Engineer, the Contractor shall install or replace additional service connection pipe. Additional service connection replacement may extend to but shall not include the wye or tee on the main line sewer.
- D. Where the storm service connection pipe is located within two feet laterally of the sanitary pipe and replacement of either service connection is authorized, both pipes shall be replaced.

### 3.8 CLEANING SITE AND RESTORING DAMAGED SURFACES

- A. Upon completion of the backfill work, the Contractor shall immediately remove and dispose of all surplus materials including dirt and rubbish to the satisfaction of the Engineer.
- B. Unless otherwise called for on the plans, the Contractor shall replace in-kind all damaged or disturbed pavement and sidewalks to a condition equal to or better than that existing before the work was started as a part of performing the Point Repair work. Concrete sidewalks and pavement shall be replaced in whole blocks.
- C. All restoration of lawns, planting beds, and shrubbery shall be performed in accordance with Sodding, Seeding and Mulching as a part of performing the Point Repair work. The Contractor shall maintain the lawn and correct any settlement that occurs during the one-year maintenance period.

- D. Upon completion of the foregoing work, all tools and other property belonging to the Contractor shall be removed, and the site shall be left in good condition.

### 3.9 TRAFFIC PAINT

- A. The Contractor shall replace all existing pavement markings in the style and at the locations that existed prior to this work. The Contractor shall make records of these markings as they exist and shall supply these records to the Engineer prior to the start of any work. In the absence of such documentation, the Owner's discretion shall prevail.

### 3.10 INSPECTION BEFORE ACCEPTANCE

- A. In addition to work being observed by the Engineer during construction, each section of sewer on which a point repair is made shall be inspected in accordance with Television Inspection before final acceptance by the Owner. The point repair shall be true to both line and grade, free from cracks, broken bells, and protruding joint materials and shall show no leaks. The hydraulics of the sewer shall be in no ways be impaired. There shall be no projections of connecting pipe into the sewer. Any deposits of sand, dirt, mortar, or other materials shall be removed from the pipe in accordance with Sewer Line Cleaning at no additional cost to the Owner.
- B. If, as the result of any inspection, before final acceptance of the work, it is found that any section of any sewer has unduly settled, that joints have opened up or when the jointing material has come loose and projects into the sewer, or if pipes or bells are found cracked, broken or misshaped beyond accepted standards, or if any other defects are found in the sewers or in any of their appurtenances which might impair the satisfactory performance of the sewer or which show non-conformance with the drawings or Specifications, the Contractor shall cause such effective or inferior work to be promptly removed and replaced or satisfactorily repaired by proper material and workmanship without extra compensation for the labor, equipment and materials required.
- C. Should the Engineer require that any work be uncovered because of suspected failure or non-conformance or for inspection or other cause, and if such work is subsequently found satisfactory, the cost involved for such work will be paid for at the unit price bid for the respective items of work involved.

END OF SECTION 330130.04

## SECTION 330130.13 - SEWER PIPE JOINT TESTING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Other Sections Referenced:
  - 1. Section 330130.01 - Sewer Collection System Rehabilitation Definitions
  - 2. Section 330130.02 - Sewer Line Cleaning
  - 3. Section 330130.03 - Sewer Flow Control
  - 4. Section 330130.17 - Television Inspection

#### 1.2 DESCRIPTION OF WORK

- A. The intent of sewer pipe joint testing is to identify those sewer pipe joints that are defective thereby allowing extraneous water to enter the sewer system.
- B. Testing cannot be performed and will not be required on cracked or broken pipe, service connections, or sections of pipe between joints. Testing will not be required on joints which are visibly leaking.

#### 1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

#### 1.4 SUBMITTALS

- A. Equipment Data: Submit equipment manufacturer's technical data and operation instructions for the testing equipment to be used.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. All equipment and material shall be of a type that has been generally been in use for a period of five (5) years. Work performed with experimental equipment or material will not be permitted without prior written consent of the Owner.

## 2.2 MATERIAL

- A. Test Medium: Both water and air are acceptable, but the test procedure is different for each.

## 2.3 EQUIPMENT

- A. The basic equipment used shall consist of a television inspection equipment, joint testing device (such as a packer), and test monitoring equipment.
  - 1. The equipment shall be constructed in such a way as to provide means for introducing the test medium, under pressure, into the void area created by the expanded ends of the joint-testing device and means for continuously measuring the actual static pressure of the test medium at and within the void area only.
  - 2. Void pressure data shall be transmitted to the televising recording equipment via an electrical pressure transducer located at the void.
  - 3. The recording equipment shall be capable of recording on the video tape the manhole section being tested, the footage from the beginning manhole, and a real-time image of the void pressure.
- B. Test monitoring equipment shall be housed in a suitable vehicle and arranged to allow for simultaneous and continuous observation of the television monitor and test monitoring equipment by the Engineer.

## PART 3 - EXECUTION

### 3.1 PREPARATORY WORK

- A. Prior to testing a section of sewer, the pipe shall be cleaned and the flow controlled to allow a suitable depth. See Sewer Line Cleaning and Sewer Flow Control. The cost of this work shall be considered incidental to Sewer Pipe Joint Testing and included in the price bid thereof.

### 3.2 CONTROL TEST

- A. Prior to starting the pipe joint testing phase of the work, a two-part control test shall be performed.
  - 1. To insure the accuracy, integrity, and performance capabilities of the testing equipment, a demonstration test will be performed in a test cylinder constructed in such a manner that a minimum of two known leak sizes can be simulated. This technique will establish the test equipment performance capability in relationship to the test criteria and insure that there is no leakage of the test medium from the system or other equipment defects that could affect the joint testing results. If this test



cannot be performed successfully, the Contractor shall be instructed to repair or otherwise modify his equipment and re-perform the test until the results are satisfactory to the Engineer. This test may be required at any other time during the joint testing work if the Engineer suspects the testing equipment is not functioning properly.

2. After entering each manhole section with the test equipment, but prior to the commencement of joint testing, the test equipment shall be positioned on a section of sound sewer pipe between pipe joints, and a test performed as specified. This procedure will demonstrate the reliability of the test equipment and the soundness of the pipe material. Should it be found that the barrel of the sewer pipe will not meet the joint test requirements, the requirements will be modified as necessary.

### 3.3 TESTING

- A. Each sewer pipe joint which is visibly leaking shall be considered as having failed the test.
- B. Each sewer pipe joint which is not visibly leaking shall be individually tested at a test pressure equal to  $1/2$  psi per vertical foot of pipe depth (not exceeding a test pressure of 10 psi) in accordance with one of the following procedures:

1. Water Test Procedure:

- a. The testing device shall be positioned within the line in such a manner as to straddle the pipe joint to be tested.
- b. The testing device ends (end elements, sleeves) shall be expanded so as to isolate the joint from the remainder of the line and create a void area between the testing device and the pipe joint. The ends of the testing device shall be expanded against the pipe with sufficient pressure to contain a minimum of 10 psi within the void without leakage past the expanded ends.
- c. Water shall then be introduced into the void area until a pressure equal to or greater than the required test pressure is observed with the void pressure monitoring equipment. If the required test pressure cannot be developed (due to joint leakage), the joint will have failed the test.
- d. The flow rate of the test water shall then be regulated to a rate at which the void pressure is observed to be the required test pressure. A reading of the test water flow meter shall then be taken. If the flow rate exceeds  $1/4$  gallon per minute (due to joint leakage), the joint will have failed the test.

2. Air Test Procedure:

- a. The testing device shall be positioned within the line in such a manner as to straddle the pipe joint to be tested.
- b. The testing device ends (end elements, sleeves) shall be expanded so as to isolate the joint from the remainder of the line and create a void area between the testing device and the pipe joint. The ends of the testing device shall be expanded against the pipe with sufficient pressure to contain a minimum of 10 psi within the void without leakage past the expanded ends.

- c. Air shall then be introduced into the void area until a pressure equal to or greater than the required test pressure is observed with the void pressure monitoring equipment. If the required test pressure cannot be developed (due to joint leakage), the joint will have failed the test.
- d. After the void pressure is observed to be equal to or greater than the required test pressure, the air flow shall be stopped. If the void pressure decays by more than 2 psi within 15 seconds (due to joint leakage), the joint will have failed the test.

### 3.4 TEST RECORDS

- A. Digital video recording and written records shall be kept of the joint testing on each manhole section. The records shall include:
  - 1. Identification of the manhole section tested.
  - 2. Location (footage) of each joint tested.
  - 3. The test pressure used.
  - 4. A statement indicating the test results (passed or failed) for each joint tested.
- B. The complete test of each joint shall be recorded from the beginning of the pressure buildup in the void, through the pressure holding period, to the time of pressure release.
- C. A copy of the written records and title to the video recording records shall be given to the Owner.

END OF SECTION 330130.13

## SECTION 330130.17 - TELEVISION INSPECTION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specifications, apply to work of this section.
- B. Other Sections Referenced:
  - 1. Section 330130.01 - Sewer Collection System Rehabilitation Definitions
  - 2. Section 330130.02 - Sewer Line Cleaning
  - 3. Section 330130.03 - Sewer Flow Control

#### 1.2 DESCRIPTION OF WORK

- A. After cleaning or when otherwise specified, sewer and or laterals shall be visually inspected by means of closed-circuit television (CCTV). Flow in the section being inspected will be suitably controlled.

#### 1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work. CCTV shall be performed by PACP certified personnel.

#### 1.4 SUBMITTALS

- A. Equipment Data: Submit equipment manufacturer's technical data and operation instructions for the televising and recording equipment to be used.
- B. Product Data: Submit brand name and specifications of video media to be used for the recording of the televising data.
- C. Report: Submit sample televising log report for review and approval of content and format.

### PART 2 - PRODUCTS

#### 2.1 GENERAL

- A. The camera, television monitor, and other components of the video system shall be capable of producing picture quality to the satisfaction of the Owner's Representative, and if unsatisfactory, equipment shall be removed and no payment will be made for an unsatisfactory inspection.

## 2.2 MATERIAL

- A. Video recording shall be submitted on Owner approved media.

## 2.3 EQUIPMENT

- A. The television camera used for the inspection shall be one specifically designed and constructed for such closed-circuit sewer pipe inspection. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera shall televise and transmit the image in color and for mainline sewers shall have pan and tilt capabilities.
- B. The propulsion system shall be either a tractor, skid and winch arrangement, or with special approval from the Owner, a float.
- C. The recording system shall be digital with capability for annotating and narrating the video image, and for producing digital photographs of the television picture.

## PART 3 - EXECUTION

### 3.1 PROCEDURE FOR MAINLINE TELEVISIONING

- A. Normally, the camera will be set up in the upstream manhole. As the camera is lowered into the manhole, the manhole walls will be televised and recorded. Where the setup point causes the camera lens to be positioned a distance upstream or downstream of the manhole wall, the operator shall televise the pipe from the wall to the set point, and record the observations by voice over on the video tape.
- B. The height of the camera shall be adjusted so that the lens is at the center of the pipe.
- C. The camera will be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case will the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, and powered rewinds or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line.
- D. The camera will be moved to the far manhole and the recording shall show the condition of the manhole trough. The operator shall make a visual observation of the far manhole. Connecting pipes and manhole defects not captured on the video shall be recorded by voice over on the video tape and written in the television inspection log.
- E. Connections to the sewer shall be televised using the pan and tilt capabilities of the camera. The camera shall be positioned in the sewer at a location which maximizes the sight distance up the connecting pipe. The acceptable length of televising shall be a distance of 6 feet, or to the end of the pipe (if capped), or to the first bend (if a wye).

- F. If, during the inspection operation, the television camera will not pass through the entire manhole section, the Contractor shall perform a reverse setup (set up their equipment so that the inspection can be performed from the opposite manhole). If, again, the camera fails to pass through the entire manhole section, the manhole section will be referred to the Engineer for evaluation.
- G. When manually operated winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being inspected to insure good communications between members of the crew.
- H. The importance of accurate distance measurements is emphasized. Measurement for location of defects and connections shall be by means of a footage counter with the value displayed on the video tape. The footage counter shall be set such that zero is the center of the beginning manhole. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Accuracy of the footage counter shall be checked above ground by use of a walking meter, roll-a-tape, or other suitable device. The footage counter shall be calibrated to an accuracy that is satisfactory to the Engineer.
- I. Documentation of the television results shall be as follows:
  - 1. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during inspection. In addition, other points of significance such as locations of building sewers, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the Owner. Each feature called out on the inspection log shall be identified as to its location on the CCTV video by means of a footage counter. A separate video file shall be made for each manhole section (separate video tape if recording on video tape),
  - 2. Photographs: Digital photographs of the television picture of problems shall be taken by the Contractor, as long as such photographing does not interfere with the Contractor's operations.
  - 3. Video Recordings: The purpose of video recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. Video recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. Title to the video recording(s) shall be given to the Owner upon completion of the project. The Contractor shall have all video(s) and necessary playback equipment readily accessible for review by the Owner during the project.

### 3.2 PROCEDURE FOR SERVICE LATERAL TELEVISIONING

- A. The Contractor shall provide television equipment capable of properly documenting the conditions as found within the lateral. The camera equipment shall be capable of launching into the full length of each lateral and providing an accurate picture of the lateral to be lined. Lighting for the camera shall illuminate the entire periphery of the lateral.

- B. The camera will be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition.
- C. Documentation of the television results shall be as follows:
  - 1. The building address (number and street).
  - 2. Upstream and downstream manholes
  - 3. Location (footage) of each service connection as measured from the upstream manhole.
  - 4. Work done on the lateral (i.e. cleaning, root removal, etc.)
  - 5. Television Inspection Logs: Printed location records shall be kept by the Contractor and will clearly show the location in relation to the mainline pipe of each infiltration point observed during inspection. In addition, other points of significance such as locations of connecting pipes, unusual conditions, roots, storm sewer connections, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the Owner. A separate video file shall be made for each lateral.
  - 6. Photographs: Digital photographs of the television picture of problems shall be taken by the Contractor, as long as such photographing does not interfere with the Contractor's operations.
- D. Video Recordings: The purpose of video recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. Video recording playback shall be at the same speed that it was recorded. Slow motion or stop-motion playback features may be supplied at the option of the Contractor. Title to the video recording(s) shall be given to the Owner upon completion of the project. The Contractor shall have all video(s) and necessary playback equipment readily accessible for review by the Owner during the project.

END OF SECTION 330130.17

## SECTION 330130.61 - SEWER PIPE JOINT SEALING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. Other Sections Referenced:
  - 1. Section 330130.01 – Sewer Collection System Rehabilitation Definitions
  - 2. Section 330130.02 – Sewer Line Cleaning
  - 3. Section 330130.03 – Sewer Flow Control
  - 4. Section 330130.13 – Sewer Pipe Joint Testing
  - 5. Section 330130.17 – Television Inspection
  - 6. Section 330130.63 – Chemical Sealing Materials

#### 1.2 DESCRIPTION OF WORK

- A. A two-part chemical sealing material will be injected into the pipe joint. The chemicals will react to form a gelatinous material within and on the outside of the pipe. This gel will act as a flexible gasket to seal the joint and prevent groundwater from entering the pipe. An additive will be added to inhibit root growth through the gel material.
- B. It is the intent of the sewer pipe joint sealing work to seal all sewer pipe joints utilizing an internal joint sealing method. It is realized that this method may only be used on sewer pipe sections in sound physical condition. Longitudinally cracked or broken pipe will not be sealed. When bell cracks or chips are evident from pipe section offset, sealing may be undertaken where the offset is small enough to allow proper seating of the sealing packer on both sides of the joint to be sealed.

#### 1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

#### 1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data and application instructions.
- B. Submit Material Safety Data Sheets for the chemicals used in the grout and root inhibitor.
- C. Equipment Data: Submit equipment manufacturer's technical data and operating instructions for the joint packing equipment to be used.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. All equipment and material shall be of a type that has been in general use for a period of five (5) years. Work performed with experimental equipment or material will not be permitted without prior written consent of the Owner.

### 2.2 MATERIAL

- A. Grout: The sealing material shall be formed from a two-part chemical grout that is mixed within the void area formed by the grouting packer. (See Chemical Sealing Materials).
- B. Root Inhibitor: A root inhibitor, such as dichlobenil or approved equal, shall be incorporated into every batch of grout.

### 2.3 EQUIPMENT

- A. The basic equipment shall consist of a television inspection system, necessary chemical sealant containers, pumps, regulators, valves, hoses, etc., and joint sealing packers for the various sizes of sewer pipes.
  - 1. The equipment shall be constructed in such a way as to provide means for introducing the sealing materials, under pressure, into the void area created by the expanded ends of the joint-testing device and means for continuously measuring the actual static pressure of the materials at and within the void area only.
  - 2. Void pressure data shall be transmitted to the televising recording equipment via an electrical pressure transducer located at the void.
  - 3. The recording equipment shall be capable of recording on the video tape the manhole section being tested, the footage from the upstream manhole, and a real-time image of the void pressure.
- B. Sealing equipment shall be housed in a suitable vehicle and arranged to allow for continuous observation of the television monitor and sealing equipment by the Engineer and three (3) other representatives of the Owner.
- C. The packer shall be cylindrical and have a diameter less than the pipe size and have cables attached at each end to pull it through the line. The packer device shall be constructed in a manner to allow a restricted amount of sewage to flow. Generally, the equipment shall be capable of performing the specified operations in lines where flows do not exceed the maximum line flows for joint testing/sealing (see Sewer Flow Control).
- D. The pumping unit, metering equipment, and the packer device shall be designed so that the proportions and quantities of materials can be regulated in accordance with the type and size of the leak being sealed.
- E. The equipment shall be manufactured of materials suitable for the addition of the root inhibitor.



## PART 3 - EXECUTION

### 3.1 PREPARATORY WORK

- A. Prior to sealing a section of sewer, the pipe shall be cleaned and the flow controlled to enable a suitable depth for the sealing equipment (see Sewer Line Cleaning and Sewer Flow Control). The cost of this work shall be considered incidental to Sewer Pipe Joint Sealing and included in the price bid thereof.
- B. Root inhibitor shall be stored on the vehicle in unit doses (one dose per each batch of sealing material). Prior to starting the project, root inhibitor shall be transferred from bulk containers to individual containers. Bulk containers shall not be stored on the vehicle. Each dose shall be contained in a sealed container which shall not be opened until just prior to its inclusion in the batch.

### 3.2 JOINT SEALING PROCEDURE

- A. All joints, leaks or breaks shall be sealed. Sealing shall be accomplished by forcing the chemical sealing materials into or through joints, leaks or breaks by a system of pumps, hoses, and sealing packers.
- B. Jetting or driving pipes from the surface that could damage or cause undermining of the pipe lines shall not be allowed. Uncovering the pipe by excavation of pavement and soil (which would disrupt traffic, undermine adjacent utilities and structures, and cause further damage to the pipe lines being repaired) shall not be allowed.
- C. The packer shall be positioned over each joint, leak or break by means of a closed-circuit television camera in the line. It is important that the procedure used by the Contractor for positioning the packer be accurate to avoid over pulling the packer and thus not effectively sealing (grouting) the intended defect.
- D. The packer ends (end elements, sleeves) shall be expanded using controlled pressure. The expanded ends shall seal against the inside periphery of the pipe to form a void area at the joint, now completely isolated from the remainder of the pipe line.
- E. Into this isolated area, sealant materials shall be pumped through the hose system at controlled pressures which are in excess of groundwater pressures.

### 3.3 SEAL VERIFICATION

- A. Upon completion of the sealing of each individual joint, leak or break, the packer shall be deflated until the void pressure meter reads zero pressure, then reinflated and the joint retested as specified (see Sewer Pipe Joint Testing). The cost of this testing shall be included in the cost of Sewer Pipe Joint Sealing.
- B. Should the void pressure meter not read zero, the Contractor shall clean his equipment of residual grout material or make the necessary equipment repairs/adjustments to produce accurate void pressure readings.

- C. Joints that fail to meet the specified test criteria shall be resealed and retested until the test criteria can be met in order to receive payment.

### 3.4 RESIDUAL SEALING MATERIAL

- A. Residual sealing materials that extend into the pipe, reduce the pipe diameter, or restrict the flow shall be removed from the joint. The sealed joints shall be left reasonably "flush" with the existing pipe surface.
- B. If excessive residual sealing materials accumulate in the line and/or if directed by the Engineer the manhole section shall be cleaned to remove the residual materials. In no case shall excess grout material be flushed down the sewer. The cost of this cleaning shall be included in the cost of Sewer Pipe Joint Sealing.

### 3.5 RECORDS

- A. Digital video recordings shall be kept of the joint sealing performed in each manhole section. The following information shall be recorded on the video:
  - 1. Identification of the manhole section sealed.
  - 2. The footage location of each joint sealed, measured from the upstream manhole.
  - 3. Void pressure continuously recorded throughout the joint sealing procedure.
  - 4. Number of gallons of sealant used.
  - 5. A verbal statement indicating the sealing results (passed or failed) for each joint sealed.
  - 6. If a joint is not grouted, a verbal statement indicating the reasons for not sealing the joint.
- B. Written records also shall be kept of joint sealing performed in each manhole section. Written records shall include:
  - 1. Identification of the manhole section sealed.
  - 2. The footage location of each joint sealed, measured from the upstream manhole.
  - 3. Sealing pressure at refusal.
  - 4. Number of gallons of sealant used.
  - 5. A statement indicating the sealing results (passed or failed) for each joint sealed.
- C. The complete sealing of each joint, leak or break shall be recorded on the video tape from the beginning of the pressure buildup in the void, through the pressure holding period, to the time of pressure release.
- D. A copy of the written records and title to the video recordings shall be given to the Owner prior to payment for Sewer Pipe Joint sealing.

### 3.6 GUARANTY

- A. All sewer pipe joint sealing work performed shall be guaranteed against faulty workmanship and/or materials for a period of one year after the completion of the work.
1. Prior to the expiration of the guaranty period, an initial retest area consisting of specific manhole sections shall be selected by the Engineer/Owner. The initial test area shall consist of at least 5%, but not exceed 10%, of the linear feet contained in the original project.
  2. Within the initial retest area, the Contractor shall retest all previously sealed joints as specified (see Sewer Pipe Joint Testing). Any joints failing the retest shall be resealed. If the failure rate of the retested joints is less than 1% of the joints retested, the work shall be considered satisfactory and no further retesting will be required. Payment for retesting the initial area shall be at the unit price bid for each item of work required (e.g.: cleaning, TV inspection, testing, etc.). No compensation shall be provided for resealing (grouting) joints that fail.
  3. If, in the initial retest area, the failure rate of the retested joints exceeds 1% of the joints retested, an additional retest area of equivalent size shall be selected and all previously sealed joints shall be retested. This additional testing and sealing, if necessary, will continue until a failure rate of less than 1% is met. Any additional testing/sealing required beyond the initial retest area shall be accomplished at no cost to the Owner.
  4. Should as much as 25% of the original project be retested and fail to meet the 1% requirement, the Contractor will be required to provide the same number of crews as utilized in the original project so that the retesting will proceed at a more rapid rate.

END OF SECTION 330130.61

## SECTION 330130.63 - CHEMICAL SEALING MATERIALS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specifications sections, apply to work of this section.
- B. Other Sections Referenced:
  - 1. Section 330130.61 - Sewer Pipe Joint Sealing

#### 1.2 DESCRIPTION OF WORK

- A. The intent of this section is to define the properties that a sealing material must have to perform effectively in the intended application and under expected field conditions.
- B. Generic chemical sealing materials currently in use are listed with the basic properties, performance standards, and mix ratios which are known to give acceptable performance.
- C. It is recognized that new and improved chemical sealing materials will become available from time to time. Sources, manufacturers, and product names of chemical sealing materials will thus change from time to time and therefore specific sources, manufacturers, and product names are not referred to in this specification.
- D. It should be understood that all of the generically classified chemical sealing materials can achieve desired long-lasting results when used in the proper application and properly applied. The knowledge and skill of the applicator has a greater effect on achieving the desired results than the specific sealing material applied.
- E. In every case, mixing and handling of chemical sealing materials shall be in strict accordance with the manufacturer's recommendations.

#### 1.3 QUALITY ASSURANCE

- A. All chemical sealing materials used in the performance of the work specified must have the following properties and characteristics:
  - 1. While being injected, the chemical sealant must be able to react/perform in the presence of water.
  - 2. The cured material must be capable of withstanding submergence in water without degradation.
  - 3. The resultant sealant formation must prevent the passage of water.
  - 4. The sealant material, after curing, must be flexible as opposed to brittle or rigid.
  - 5. In place, the resultant sealant formation should be able to withstand freeze/thaw and wet/dry cycles without adversely affecting the seal.

6. The sealant formation must not be biodegradable. Additives may be used to meet this requirement.
7. The cured sealant should be chemically stable and resistant to concentrations of acids, alkalis, and organics found in normal sewage.
8. Packaging of component materials must be compatible with field storage and handling requirements. Packaging must provide for worker safety and minimize spillage during handling.
9. Mixing of component materials must be compatible with field operations and not require precise measurements.
10. Clean-up must be done without inordinate use of flammable or hazardous chemicals.
11. Residual sealing materials must be removable from the sewer after injection to insure no flow reduction, restriction, or blockage of normal sewage flows.

## PART 2 - PRODUCTS

### 2.1 CHEMICAL SEALING MATERIALS

- A. The following is a generic listing of chemical sealing materials currently in use and the basic requirements, properties and characteristics of each:
  1. Acrylamide base gel chemical sealing material requirements, properties and characteristics:
    - a. A minimum of ten percent (10%) acrylamide base material by weight in the total sealant mix. A higher concentration of acrylamide base material may be used, when desirable, to increase strength or offset dilution during the induction period.
    - b. The ability of tolerate some dilution and react in moving water during the induction period.
    - c. A viscosity of approximately two (2) centipoise which can be increased with additives.
    - d. A constant viscosity during the induction period.
    - e. A controllable reaction time (induction period) from ten (10) seconds to one (1) hour.
    - f. A reaction (curing) which produces a homogeneous, chemically stable, nonbiodegradable, firm, flexible gel.
    - g. The ability to increase mix viscosity, density and gel strength by the use of additives, e.g.: diatomaceous earth.
  2. Urethane base foam chemical sealing material requirements, properties and characteristics:
    - a. Approximately one (1) part of urethane prepolymer thoroughly mixed with one (1) part of water by weight (50% prepolymer).
    - b. A liquid prepolymer having a solids content of eighty-two percent (82%) to eighty-eight (88%), specific gravity of 1.1 (9.15 pounds per gallon), and flash point of 20°F.

- c. A liquid prepolymer having a viscosity of 300 to 500 centipoise at 72°F that can be pumped through 500 feet of one-half (1/2) inch hose with a 500 psi head at a one (1) ounce/second flow rate.
  - d. A cure time of 15.0 minutes at 40°F, 8.2 minutes at 70°F, and 4.6 minutes at 100°F when the prepolymer is reacted with water only.
  - e. A cure time of 5.5 minutes at 40°F, 3.5 minutes at 70°F, and 2.6 minutes at 100°F when the prepolymer is reacted with water containing 0.4% accelerator.
  - f. During injection; foaming, expansion, and viscosity increase take place.
  - g. Physical properties of the cured foam of approximately; fourteen (14) pounds per cubic foot density, 80 to 90 psi tensile strength, and 700% to 800% elongation when a mixture of fifty percent (50%) prepolymer and fifty percent (50%) water undergoes a confined expansion to five times its initial liquid volume.
3. Urethane base gel chemical sealing material requirements, properties and characteristics:
- a. One (1) part prepolymer thoroughly mixed with between five (5) and ten (10) parts of water by weight. The recommended mix ratio is one (1) part urethane prepolymer to eight (8) parts of water (11% prepolymer).
  - b. A liquid prepolymer having a solids content of seventy-seven percent (77%) to eighty-three percent (83%), specific gravity of 1.04 (8.65 pounds per gallon), and flash point of 20°F.
  - c. A liquid prepolymer having a viscosity of 600 to 1200 centipoise at 70°F that can be pumped through 500 feet of one-half (1/2) inch hose with a 1000 psi head at a one (1) ounce/second flow rate.
  - d. The water used to react the prepolymer should be in the pH range of five (5) to nine (9).
  - e. A cure time of eighty (80) seconds at 40°F, fifty-five (55) seconds at 60°F, and thirty (30) seconds at 80°F when one (1) part prepolymer is reacted with eight (8) parts of water only. Higher water ratios give longer cure times.
  - f. A cure time that can be reduced five (5) to ten (10) seconds for water temperatures of 40°F to 80°F when one (1) part prepolymer is reacted with eight (8) parts of water containing gel control agent.
  - g. A relatively rapid viscosity increase of the prepolymer/water mix. Viscosity increases from about ten (10) to sixty (60) centipoise in the first minute for one (1) to eight (8) prepolymer to water ratio at 50°F.
  - h. A reaction (curing) which produces a chemically stable, nonbiodegradable, tough, flexible gel.
  - i. The ability to increase mix viscosity, density, gel strength and resistance to shrinkage by the use of additives to the water.

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 330130.63

## SECTION 330130.72 - CURED-IN-PLACE PIPE LINING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Other Sections Referenced:
  - 1. Section 330130.01 - Sewer Collection System Rehabilitation Definitions
  - 2. Section 330130.02 - Sewer Line Cleaning
  - 3. Section 330130.03 - Sewer Flow Control
  - 4. Section 330130.17 - Television Inspection
- C. Other documents which shall be considered part of and included in these specifications
  - 1. ASTM - F1216 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube
  - 2. ASTM - F1743 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pull in and Inflate and Curing of a Resin-Impregnated Tube
  - 3. ASTM - D543 Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents
  - 4. ASTM - D638 Standard Test Method for Tensile Properties of Plastics
  - 5. ASTM - D790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
  - 6. ASTM - D792 Standard Test Methods for Density and Specific Gravity of Plastics by Displacement.
  - 7. ASTM - F2019 Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Pulled in Place Installation of Glass Reinforced Plastic (GRP) Cured-in-Place Thermosetting Resin Pipe (CIPP)
  - 8. ASTM - D2122 Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings
  - 9. ASTM F2561 Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One Piece Main and Lateral Cured-in-Place Liner
  - 10. ASTM - D2990 Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics
  - 11. ASTM - D3567 Standard Practice for Determining Dimensions of Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe and Fittings
  - 12. ASTM - D3681 Standard Test Method for Chemical Resistance of "Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe in a Deflected Condition
  - 13. ASTM - D5813 Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe
  - 14. ASTM E 132 Test Method for Poisson's Ratio at Room Temperature

- D. Neither the CIPP product, system, nor its installation, shall cause adverse effects to any of the Owner's processes or facilities. The installation pressure for the product shall not damage the system in any way, and the use of the product shall not result in the formation or production of any detrimental compounds or by-products at the wastewater treatment plant or to local receiving waters. The Contractor shall notify the Owner and identify any by-products produced as a result of the installation operations, test and monitor the levels, and comply with any and all local waste discharge requirements. The Contractor shall cleanup, restore existing surface conditions and structures, and repair any of the CIPP system determined to be defective. The Contractor shall conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses and property owners or tenants.
- E. The prices submitted by the Contractor, shall include all costs of permits, labor, equipment and materials for the various bid items necessary for furnishing and installing, complete in place, CIPP in accordance with these specifications. All items of work not specifically mentioned herein which are required, by the contractor, to make the product perform as intended and deliver the final product as specified herein shall be included in the respective lump sum and unit prices bid.

## 1.2 DESCRIPTION OF WORK

- A. The Contractor shall provide all materials, labor, equipment, and services necessary for traffic control, bypass pumping and/or diversion of flows (unless specifically included as a bid item), cleaning and television inspection of sewers to be rehabilitated, liner installation, reconnection of service connections, all quality controls, provide samples for performance of required material tests, final television inspection, testing of the rehabilitated pipe system, warranty work and other work, all as specified herein.
- B. The CIPP shall be continuous and jointless from manhole to manhole or access point to access point and shall be free of all defects that will affect the long-term life and operation of the pipe.
- C. The CIPP shall fit sufficiently tight within the existing pipe so as to not leak at the manholes, at the service connections, or through the wall of the installed pipe. If leakage occurs at the manholes or the service connections, the Contractor shall seal these areas to stop all leakage using a material compatible with the CIPP. If leakage occurs through the wall of the pipe, the CIPP shall be repaired, or removed and replaced, as recommended by the CIPP manufacturer. Final approval of the CIPP will be based on a leak tight pipe.
- D. The CIPP shall be designed for a life of 50 years or greater and an equal service life unless specifically specified otherwise by the Owner.
- E. The installed CIPP shall withstand all applicable surcharge loads (soil overburden, live loads, etc.) and external hydrostatic (groundwater) pressure, if present, for each specific installation location.



- F. Unless additional chemical resistance is specified in SPECIFIC PROJECT REQUIREMENTS, the installed CIPP shall have a long term (50 year or greater) corrosion resistance to the typical chemicals found in domestic sewage and defined in the referenced and applicable ASTM standards.
- G. The intent of cured-in-place pipe (CIPP) is to rehabilitate sewer lines by installing a flexible polyester felt tube saturated with a thermosetting resin into the existing pipe. When cured and complete, the installed pipe should extend the full length of the pipe section being rehabilitated and shall provide a structurally sound, continuous, jointless, tight-fitting, watertight pipe within a pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP using the system selected by the Contractor meeting the Owners requirements. Deficiencies which will be corrected by the finished product include:
  - 1. Cracked and broken pipe caused by poor construction, unstable soil, earth movement, infiltration, roots, destructive loadings, cleaning tool damage, etc.
  - 2. Corrosion of pipe caused by acid attack above and/or below the flow line.
  - 3. Erosion of pipe caused by abrasion below the flow level.
  - 4. Degradation of brick pipe caused by loss of masonry.
  - 5. Infiltration of groundwater and soil through leaking pipe joints and structural defects.
  - 6. Exfiltration of transported fluid through leaking pipe joints and structural defects.
  - 7. Inflow of surface water and infiltration of groundwater through unused or illegal connections.

### 1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.
- B. Installer's Qualifications: Firms with at least 5 successfully completed projects having installed an aggregate total of 10,000 linear feet of the submitted manufacturer's cured-in-place liner.

### 1.4 SUBMITTALS

- A. Submit the latest edition and any revisions thereto of the manufacturer's technical data and installation instructions including fabric tube, flexible membrane (coating material), raw resin data, shipping/ storage/ handling instructions, tube wet-out & cure methods, and CIPP manufacturer's repair/replacement procedures.
- B. Submit Material Safety Data Sheet(s) for the resins, any other chemical additives, and any other chemicals used in the CIPP system.
- C. Submit certified copies of all test reports on the properties of the proposed resin materials prior to their use. Tests shall be performed by an approved independent testing laboratory or other approved source.
- D. If not submitting the specified CIPP thickness, submit approvable design calculations for the CIPP material thickness for each section of the pipe to be rehabilitated.

## 1.5 SAFETY

- A. The Contractor shall conform to all work safety requirements of pertinent regulatory agencies, and shall secure the site for the working conditions in compliance with the same. The Contractor shall erect such signs and other devices as are necessary for the safety of the work site.
- B. The Contractor shall perform all of the work in accordance with applicable OSHA standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for pipe renewal.
- C. The Contractor shall submit a proposed Safety Plan to the Owner, prior to beginning any work, identifying all competent persons. The plan shall include a description of a daily safety program for the job site and all emergency procedures to be implemented in the event of a safety incident. All work shall be conducted in accordance with the Contractor's submitted Safety Plan.
- D. Compensation for all work required for the submittal of the Safety Plan shall be included in the various pipelining items contained in the Proposal.

## 1.6 AS-BUILT DRAWINGS/RECORDS

- A. As-Built drawings/records, pre & post inspection videotapes, CDs or other electronic media shall be submitted to the Owner, by the Contractor, within 2 weeks of final acceptance of said work or as specified by the Owner. As-Built drawings/records will include the identification of the work completed by the Contractor and shall be prepared on one set of Contract Drawings/Records provided to the Contractor at the onset of the project.

## 1.7 WARRANTY

- A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The Contractor shall warrant the CIPP material and installation for a period of one (1) year. During the Contractor warranty period, any defect which may materially affect the integrity, strength, function and/or operation of the pipe, shall be repaired at the Contractor's expense in accordance with procedures as recommended by the manufacturer.
- B. On any work completed by the contractor that is defective and/or has been repaired, the contractor shall warrant this work for (1) year in addition to the warranty required by the contract.
- C. After a pipe section has been rehabilitated and for a period of time up to one (1) year following completion of the project, the Owner may inspect all or portions of the rehabilitated system. The specific locations will be selected at random by the Owner's inspector and should include all sizes of CIPP from this project. If it is found that any of the CIPP has developed abnormalities since the time of "Post Construction Television Inspection," the abnormalities shall be repaired and/or replaced as defined in Section 1.7

CIPP Repair/Replacement and as recommended by the manufacturer. If, after inspection of a portion of the rehabilitated system under the contract, problems are found, the Owner may televise all the CIPP installed on the contract. All verified defects shall be repaired and/or replaced by the Contractor and shall be performed in accordance with Section 1.7 CIPP Repair/Replacement and per the original specifications, all at no additional cost to the Owner.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. All equipment and material shall be of a type that has been generally been in use for a period of five (5) years. Work performed with experimental equipment or material will not be permitted without prior written consent of the Owner.

### 2.2 MATERIALS

- A. All materials used in the installation of CIPP shall be equal to or exceed the manufacturer's standards.

- 1. Resin:

- a. The resin shall be a corrosion resistant polyester or vinyl ester resin and catalyst system or epoxy and hardener system that, when properly cured within the tube composite, meets the requirements of ASTM F1216, ASTM F1743 or F2019 and ASTM D5813, the physical properties herein, and those which are to be utilized in the design of the CIPP for this project. The resin, specified for the specific application defined in the contract documents, shall produce CIPP which will comply with or exceed the structural and chemical resistance requirements of this specification.
- b. The resin to tube ratio, by volume, shall be furnished as recommended by the manufacturer.

- 2. Fabric Tube

- a. The fabric tube shall consist of one or more layers of absorbent non-woven felt fabric, felt/fiberglass, felt/carbon fiber, carbon fiber or fiberglass and meet the requirements of ASTM F 1216, ASTM F 1743, or ASTM F2019 and ASTM D5813. The fabric tube shall be capable of absorbing and carrying resins, constructed to withstand installation pressures and curing temperatures and have sufficient strength to bridge missing pipe segments and stretch to fit irregular pipe sections. The contractor shall submit certified information from the felt manufacturer on the nominal void volume in the felt fabric that will be filled with resin.
- b. The wet-out fabric tube shall have a uniform thickness and excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.

- c. The fabric tube shall be manufactured to a size and length that when installed will tightly fit the internal circumference, meeting applicable ASTM standards or better, of the original pipe. Allowance shall be made for circumferential stretching during installation. The tube shall be properly sized to the diameter of the existing pipe and the length to be rehabilitated and be able to stretch to fit irregular pipe sections and negotiate bends. The Contractor shall determine the minimum tube length necessary to effectively span the designated run between manholes.
  - d. The Contractor shall verify the lengths in the field prior to ordering and prior to impregnation of the tube with resin to ensure that the tube will have sufficient length to extend the entire length of the run. The Contractor shall also measure the inside diameter of the existing pipelines in the field prior to ordering liner so that the liner can be installed in a tight-fitted condition.
  - e. The outside and/or inside layer of the fabric tube (before inversion/pull-in, as applicable) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate, if applicable, vacuum impregnation and monitoring of the resin saturation during the resin impregnation (wet-out) procedure.
  - f. No material shall be included in the fabric tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be acceptable upon visual inspection as evident by color contrast between the tube fabric and the activated resin containing a colorant.
  - g. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made. The hue of the color shall be dark enough to distinguish a contrast between the fully resin saturated felt fabric and dry or resin lean areas. Seams in the fabric tube, if applicable, shall meet the requirements of ASTM D5813.
  - h. Unless otherwise acceptable to the Owner, the outside of the fabric tube shall be marked a maximum of every 5 feet with the name of the manufacturer or CIPP system, manufacturing lot and production footage.
  - i. The minimum length of the fabric tube shall be that deemed necessary by the installer to effectively span the distance from the starting manhole to the terminating manhole or access point, plus that amount required to run-in and run-out for the installation process.
  - j. The nominal fabric tube wall thickness shall be constructed, as a minimum, to the nearest 0.5 mm increment, rounded up from the design thickness for that section of installed CIPP. Wall thickness transitions, in 0.5 mm increments or greater as appropriate, may be fabricated into the fabric tube between installation entrance and exit access points. The quantity of resin used in the impregnation shall be sufficient to fill all of the felt voids for the nominal felt thickness.
3. The uncured tubing shall be designed to withstand the insertion stresses, and to be able to negotiate pipe joint offsets, gaps, and angular changes up to and including forty-five degrees (45°).

4. The nominal specified thickness for each pipe section shall be designated in the Proposal section or Specific Project Requirements section of the specifications or as shown on the plans. The cured material thickness tolerance shall be plus or minus twenty-five percent ( $\pm 25\%$ ) of the specified thickness. The thickness of any inner and/or outer membrane shall not be included.
5. Minimum Physical Properties
  - a. Where specific thicknesses are not provided the following values shall be used to calculate a minimum value.
    - 1) All pipe shall be considered fully deteriorated.
    - 2) All pipe shall be subjected to soil loads of 120 pounds per cubic foot.
    - 3) All pipe shall be subject to AASHTO HS-20 highway loading.
    - 4) The water table shall be assumed to be five (5) feet below the ground surface.
    - 5) All pipe shall be assumed to have five percent (5%) ovality.
    - 6) Creep Retention Factor 50%.
    - 7) Constrained Soil Modulus per AASHTO LRFD Section 12 and AWWA Manual M45.
    - 8) Minimum Service Life 50 years.
    - 9) Design Safety Factor of 2.0 (1.5 for pipes 36" or larger)
6. Structural Requirements
  - a. The cured pipe material shall conform to the minimum structural standards as listed below. Evidence shall be presented to demonstrate that the long-term modulus of elasticity of the cured product is no less than fifty percent (50%) of the herein specified Modulus of Elasticity (Short-term).

| <u>Cured Pipe Material Test</u> | <u>Test Method</u> | <u>Minimum Value</u> |
|---------------------------------|--------------------|----------------------|
| Chemical Resistance             | ASTM D 543         | < allowed loss       |
| Tensile Strength                | ASTM D 638         | 3,000 psi            |
| Flexural Strength               | ASTM D 790         | 4,500 psi            |
| Flexural Modulus of Elasticity  | ASTM D 790         | 250,000 psi          |
| Poisson's Ratio                 | ASTM E 132         | 0.3                  |

- b. The CIPP shall be designed as per ASTM F1216 Appendixes. The CIPP design shall assume no bonding to the original pipe wall.
- c. Any material failing to meet any of the structural standards of this specification may be rejected or may be cause for changing the material thickness if approved by the Engineer.

## PART 3 - EXECUTION

### 3.1 PREPARATORY PROCEDURES

- A. The Contractor shall notify all homeowners on the manhole section to be lined forty-eight (48) hours in advance of the work to be done. The Contractor shall inform the homeowner of precautions necessary to prevent backup of sewage into the house. Notification shall include language that the work may extend beyond normal permitted working hours, if necessary to reinstate service laterals.
- B. The following preparatory procedures shall be adhered to unless otherwise approved by the Engineer:
  - 1. **Cleaning of Sewer Line:** Before ordering liner materials for the project, the Contractor shall remove all internal debris from the pipe line that will interfere with the installation and the final product delivery of the CIPP, as required in these specifications, and accurately measure and document the exact size of the existing pipeline to be rehabilitated. Solid debris and deposits shall be removed from the system and disposed of properly by the Contractor. Moving material from manhole section to manhole section shall not be allowed. As applicable, the contractor shall either plug or install a flow bypass pumping system to properly clean the pipe lines. Precaution shall be taken by the Contractor in the use of cleaning equipment to avoid damage to the existing pipe. The repair of any damage, caused by the cleaning equipment, shall be the responsibility of the Contractor. The Owner will designate a site for the disposal of all debris removed from the Owner's sewer system as a direct result of the cleaning operation. Unless otherwise specified by the Owner, the Contractor shall dispose of all debris at no charge. Should any dumping fees apply, the Contractor shall be compensated at the respective unit price bid in the Proposal for cleaning.
  - 2. **Inspection of Sewer Line:** In accordance with the Television Inspection requirements, the Contractor shall televise the pipe with PACP certified personnel specially trained in locating breaks, obstacles, and service connections. The interior of the sewer line shall be carefully inspected to determine the location and extent of any structural failures. The location of any conditions which may prevent proper installation of the CIPP shall be noted so that such conditions can be corrected. The Contractor shall provide the Owner a copy of the pre-cleaning and post-cleaning video and suitable log, and/or in digital format, for review prior to installation of the CIPP and for later reference by the Owner.
  - 3. **Connections:** While televising the mainline sewer, the Contractor shall accurately measure and record the locations and positions of service connections using a fiberglass or other tape approved by the Engineer. Additionally, the Contractor shall utilize the pan and tilt capabilities of the televising equipment to determine which connections are live (active) and which are not in use. If required by the Contract documents, each connection will be dye tested to determine whether or not the connection is live or abandoned.

4. **Bypassing Sewage:** The Contractor shall provide for the flow of existing mainline and service connection effluent around the section or sections of pipe designated for CIPP installation. With most small diameter pipelines, particularly on terminal sewers, plugging will be adequate but must be monitored on a regular basis to prevent backup of sewage into adjacent homes. Service connection effluent may be plugged only after proper notification to the affected residence and may not remain plugged overnight. Installation of the liner shall not begin until the Contractor has installed the required plugs or a sewage bypass system and all pumping facilities have been installed and tested under full operating conditions including the bypass of mainline and side sewer flows. Once the installation has begun, existing flows shall be maintained, until the resin/tube composite is fully cured, cooled down, full televised and the CIPP ends finished. The Contractor shall coordinate sewer bypass and flow interruptions with the Owner at least 14 days in advance and with the property owners and businesses at least 1 business day in advance. The pump and bypass lines shall be of adequate capacity and size to handle peak flows. The Contractor shall submit a detail of the bypass plan and design to the Owner before proceeding with any CIPP installation. Compensation for bypass pumping and all associated plans and approvals shall be as specified in PRICES TO INCLUDE. All bypassing of flow shall be performed as specified under 330130.03 - SEWER FLOW CONTROL.
5. **Line Obstructions:** It shall be the responsibility of the Contractor to clear the line of obstructions such as solids, dropped joints, protruding service connections, or collapsed pipe that will prevent installation. If the obstruction(s) could have been removed by bucket machines or by using conventional cleaning methods, no compensation will be granted.
  - a. Internal repairs are protruding service connections, dropped portions of pipe which can be removed or pushed back in place, and other obstructions which cannot be cleared using conventional cleaning methods, but which can be cleared from within the pipe. Such internal repairs shall be approved in writing by the Engineer prior to the commencement of the work and shall be considered as a pay item.
  - b. Point repairs are obstructions that cannot be removed by either conventional sewer cleaning equipment or by internal equipment. The Contractor shall make an excavation to expose and remove or repair the obstruction. Such excavation shall be approved in writing by the Engineer prior to the commencement of the work, shall be performed as specified under Point Repairs, and shall be considered as a pay item.
6. **Pre-Insertion Television Inspection:** The Contractor shall televise and record the sewer pipe immediately before installing CIPP. This televising is to assure that the pipe is clean and existing pipe conditions are acceptable for lining. Should additional cleaning be required, it shall be provided at no additional cost to the Owner. The cost of this televising shall be included in the cost of CIPP.

### 3.2 INSTALLATION PROCEDURES

- A. General: The Contractor shall designate a location where the uncured resin in original containers and the fiber felt tube will be impregnated prior to installation. The Contractor shall provide for the Owner's inspection of the materials and impregnation procedure. A resin/catalyst system compatible with the requirements of this method shall be used. The quantities of the liquid thermosetting material shall be sufficient to provide the thickness specified herein. When a proprietary lining technique is used and the licensor's procedures for proper installation differ from these specifications, the licensor's procedures shall govern.
- B. Handling: The Contractor shall exercise care during transportation, storage and handling of the liner system to ensure that it will not be torn, cut, or otherwise damaged. The tube shall be impregnated with resin not more than twenty-four (24) hours before the proposed time of installation. Prior to insertion, the tube shall be stored and transported to the site in a refrigerated truck. The insertion shall take place no later than thirty (30) minutes after the catalyst is placed into the resin mix.
- C. Insertion: The impregnated fiber felt tube shall be inserted through an existing manhole, through the pipe to be rehabilitated, to the designated rehabilitation location. The tube shall be inserted in accordance with the manufacturer's instructions.
  - 1. A seal, consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP, shall be applied at manhole/wall interface in accordance with the CIPP System manufacturer's recommendations.
- D. Temperature: Prior to installation and as recommended by the manufacturer, remote temperature gauges or sensors shall be placed inside the host pipe to monitor the temperatures during the cure cycle. Liner temperature shall be monitored and logged during curing of the liner.
- E. Inflation: The inflation/expansion pressure shall be sufficient to hold it tight to the pipe wall, to produce dimples at side connections and flared ends at manhole walls. Care shall be taken not to over stress the felt tube at the elevated curing temperatures, or otherwise cause damage or failure prior to cure.
- F. Curing: After insertion and inflation/expansion is completed, the Contractor shall supply a suitable heat source. The equipment shall be capable of delivering heat throughout the section to raise the curing medium temperature above the recommended minimum value. This minimum temperature shall be determined by the resin/catalyst system employed. The temperature shall be maintained within the manufacturer's recommended limits for the duration of the cure period. The cure period shall be of a duration recommended by the resin manufacturer, as modified for the installation process.
- G. Cool down: The Contractor shall cool the hardened pipe to a temperature meeting the manufacturer's recommendations. Care shall be taken in the release of the pressure so that a vacuum will not be developed that could damage the newly installed pipe. Temperatures and curing data shall be monitored and recorded, by the Contractor, throughout the installation process to ensure that each phase of the process is achieved as approved in accordance with the CIPP System manufacturer's recommendations.



- H. Finish: The installed CIPP shall be continuous over the entire length of a sewer line section and be free from visual defects such as foreign inclusions, dry spots, pinholes, major wrinkles and delamination. The CIPP shall be impervious and free of any leakage through the CIPP wall.

Any defect which will or could affect the structural integrity or strength of the CIPP shall be repaired at the Contractor's expense.

The Contractor shall seal both ends of the CIPP in accordance with the manufacturer's recommendations for the field conditions. If, due to broken or misaligned sewer pipe at manhole walls, the installed pipe fails to make a tight seal, the Contractor shall apply a sealant at that point. The sealant shall be of a resin mixture compatible with that used in the CIPP process. The end shall be sealed for a distance of at least (1) pipe diameter inside the host pipe.

If any of the service connections leak water between the host pipe and the installed CIPP, the connection mainline interface shall be sealed to provide a water tight connection.

- I. Void Areas: Where required by the owner, where necessary in order to assure a structurally sound pipe, or where necessary for the successful CIPP Lining installation, the contractor shall backfill voids that remain after installation of CIPP. The material shall be of the flowable fill type and shall be injected into the void while removing all trapped air from the void. The contractor shall submit the proposed method of placing the flowable fill, including pressures that will not collapse the CIPP and air release method to be employed, to the owner for review before any material is installed. The cost of this work shall be at the unit price bid for flowable fill complete and include all material, equipment and labor to complete the filling of the void.
- J. Testing: After the installation procedures have been performed and curing is complete, but before any service are reinstated, the Contractor shall conduct a leakage test on the sewer line to determine if it is watertight.
1. For water cured liners, the test shall be conducted by using the existing hydrostatic head provided by the standpipe. The test time shall be fifteen (15) minutes, during which time no makeup water shall be added to the standpipe. If at the end of the test period, no significant water loss is observed in the standpipe, the watertightness of the cured-in-place pipe will be considered satisfactory.
  2. For air or steam cured liners, the test shall be conducted by removing the bladder and plugging both ends of the cured pipe. The pipe shall then be pressurized with air to a test pressure of one-half (1/2) psi per vertical foot of pipe depth (not exceeding a test pressure of ten (10) psi). The air flow shall be stopped. If the required pressure can be developed and if the pressure decays by less than one (1) psi within four (4) minutes, the watertightness of the liner pipe will be considered satisfactory.

- K. **Service Connection Reinstatement:** After testing, the Contractor shall reinstate the existing live service connections. This shall generally be done without excavation, from the interior of the pipe by means of a television camera and a remotely controlled cutting device. The work shall be performed by experienced operators so that no blind holes are made in the CIPP. The openings of the existing live service connections shall be cut to not less than ninety percent (90%) of their original size. The opening shall not be more than 100% of the service connection opening. All cuts shall be free of burrs, frayed edges, or any restriction preventing free flow of the sewage. Excessive cuts, wrong holes, or trial cuts shall not be made and must be repaired at no cost to the Owner to the full satisfaction of the Engineer. In all cases, the invert of the lateral connection shall be cut flush with the invert entering the mainline to eliminate debris build-up.

Reconnections of existing services shall be made after the CIPP has been installed, fully cured, and cooled down. It is the Contractor's responsibility to make sure that all active service connections are reconnected.

External reconnections are to be made with a tee fitting in accordance with CIPP System manufacturer's recommendations. Saddle connections shall be seated and sealed to the new CIPP using grout or resin compatible with the CIPP.

Coupons of pipe material resulting from service tap cutting shall be collected at the next manhole downstream of the pipe rehabilitation operation prior to leaving the site. Coupons may not be allowed to pass through the system.

### 3.3 FINAL ACCEPTANCE

- A. **Finish:** The finished pipe shall be continuous over the entire length of sewer run between two manholes and be free from significant defects.
1. Any defects which will affect, the intended use, integrity or strength of the pipe shall be repaired, at the Contractor's expense, in a manner mutually agreed by the Owner and the Contractor.
- B. **Inspection:** After the work is completed, the Contractor shall provide the Owner with a videotape showing both the before and after conditions, including the reinstated service connections.
- C. **Cleanup:** After the installation work has been completed and all testing acceptable, the Contractor shall clean up the entire project area. All excess material and debris not incorporated into the permanent installation shall be disposed of by the Contractor.
- D. **Warranty:** During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the Contractor's expense in a manner mutually agreed by the Owner and the Contractor.

END OF SECTION 330130.72

## SECTION 330130.74 – CIPP CONNECTION WITH LATERAL

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division-1 Specifications, apply to work of this section.
- B. Other Sections Referenced:
  - 1. Section 330130.01 – Sewer Collection System Rehabilitation Definitions
  - 2. Section 330130.02 – Sewer Line Cleaning
  - 3. Section 330130.03 – Sewer Flow Control
  - 4. Section 330130.17 – Television Inspection
- C. Other documents which should be considered part of and include in these specifications
  - 1. ASTM F-2561 Standard Practice for Rehabilitation of a Sewer Service Lateral and Its Connection to the Main Using a One-Piece Main and Lateral Cured-In-Place Liner.
  - 2. ASTM D-790 Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  - 3. ASTM D-792 Standard Test Methods for Density and Specific Gravity of Plastics by Displacement.
  - 4. ASTM D-2990 Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
  - 5. MD5813 Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe.

#### 1.2 DESCRIPTION OF WORK

- A. This specification covers material requirements, installation practices, and test methods for the reconstruction of a sewer service lateral pipe and the main connection without excavation. The lateral pipe is renovated remotely from the main pipe to a sewer cleanout located within the public right of way, or other location as designated by the Engineer. The pipe renovation shall be accomplished by the inversion and inflation of a resin impregnated, single-piece lateral and main connection liner assembly. The liner assembly is pressed against the lined main pipe by inflation of a bladder and held under pressure until the thermo-set resin has cured. When cured, the liner shall extend over a predetermined length of the service lateral and the full circumference of the main pipe connection forming a continuous, single-piece, tight fitting, corrosion resistant and verifiable non-leaking cured in-place pipe (CIPP) inclusive with gasket seals. The Materials and Installation practices shall adhere to the minimum requirements of ASTM F2561-11 “Standard Practice for Rehabilitation of a Sewer Service Lateral and its Connection to the Main Using a One-Piece Main and Lateral Cured-in Place Liner.”

### 1.3 QUALITY ASSURANCE

- A. In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work.

### 1.4 SUBMITTALS

- A. Submit the latest edition and any revisions thereto of the manufacturer's technical data and installation instructions.
- B. Submit Material Safety Data Sheet(s) for the resins, any other chemical additives, and any other chemicals used in the CIPP system.
- C. Submit certified copies of all test reports on the properties of the proposed resin materials prior to their use. Tests shall be performed by an approved independent testing laboratory or other approved source.
- D. Submit design calculations for the CIPP material thickness for each section of the pipe to be rehabilitated.

### 1.5 QUALIFIED BIDDER

- A. A qualified bidder for installing a mainline/lateral connection and lateral repair system shall use a Manufactured System that has a minimum of a five-year history of satisfactory performance and the Manufactured System shall have performed a minimum of 10,000 successful installations during this time period in the U.S., including 300,000 feet of lateral lining. Bidders shall be prepared to submit a list of installation projects, numbers of connections sealed and lateral footage lined providing contact names, addresses, and telephone numbers for reference.

## PART 2 - PRODUCTS

### 2.1 GENERAL

- A. All equipment and material shall be of a type that has been generally been in use for a period of five (5) years. Work performed with experimental equipment or material will not be permitted without prior written consent of the Owner.
- B. The reconstruction shall be accomplished using a non-woven textile tube of particular length and a thermo-set resin with physical and chemical properties appropriate for the application. The lateral tube located within a translucent inversion bladder is vacuum impregnated with the synthetic resin and is then placed inside of a protective carrying device. The mainline portion of the liner is physically attached to the lateral portion and is

affixed around a rigid “T” launching device. The protective “T” launching device is winched into the existing sewer. When the “T” launching device is properly positioned at the lateral connection, the mainline bladder is inflated by pressurized air that presses the main liner against the host pipe. The lateral portion is then inverted up through the lateral service line by the action of the inversion bladder. Once the resin-saturated liner is cured, the inversion bladder and launching/carrying devices are removed.

## 2.2 MATERIAL

- A. Liner Assembly - The liner assembly shall be continuous in length and consist of one or more layers of absorbent textile material i.e. needle punched felt, circular knit or circular braided tubes that meet the requirements of ASTM F1216 and ASTM D5813 Sections 6 and 8. No intermediate or encapsulated elastomeric layers shall be in the textile that may cause de-lamination in the cured in-place pipe. The textile tube and sheet shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe segments, and flexibility to fit irregular pipe sections. The wet-out textile tube and sheet shall meet ASTM F 1216, 7.2 as applicable, and shall have a uniform thickness and 5% to 10% excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.
- B. Mainline Liner Tube - The main sheet will be flat with one end overlapping the second end and sized accordingly to create a circular lining equal to the inner diameter of the main pipe. The interior of the textile sheet shall be laminated with an impermeable, translucent flexible membrane.
- C. Lateral Liner Tube - The exterior of the lateral liner tube shall be laminated with an impermeable, translucent flexible membrane. Longitudinal seams in the tube shall be stitched and thermally sealed. The lateral tube will be continuous in length and the wall thickness shall be uniform. The lateral tube will be capable of conforming to offset joints, bells, disfigured pipe sections and pipe diameter transitions up to 20% of the connection diameter.
- D. Mainline Connection - The main tube and lateral tube shall be formed as a one-piece assembly by stitching the lateral tube to the main sheet aperture. The connecting end of the lateral tube shall be shaped to match the aperture and curvature of the main tube. The lateral tube and main tube are connected by stitching and sealing the stitching using a flexible UV cured adhesive/sealant. The main and lateral tubes are assembled in the shape of a “T” or WYE with corresponding dimensions. Submittals for the liner assembly must include the manufacturers test protocol and tests data that certifies the connection between the liner tubes is leak-free, when subjected to a controlled vacuum leak test.
- E. Gasket Seals - The mainline connection shall include a seamless molded flange shaped end seal gasket securely attached to the main liner tube. The lateral tube shall include an hydrophilic gasket attached six-inches from the upstream terminating end of the lateral tube.

- F. End Seal Test Data - The hydrophilic gaskets must include test data that reports substantial water-tightness at the terminating ends of a CIPP when subjected to hydrostatic loading that simulates subterranean conditions. Gasket seal submittals must include tests data simulating hydration/ dehydration conditions and the test results must successfully demonstrate and document long-term performance without deterioration, loss of material, flexibility, and expansion of the gasket during repeated cycles of hydration and dehydration.
- G. Bladder Assembly - The liner assembly shall be surrounded by a second impermeable, inflatable, flexible translucent membrane (translucent bladder) that will contain the resin and facilitate vacuum impregnation while monitoring of the resin saturation during the resin impregnation (wet-out) procedure.

### 2.3 RESIN SYSTEM

- A. The resin/liner system shall conform to ASTM D5813 Section 8.2.2 10,000 hour test.
- B. The resin shall be a corrosion resistant polyester, vinyl ester, epoxy or silicate resin and catalyst system that when properly cured within the composite liner assembly, meets the requirements of ASTM F1216, the physical properties herein, and those which are to be utilized in the design of the CIPP, for this project.
- C. The resin shall produce CIPP, which will comply with the structural and chemical resistance requirements of ASTM F1216.

Table 1 - CIPP Initial Structural Properties

| Property          | ASTM Test | Minimum Value |         |
|-------------------|-----------|---------------|---------|
|                   |           | psi           | (MPa)   |
| Flexural Strength | D 790     | 4,500         | (31)    |
| Flexural Modulus  | D 790     | 250,000       | (1,724) |

### 2.4 DESIGN CONSIDERATIONS

- A. The CIPP shall be designed per ASTM F1216, Appendix X1.
- B. The CIPP design for the lateral tube shall assume no bonding to the original pipe.
- C. Roughness Coefficient the liner must be smooth and have an average “n” factor of 0.013 or lower.

## PART 3 - EXECUTION

### 3.1 INSTALLATION RECOMMENDATIONS

- A. Access Safety – Prior to entering access areas such as manholes, an excavation pit, performing inspection or cleaning operations, an evaluation of the atmosphere to determine the presence of toxic or flammable vapors or lack of oxygen shall be undertaken in accordance with local, state, or federal safety regulations.
- B. Cleaning and Inspection – As per 330130.02 and 330130.17.
- C. Accessing the Lateral – The lateral pipe shall be remotely accessed from the main pipe for purposes of cleaning, pre-inspection, liner insertion and post inspection.
- D. Plugging – The upstream side of the cleanout shall be plugged during insertion and curing of the liner assembly ensuring no flows enter the pipe and no air, steam or odors will enter the building. When required, the main pipe flows will be by-passed. The pumping system shall be sized for normal to peak flow conditions. The upstream manhole shall be monitored at all times and an emergency deflating system will be incorporated so that the plugs may be removed at any time without requiring confined space entry.
- E. Inspection of Pipelines – The interior of the pipeline shall be carefully inspected to determine the location of any condition that shall prevent proper installation, such as roots, and collapsed or crushed pipe sections. These conditions shall be noted. Experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television shall perform inspection of pipelines.
- F. Line Obstructions – The existing service lateral shall be clear of obstructions that prevent the proper insertion and expansion of the lining system. Changes in pipe size shall be accommodated, if the lateral tube is sized according to the pipe diameter and condition.

Obstructions may include dropped or offset joints of no more than 20% of inside pipe diameter. Where a partial obstruction is caused by the lateral pipe being cocked at the wye connection and protruding into the wye, the protruding portion of the lateral pipe shall be trimmed to provide a clear passage of at least 80% of the inside pipe diameter.

- G. Resin Impregnation – The liner assembly is encapsulated within the translucent bladder (liner/bladder assembly) shall be saturated with the resin system (wet-out) under controlled vacuum conditions. The volume of resin used shall be sufficient to fill all voids in the textile lining material at nominal thickness and diameter. The volume shall be adjusted by adding 5% to 10% excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints in the original pipe. No dry or unsaturated area in the mainline sheet or lateral tube shall be acceptable upon visual inspection.

- H. Liner Insertion – The lateral tube and inversion bladder will be inserted into the carrying device. The mainline liner and bladder shall be wrapped around a “T” launching device, and held firmly by pacing four (4) hydrophilic O-rings around the main liner. An adhesive sealant 300ml in volume is applied to the main/lateral interface and shall be applied as a two inch (2”) wide band on the main liner. Both the launching and carrying device are pulled into the pipe using a cable winch. The pull is complete when the open port of the “T” launching device is remotely positioned by use of sewer cameras to be aligned with the interface of the service connection and mainline pipe. The lateral tube is completely protected during the pull. The mainline liner is supported on a rigid “T” launcher that is elevated above the pipe invert through the use of a rotating skid system. The liner assembly shall not be contaminated or diluted by exposure to dirt, debris, or water during the pull.
- I. Bladder – The main bladder shall be inflated causing the main sheet to unwrap and expand, embedding the hydrophilic O-rings between the main liner and the main pipe as the main liner is pressed tight against the main pipe. The lateral tube is inverted by the action of the lateral bladder through the center of the main liner as it extends up into the lateral pipe to a distance of three (3) feet. The main/lateral bladder assembly shall extend past all ends of the liner, as no cutting and trimming shall be required.

### 3.2 CIPP PROCESSING

- A. Curing – After the liner has been fully deployed into the lateral pipe, pressure is maintained pressing the liner firmly against the inner pipe wall until the liner is cured at ambient temperatures or by a suitable heat source. The heating equipment shall be capable of delivering a mixture of steam and air throughout the liner bladder assembly to a uniform raise the temperature above the temperature required to cure the resin. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of the soil). The heat source temperatures shall be monitored and logged during the cure and cool down cycles. The manufacturer’s recommended cure schedule shall be submitted.
- B. CIPP Processing – Curing shall be done without pressure interruption with air or a mixture of air and steam for the proper duration of time per the resin manufacturer’s recommendations. The curing process is complete when the temperature of the CIPP reaches 100 degrees Fahrenheit or less, the processing shall be finished.

### 3.3 FINISH

- A. The finished CIPP – CIPP Shall be a homogenous liner assembly located within a lateral service pipe for a specific length, and extending into the main pipe to renew 16-inches of the main pipe (5” on either side of a 6” lateral or 6” on either side of a 4” connection). The CIPP shall smooth with minimal wrinkling and increase flow rate. The CIPP shall be free of dry spots, lifts, and delaminated portions. The CIPP shall include an engineered taper at



each end providing a smooth transition to the host pipe for accommodating video equipment and maintaining proper flow in the mainline. After the work is completed, the installer will provide Owner with video footage documenting the repair and the visual markings identifying the sewer lateral address as completed work. The finished product must provide an airtight/ watertight verifiable non-leaking connection between the main sewer and sewer service lateral.

### 3.4 INSPECTION AND TESTING PRACTICES

- A. Sampling – It is required by the Owner, that Contractor shall prepare a CIPP sample. The sample shall be prepared by securing a flat plate mold using the textile tube material and resin system as used for the rehabilitated pipe.
- B. Pressure – The pressure applied on the plate sample will be equal to the highest pressure exerted on the lateral tube during the inversion process.
- C. Length – The minimum length of the sample must be able to produce at least five specimens for testing in accordance with ASTM D-790-03.
- D. Conditioning – Condition the test specimens at  $73.4 \pm 3.6^\circ$  F ( $23 \pm 2^\circ$ C) and  $50 \pm 5\%$  relative humidity for not less than 40 hour prior to test in accordance with Practice ASTM D 618, for those tests where conditioning is required.
- E. Short-Term Flexural (Bending) Properties – The initial tangent flexural modulus of elasticity and flexural stress shall be measured for gravity and pressure pipe applications in accordance with Test Method D 790 and shall meet the minimum requirements of Table 1.
- F. CIPP Wall Thickness – The minimum wall thickness at any point shall not be less than 87.5% of the specified design thickness as agreed upon between Owner and Contractor.
- G. Gravity Pipe Leakage Testing – It is required by the Owner that Contractor shall test five percent (5%) of the sealed connections. Contractor shall use an air test method where a test plug is placed adjacent to the upstream and downstream ends of the main sheet CIPP and at the upper most end of the lateral tube. This test should take place after the CIPP has cooled down to ambient temperature. The test pressure shall be 4 PSI for a three-minute) minute test time and during this time the pressure shall not drop below 3.5 PSI.

### 3.5 WARRANTY

- A. All CIPP liners shall be certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for ten (10) years from the date of acceptance. The Contractor guarantees the work to be free from defects caused by faulty workmanship and/or materials for a period of ten (10) Years. During the warranty period, any defects which affect the integrity, strength or water tightness of the pipe shall be repaired at the Contractor's expense.

- B. The Contractor shall carry Professional Liability Coverage and provide proof of insurance during the term of the contract.

END OF SECTION 330130.74