SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Scope and Location

B. Owner Supplied Products

C. Contractor Use of Site

D. Existing Services, Structures and Underground Facilities

E. Protection of Work and Improvements

F. Schedules and Work Sequence

G. Owner Occupancy

1.02 PROJECT SCOPE AND LOCATION

A. The project consists of the rehabilitation of existing sanitary sewers and sanitary manholes to remove Inflow and Infiltration (I/I) from the sewer system and to increase the structural integrity of the sewers. The rehabilitation consists of Television Inspection, Sewer Joint Sealing, CIPP Relining, and Manhole Rehabilitation.

B. The project site is located in the Village of Byesville in, Guernsey County, OH.

C. Contractor shall provide all items, articles, materials, operations or methods mentioned or scheduled on the Drawings or herein specified: including all labor, supervision, equipment, incidentals, taxes and permits necessary to complete the Work as described within the Contract Documents. Contractor shall install all items provided by Owner as mentioned or scheduled on the Drawings or herein specified.

1.03 OWNER SUPPLIED PRODUCTS

A. None

1.04 CONTRACTOR USE OF SITE

A. Access to Site: Limited to Contractor.

B. Construction Operations: Easements were not obtained for this project. Contractor shall contain operations to within the rights-of-way, or lands upon which the work is to be performed.

C. Utility Outages and Shutdown: None

1.05 EXISTING SERVICES, STRUCTURES AND UNDERGROUND FACILITIES

A. Interruption of existing sewer service shall be kept to an absolute minimum and shall be limited to times approved by the Owner.

B. If deemed necessary by the Owner, such work shall be accomplished after Owner's normal office/operation hours.

C. Work shall not commence until all labor, materials and equipment are available and Work can continue without interruption or delay.

D. Should unchartered or incorrectly charted piping or other utilities be encountered during installation, notify Owner and consult with utility owner immediately for directions.

E. Cooperate with Owner and utility companies in keeping respective services and facilities in operation and repair any damaged utilities to the satisfaction of the utility owner.

F. Contractor shall not interrupt existing utilities serving facilities occupied and used by the Owner or others, except when permitted in writing by the Owner.

G. Any accidental interruption of services shall be repaired immediately, including provision of temporary facilities until permanent repairs can be made.

H. Existing underground facilities may consist of gas lines, water lines, storm sewers, and buried telephone and electric cables. The utilities shown on the Drawings are based on data furnished by the utility companies listed in the Drawings and on field observations and are believed to be reasonably accurate.

I. Contractor shall notify the Ohio Utilities Protection Service (OUPS), (1-800-362-2764), the Oil and Gas Producer's Underground Protection Service (OGPUPS), (1-800-925-0988), and any other non-OUPS/non-OGPUPS utility a minimum of 48 hours prior to commencing work on the

project to coordinate the marking of utilities in the field. Based on information made available by the various utility companies, the companies shown in the Drawings have facilities in the area.

J. Contractor shall proceed with caution in the excavation and preparation of the Site so the exact location of structures and Underground Facilities can be determined. Contractor shall include in Contract Price any costs for temporary or permanent relocations of such structures and Underground Facilities required to complete the Work unless specifically indicated otherwise in the Specifications.

K. Contractor shall keep an accurate and complete record of all such structures and Underground Facilities encountered and shall provide the Owner a copy of this record. The record shall include a description of the item encountered, opinion as to condition, and adequate measurements and depths so that the item can be located in the future.

L. Contractor shall inspect all structures and Underground Facilities for condition and soundness. Unsound conditions shall be reported to the structure or facility owner immediately after exposing. Contractor shall not proceed with the work until the structure or facility owner has been notified. Owner shall then be given time to inspect and correct, if required, the structure or Underground Facility. Contractor shall make claim under the provisions of Articles 11 and 12 of the General Conditions should the Contractor feel a price or time adjustment is justified.

M. Any additional costs incurred because of the failure of the Contractor to report the condition of any and all existing structure or Underground Facility encountered shall be paid by the Contractor.

N. Whenever the Engineer feels it is necessary to explore and excavate to determine the location of existing structures and Underground Facilities, the Contractor shall make explorations and excavations for such purposes. If Contractor is required to perform additional work in making the explorations and excavations, extra compensation will be allowed as provided for in the General Conditions.

O. Federal regulations prohibit by-passing any sewage (or process waste) during construction operations. The Contractor shall be responsible for providing any required temporary pumping facilities, piping, etc., necessary to complete the project without bypassing treatment operations. Continuous treatment of sewage (process waste) shall be provided at the same level during construction as existed prior to construction.

1.06 PROTECTION OF WORK AND IMPROVEMENTS

A. Contractor shall protect the property of the Owner, existing improvements, and the Work installed by the Contractor and others from abuse, damage, dust, debris, and other objectionable materials resulting from construction activities.

B. Contractor shall provide suitable covers, partitions, or other dust and fume containment devices to suit construction operations.

C. Contractor shall keep property, existing improvements and the Work, including structures, mains, fittings and accessories free from dirt and foreign matter at all times.

D. Contractor shall provide temporary plugging of openings, holes and pipe ends that are existing or that the Contractor has installed.

E. Property, improvements and Work damaged by Contractor shall be repaired or replaced by Contractor to the satisfaction of the Owner.

1.07 SCHEDULES AND WORK SEQUENCE

A. Contractor shall provide schedules for performance of the Work in accordance with the provision set forth within the General Conditions. The schedule(s) shall detail all phases of construction to completion with milestones and associated dates. The schedule(s) shall be presented in a format acceptable to the Owner and Engineer.

1.08 OWNER OCCUPANCY

A. Owner shall have access to site throughout the term of the project.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Measurement and payment criteria applicable to the Work performed under a unit price payment method.

B. Measurement and payment criteria applicable to the Work performed under a lump sum payment method.

C. Defect assessment and non-payment for rejected work.

1.02 AUTHORITY

A. Contractor shall take all measurements and compute quantities. The Owner or Engineer will verify measurements and quantities.

B. Contractor shall assist by providing necessary equipment, labor, and survey equipment as required when requested by Owner or Engineer.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities supplied or placed in the Work and verified by the Owner or Engineer determine payment.

B. If the actual Work requires more or fewer quantities than those quantities indicated, provide the required quantities at the unit sum/prices contracted.

C. If a substantial change in quantity of any line item is anticipated, the Contractor shall notify the Owner or Engineer immediately.

1.04 GENERAL REQUIREMENTS

A. Lump Sum and unit prices shall include providing all costs required for the complete construction of the specified unit of work including cost of materials and delivery; cost of installation; labor, including social security, insurance, and other required fringe benefits; workman's compensation insurance; bond premiums; rental of equipment and machinery; taxes; testing; surveys; incidental expenses; and supervision.

B. The Owner reserves the right to reject the Contractor's measurements of the completed work that involves use of established unit prices, and to have this Work measured by an independent surveyor acceptable to the

Contractor at the Owner's expense.

C. Contract Sum adjustments will be by Change Order on basis of accumulative change for each unit price category.

1. Except as otherwise specified, unit prices shall apply to both deductive and additive variations in quantities.
2. Lump sum and unit prices in the Agreement shall remain in effect until the date of final completion of the entire Work.

D. Partial payment for material and equipment properly stored and protected will be made in accordance with the requirements of the General Conditions.

E. Payment will be made at the respective contract unit and lump sum price for each item shown in the Agreement, installed and accepted, which price and payment shall constitute full compensation for furnishing all materials and performing all Work in connection therewith and incidental thereto.

1. No separate payment will be made for:
   a. Record Drawings,
   b. Construction of haul roads as may be required,
   c. Testing.

1.05 DEFECT ASSESSMENT

A. Replace the Work, or portions of the Work, not conforming to specified requirements.

B. If, in the opinion of the Engineer and Owner, it is not practical to remove and replace the Work, the Engineer and Owner will direct on of the following remedies:

1. The defective Work may remain, but the unit/lump sum price will be adjusted to a new price at the discretion of the Engineer and Owner.
2. The defective Work will be partially repaired to the instructions of the Engineer and Owner, and the price will be adjusted to a new price at the discretion of the Engineer and Owner.
3. The individual specification sections may modify these options or may identify a specific method for modification or corrections.

C. The authority of the Engineer and Owner to assess the defect and identify the payment is final.

1.06 NON-PAYMENT FOR REJECTED PRODUCTS

A. Payment will not be made for any of the following:

1. Products wasted or disposed of in a manner that is not acceptable.
2. Products determined as unacceptable before or after placement.
3. Products not completely unloaded from the transporting vehicle.
4. Products placed beyond the lines and levels of the required Work.
5. Products remaining on hand after completion of the Work.
6. Loading, hauling and disposing of rejected products.

1.07 PROJECT ITEM DESCRIPTION

A. Mobilization and Restoration

1. Description: The work under this Item includes all work associated with preparing for the actual construction work, including but not limited to mobilization and demobilization of equipment and labor, bonds and insurance, submittals, basic surveying, yard preparation, erection of project signs, and similar items. It also includes the cost of removing onsite facilities, restoration and seeding and mulching, if necessary.

2. Payment: Payment will be made on a lump sum basis for the percent of work complete.

B. CCTV Inspection, Post Construction

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals required to complete CCTV inspection of the mainline sewer.

2. Measurement: The unit for this Item will be per foot based on footage that is televised.

3. Payment: Payment will be made at the contract unit price per foot of televised line. Payment will be made upon receipt of video recording and documentation.

C. Preparatory Sewer Cleaning of Mainline Sewer

1. Description: The work under this Item Includes all labor, materials, equipment, and tools required to clean the mainline sewer prior to lining.

2. Measurement: The unit for this item will be per foot based on footage of mainline sewer cleaned.

3. Payment: Payment will be made at the contract unit price per foot of mainline sewer that is cleaned.

D. Cutting of Protruding Taps in Mainline Sewer

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of protruding tap cutting.

2. Measurement: The unit for this Item will be per each based on the actual number of protruding taps cut.

3. Payment: Payment will be made at the contract unit price per each protruding tap cut.

E. Installation of T-Liner service lateral (10' length)

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of installing a T-Line service lateral.

2. Measurement: The unit for this Item will be per each lateral based on the number of laterals that have T-liner inserts installed.

3. Payment: Payment will be made at the contract unit price per lateral T-liner insert installed.

F. Warranty Inspection of Mainline Sewers

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of pipe cleaning, CCTV inspection, retesting and sealing pipe joints and lateral connections during the six-month inspection.

2. Measurement: The unit for this Item will be per foot based on the actual footage of pipe inspected.

3. Payment: Payment will be made at the contract unit price per foot of inspected sewer. No additional compensation will be provided for repairs and post-repair inspections completed during the warranty period.

G. Sewer CIPP Liner, 15"

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of CIPP installation including the sealing of the liner in and out of the manhole interface.

2. Measurement: The unit for this Item will be per foot of liner installed in place measured horizontally from manhole center to manhole center.

3. Payment: Payment will be at the contract unit price for the specified pipe diameter per each foot of liner installed in place.

H. Sewer CIPP Liner, 12"

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of CIPP installation including the sealing of the liner in and out of the manhole interface.

2. Measurement: The unit for this Item will be per foot of liner installed in place measured horizontally from manhole center to manhole center.

3. Payment: Payment will be at the contract unit price for the specified pipe diameter per each foot of liner installed in place.

I. Sewer CIPP Liner, 8"

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of CIPP installation including the sealing of the liner in and out of the manhole interface.

2. Measurement: The unit for this Item will be per foot of liner installed in place measured horizontally from manhole center to manhole center.

3. Payment: Payment will be at the contract unit price for the specified pipe diameter per each foot of liner installed in place.

J. Post Sewer Lining Lateral Reconnection

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of reinstating service connections after the sewer liner has been installed.

2. Measurement: The unit for this Item will be per each reinstated lateral.

3. Payment: Payment will be at the contract unit price per each reinstated lateral.

K. Manhole Liner Installation - Type B

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of installing the type of liner indicated in the drawings as specified including all necessary pretreatment such as the sealing of active leaks, cracks and holes.

2. Measurement: The unit for this Item will be per vertical foot of manhole to be lined defined as the length from top edge of the sewer channel at the bottom of the manhole to bottom of chimney seal at the top of the manhole.

3. Payment: Payment will be made at the contract unit price per vertical

foot of manhole with a complete liner installed in place.

L. Reconstruction of Manhole Invert, Bench, and Trough

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of removing existing unsound portions of the invert, bench, and/or trough and reconstructing them as specified and removal of manhole steps.

2. Measurement: The unit for this Item will be per each manhole where work under this item is performed.

3. Payment: Payment will be at the contract unit price per each manhole with a reconstructed invert, bench, and trough.

M. Seal Bench-Wall Interface

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of sealing the existing bench-wall interface in the manhole as specified.

2. Measurement: The unit for this Item will be per each manhole where work under this item is performed.

3. Payment: Payment will be at the contract unit price per each manhole with a sealed bench-wall interface.

N. Seal Joints & Cracks

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of sealing the all joints and cracks in the manhole as specified.

2. Measurement: The unit for this Item will be per each manhole where work under this item is performed.

3. Payment: Payment will be at the contract unit price per each manhole with a sealed joints and cracks.

O. Seal Pipe Connection

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of sealing influent pipe connection(s) inside Manhole as specified.

2. Measurement: The unit for this Item will be per each Manhole that requires sealing of pipe connections.

3. Payment: Payment will be made at the contract unit price per each

Manhole that is proposed to seal pipe connections.

P. Seal Hole

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of sealing hole(s) inside Manhole as specified.

2. Measurement: The unit for this Item will be per each Manhole that requires sealing of holes.

3. Payment: Payment will be made at the contract unit price per each Manhole that is proposed to seal holes.

Q. Polymer Chimney Seal

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of installing a polymer chimney seal as specified.

2. Measurement: The unit for this Item will be per each chimney seal installed in place.

3. Payment: Payment will be made at the contract unit price per each chimney seal installed in place.

R. Replace Manhole Lid/Casting

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of replacing the manhole lid and casting.

2. Measurement: The unit for this item will be per each replacement lid and casting.

3. Payment: Payment will be made at the contract unit price per each replacement lid and casting installed in place.

S. Secure Manhole Casting

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of securing an existing manhole lid and casting to the existing manhole without adjustment to grade.

2. Measurement: The unit for this item will be per each casting secured.

3. Payment: Payment will be made at the contract unit price per each casting secured in place.

T. Adjusting Manholes to Grade

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of adjusting the manhole to grade including exposing the top of the manhole, adding necessary adjustment materials, and resurfacing. No differentiation will be made between manholes in pavement or not; payment will be the same for both.

2. Measurement: The unit for this Item will be per each manhole adjusted to grade.

3. Payment: Payment will be made at the contract unit price per each manhole adjusted to grade.

U. Install Manhole Insert

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for all aspects of installing a manhole insert.

2. Measurement: The unit for this item will be per each insert.

3. Payment: Payment will be made at the contract unit price per each insert installed in place.

V. Traffic Control

1. Description: The work under this Item includes all labor, materials, equipment, tools, permits, and incidentals for directing traffic around work areas.

2. Payment: Payment will be made on a lump sum basis for all traffic maintenance paid as a percentage of work completed.

W. Sewage Bypass Pumping (Alternate Item 1)

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals for bypassing sewer flows.

2. Payment: Payment will be made on a lump sum basis for all bypass pumping based as a percentage of the work completed.

X. Alternate CCTV Inspection Preconstruction (Alternate Item 2)

1. Description: The work under this Item includes all labor, materials, equipment, tools, and incidentals required to complete CCTV

inspection of the mainline sewer.

2. Measurement: The unit for this Item will be per foot based on footage that is televised.

3. Payment: Payment will be made at the contract unit price per foot of televised line. Payment will be made upon receipt of video recording and documentation.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 PAYMENT APPLICATION

A. Required forms

1. Utilize Application for Payment Form provided in Contract Documents Section of this Project Manual.

B. Preparation of Applications:

1. Present required information in typewritten form.
2. Execute certification by signature of authorized officer.
3. Use data from approved Schedule of Values or Bid Schedule. Provide dollar value in each column for each line item for portion of work performed and for stored Products.
4. List each authorized Change Order.
5. Prepare Application for Final Payment as specified in Section 01700.

C. Submittal Procedures:

1. Submit a minimum of four (4) originally executed copies of each Application for Payment, Schedule of Values, and supporting documentation including, but not limited to invoices, weight slips, and shipping receipts.
2. Submit an updated construction schedule with each Application for Payment.
3. Payment Period: Submit Application for Payment by the first of each month to the Engineer.
4. Submit with transmittal letter as specified for Submittals in Section 01300.
5. Submit two (2) originally executed waivers for partial payment.
6. Submit two (2) certified payroll reports for payroll period.
7. If requesting payment for stored materials, submit four (4) copies of material invoice and shipping request.

8. Submit any other documentation as requested by the Engineer or Owner.

D. Substantiating Data

1. When Owner or Engineer requests substantiating information, submit data justifying dollar amounts in question.
2. Provide one copy of data with cover letter for each copy of submittal. Show application number and date, and line item by number and description.

END OF SECTION

SECTION 01039

COORDINATION, FIELD ENGINEERING AND MEETINGS

PART 1 GENERAL

1.01 SECTION INCLUDES:

A. Coordination – General.

B. Coordination with Owner's Operations.

C. Field engineering.

D. Progress meetings.

E. Pre-installation conferences.

1.02 COORDINATION - GENERAL

A. Contractor shall coordinate scheduling, submittals, and work of the various sections of the work to assure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later. Refer to Section 01010 – Summary of Work for specific construction sequence.

B. Contractor shall verify that utility requirement characteristics of operating equipment are compatible with building utilities and coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

C. Contractor shall coordinate space requirements and installation of mechanical and electrical work which are indicated diagrammatically on drawings and shall follow routing shown for pipes, ducts and conduit as closely as practicable. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance and for repairs.

D. In finished areas, except as otherwise indicated, Contractor shall conceal pipes, ducts and wiring within the construction and coordinate the locations of fixtures and outlets with finish elements.

E. Contractor shall coordinate completion and clean up of work of separate sections in preparation for substantial completion and for portions of work designated for Owner's occupancy.

F. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract

Documents, to minimize disruption of Owner's activities.

G. Coordinate work with other site contractors involved in the Project as indicated by the Plans and Specifications, or as directed by the Owner.

1.03 COORDINATION WITH OWNER'S OPERATIONS

A. The Contractor shall schedule construction activities so as to keep existing Owner's roadways, utilities and facilities in operation at all times unless otherwise approved by the Owner.

B. Temporary roadways if required to divert traffic around this work area shall be furnished, maintained and subsequently removed by the Contractor.

C. All temporary pumping, piping or miscellaneous equipment required shall be furnished, maintained and subsequently removed by the Contractor.

D. All proposed construction sequences, and all process shutdowns and equipment tie-ins shall be scheduled well in advance and shall occur only after being approved by the Owner.

E. Daily service for sanitary sewer shall be maintained to the project area at all times. In the event that the Contractor's operations cause disruption to the sanitary sewer system service to any building, the Contractor shall cease work and remedy the disruption to the Owner's satisfaction prior to resuming work.

1.04 FIELD ENGINEERING

A. Contractor shall locate and protect property stakes, legal survey monuments, and survey control and reference points. Contractor shall pay for replacement of disturbed property stakes and legal survey monuments by a Professional Surveyor registered in the State of Ohio and acceptable to the Owner.

B. Contractor shall provide field engineering services as required to establish elevations, lines, and levels, utilizing recognized engineering survey practices.

C. Contractor shall be responsible for all lines, elevations, and measurements of buildings, structures, piping, utilities, and other work executed by the Contractor under the Contract. Contractor must exercise proper precaution to verify figures before laying out the work, and will be held responsible for any error resulting from their failure to exercise such precaution.

1.05 PROGRESS MEETINGS

A. Progress meetings will be held throughout progress of the Work at intervals agreed to by the Owner, Engineer and Contractor. Interval will generally be monthly.

B. Contractor's project manager, job superintendent, major subcontractor's and suppliers shall attend as appropriate to agenda topics for each meeting. Contractor's representatives shall have authority to bind Contractor to decisions at the meetings.

C. At the meetings the Contractor shall submit typed reports detailing the progress of the Work, compliance with submitted progress schedules and future construction plans affecting the schedule of the Work.

D. The Engineer will prepare and distribute minutes to all attending parties.

1.06 PREINSTALLATION CONFERENCES

A. When required in individual specification Section, convene a pre-installation conference at work site prior to commencing work of the Section.

B. Require attendance of parties directly affecting, or affected by, work of the specific Section.

C. Notify Engineer a minimum of five (5) days in advance of meeting date.

D. Review conditions of installation, preparation and installation procedures, and coordination with related work.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01045

CUTTING AND PATCHING

PART 1 GENERAL

1.01. SECTION INCLUDES

A. Execute all cutting and patching, including excavation, backfill and fitting required to:

1. Remove and replace defective Work or Work not conforming to requirements of the Contract Documents.
2. Remove samples of installed Work as required for testing.
3. Uncover Work to provide for the Engineer's inspection of covered Work or inspection by regulatory agencies having jurisdiction.
4. Tie-in to completed Work that was not accomplished in the proper sequence.
5. Remove or relocate existing utilities and pipes, which obstruct the Work to which connections must be made.
6. Make connections or alterations to existing or new facilities.

B. Restore all existing work to a state equal to that which it was in prior to cutting and restore new Work to the standards of these Specifications.

C. Submittals:

1. Prior to cutting which may affect safety of Project, Owner's operations, or work of another contractor, submit written notice to the Engineer, requesting consent to proceed with cutting, including:

   a. Identification of Project.
   b. Description of affected Work.
   c. Necessity for cutting.
   d. Effect on other Work and on structural integrity and safety of Project.
   e. Description of proposed Work. Designate:
      1) Scope of cutting and patching.
      2) Contractor and trades to execute Work.
      3) Products proposed to be used.
      4) Extent of refinishing.
      5) Schedule of operations including required downtime for any of the Owner's facilities.
   f. Alternatives to cutting and patching, if any.
   g. Designation of party responsible for cost of cutting and patching.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01060

REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 WORK INCLUDED

A. OSHA Requirements

B. Roadway Limits

1.02 OSHA REQUIREMENTS

A. All work, including site safety, equipment, materials, and fabricated items provided under the Contract, shall comply with the provisions of the "Occupational Safety and Health Act" (OSHA), and all other applicable federal, state, county and local laws, ordinances, codes, the requirements set forth herein, and any regulations that may be specified in other parts of these Contract Documents. Where any of these are in conflict, the more stringent requirements shall be followed. Job site safety shall be the sole responsibility of the Contractor.

B. The Contractor's failure to thoroughly familiarize himself with the aforementioned safety provisions shall not relieve him from compliance with the obligations and penalties set forth herein.

1.03 ROADWAY LIMITS

A. Contractor shall comply with posted roadway weigh restrictions including any seasonal weight restrictions established by the governing highway authority.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 SUBMITTAL PROCEDURES

A. Sequentially number the transmittal forms. Include the project name, project number along with the sequential number. Re-submittals to have original number with an alphabetic suffix.

B. Identify Project, Contractor or supplier; pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.

C. Apply Contractor's stamp, signed or initialed certifying that review, verification of Products required, field dimensions, adjacent construction Work, and coordination of information, is in accordance with the requirements of the Work and Contract Documents.

D. Schedule submittals to expedite the Project, and deliver to the Engineer. Coordinate submission of related items.

E. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

F. Provide space for Contractor and Engineer review stamps. Engineer stamp requires at lease a 2 inch by 3 inch space.

G. Revise and resubmit submittals as required, identify all changes made since previous submittal.

H. Review will be made and responded to within 14 calendar days after receipt of same unless additional information is required. In lieu of returning a document, a hold notice may be issued which will stop the review time until a response is received.

I. If a submittal is dependent upon another submittal which has not been received, the first submittal will be held, via a hold notice until the second submittal is favorably acted upon.

J. Action will be taken on a complete submittal as received. The Engineer will not divide a submittal and take separate action on each part.

1.02 SHOP DRAWINGS

A. Submit the number of reproductions which Contractor requires, plus three copies which will be retained by the Engineer.

B. All documents shall be clear and readable. Clearly identify the item being submitted by markings or deletions. Identify all options being supplied. Supplement manufacturers' standard data to provide information unique to this Project.

C. It is the contractor's responsibility to provide other affected contractors with copies of approved shop drawings.

1.03 MANUFACTURER'S INSTRUCTIONS

A. Submit manufacturers' printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing as applicable.

B. Provide at least one copy with the material or equipment being furnished. Submit the number Contractor requires plus 3 additional copies for the Engineer's use and distribution.

C. Identify conflicts between manufacturers' instructions and Contract Documents.

1.04 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers' certificate to Engineer for review.

B. Submit the number Contractor requires plus 3 additional copies for the Engineer's use and distribution

C. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference date, affidavits, and certifications as appropriate.

D. Certificates may be recent or previous test results on material or Product, but must be acceptable to Engineer.

1.05 MATERIAL CERTIFICATION

A. Contractor shall provide, at the time of submittal, documentation that the manufacture or origin of the product proposed for use in the project is in compliance with the terms of the "Buy American" Requirement outlined in Section 1605 of the American Recovery and Reinvestment Act of 2009.

B. This requirement shall apply to all iron, steel and manufactured goods proposed for use within the project.

C. Manufactured goods shall be considered goods brought to the construction site for incorporation into the building or work that has been:

1. Processed into a specific form or shape; or
2. Combined with other raw material to create material that has different properties than the properties of the individual raw materials.

D. Documentation shall be generated by the item manufacturer and shall state the name of the item proposed for use and the location of manufacture of the item. If the item has been assembled from components or subcomponents, only the manufacture location of the item need be stated.

E. Submittals received by the Engineer without the requisite material certification will be rejected by the Engineer and returned to the Contractor without review. The Contractor shall assume responsibility for any delay incurred to the project schedule as a result of his failure to provide the required material certification.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01310

PROGRESS SCHEDULES

PART 1 GENERAL

1.01 RELATED SECTIONS

A. Section 01300 – Submittals.

1.02 FORMAT

A. Prepare schedules as a horizontal bar chart with separate bar for each major portion of Work or operation, identifying first workday of each week.

B. Sequence of Listings: In the same sequence as the Bid Schedule contained within this Project Manual or the schedule of values provide for lump sump work.

C. Scale and Spacing: To provide space for notations and revisions.

D. Sheet Size: Minimum 8-1/2 X 11 inches. Maximum of 22" x 34". All sheets submitted shall be easily reproducible and not requiring to piece together more than 3 sheets.

1.03 CONTENT

A. Show complete sequence of construction by activity, with dates for beginning and completion of each element of construction.

B. Identify work of separate stages, separate floors and other logically grouped activities.

C. Provide sub-schedules to define critical portions of the entire schedule.

D. Show accumulated percentage of completion of each item, and total percentage of Work completed, as of the last day of each month.

E. Provide separate schedule of submittal dates for shop drawings, product data, and samples, including Owner furnished products, if applicable, and Products identified under Allowances, if applicable, and dates reviewed submittals will be required from Engineer. Indicate decision dates for selection of finishes.

F. Indicate delivery dates for Owner furnished products and Products identified under Allowances, if applicable.

G. Coordinate content with bid schedule or schedule of values as appropriate.

1.04 REVISIONS TO SCHEDULES

A. Indicate progress of each activity to date of submittal, and projected completion date of each activity.

B. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.

C. Provide narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect, including the effect of changes on schedules of separate contractors.

1.05 SUBMITTALS

A. Submit Preliminary Progress Schedule in accordance with the requirements outlined in Paragraph 2.05 of the General Conditions.

B. Submit revised Progress Schedules with each Application for Payment.

1.06 DISTRIBUTION

A. Distribute copies of reviewed schedules to Project site file, Subcontractors, suppliers, and other concerned parties.

C. Instruct recipients to promptly report, in writing, problems anticipated by projections indicated in schedules.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Quality assurance and control of installation.

B. References.

C. Tolerances.

D. Manufacturers' field services and reports.

E. Manufacturer's certificates.

F. Testing services.

1.02 QUALITY ASSURANCE/CONTROL OF INSTALLATION

A. Contractor shall monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Contractor shall comply fully with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Engineer before proceeding.

D. Contactor shall comply with specified standards as a minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Work shall be performed by persons qualified to produce workmanship of specified quality.

F. Contractor shall secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion or disfigurement.

1.03 REFERENCES

A. Conform to reference standard by date of issue current on date of

Contract Documents.

B. Obtain copies of standards when required by Contract Documents.

C. Should specified reference standards conflict with Contract Documents, request clarification from Engineer before proceeding.

D. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.04 TOLERANCES

A. Contractor shall monitor tolerance control of installed products to produce acceptable work and shall not permit tolerances to accumulate.

B. Contractor shall comply with manufacturer's tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Engineer before proceeding.

C. Contractor shall adjust products to appropriate dimensions; position before securing products in place.

1.05 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. When specified in individual specification sections or when requested by Engineer, Contractor shall require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions of surfaces and installation, and quality of workmanship.

B. Contractor shall submit qualifications of observer to Engineer 30 days in advance of required observations.

C. Contractor shall report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer' written instructions.

D. Contractor shall submit report in duplicate within 30 days of observation to Engineer for information.

1.06 MANUFACTURERS' CERTIFICATES

A. When required by specified sections, submit three copies of manufacturer's certificates that certify the products meet or exceed specified requirements.

1.07 TESTING SERVICES

A. Contractor shall appoint, employ, and pay for services of an independent firm to perform testing.

B. The Contractor will submit to the Engineer for approval, the name and qualifications of the independent testing firm proposed for use. If not approved, the Contractor will secure thee services of another firm for submittal to the Engineer.

C. The independent firm will perform inspections, tests, and other services specified in individual specification Sections and as required by the Owner or Engineer.

D. Testing and source quality control may occur on or off the project site. Perform off-site testing as required by the Engineer or the Owner.

E. Reports will be submitted by the independent firm to the Engineer and Contractor, indicating observations and results of tests and indicating compliance or non-compliance with Contract Documents.

F. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance by incidental labor as requested.

1. Notify Owner and independent firm a minimum of 24 hours prior to expected time for operations requiring services.
2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.

G. Testing does not relieve Contractor to perform Work to contract requirements.

H. Retesting required because of non-conformance to specified requirements shall be performed by the same independent firm at request of the Owner or Engineer, at no additional cost to the Owner.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 SUMMARY

A. Work Included:

1. Temporary utilities.
2. Barriers.
3. Tree removal.
4. Contractor office and storage shed(s).
5. Engineer's field office.
6. Protection of installed work.
7. Temporary support facilities.
8. Removal of utilities, facilities, and controls.
9. Dust control.
10. Water, erosion and sediment control.
11. Noise control.
12. Traffic control.
13. Site security.
14. Site cleanup.
15. Adherence to environmental conditions.

B. Contractor shall arrange for and provide temporary facilities as specified herein and as required for proper and expeditious prosecution of the Work.

C. Contractor shall pay all costs, except as otherwise specified, until final acceptance of the Work unless Owner makes arrangements for use of completed portions of the Work after substantial completion in accordance with the provisions of the General Conditions.

D. Contractor shall make all temporary connections to utilities and services in locations acceptable to Owner and local authorities having appropriate jurisdiction.

1. Furnish all necessary labor and materials.
2. Make all installations in a manner subject to the acceptance of such authorities and Owner.
3. Maintain such connections.
4. Remove temporary installation and connection when no longer required.
5. Restore services and sources of supply to proper operating conditions.

1.02 TEMPORARY UTILITIES

A. Temporary Electricity

1. Arrange for and provide for all temporary electrical service required for the project. Provide for all temporary drops required by the work.
2. All work shall comply with all local, state and federal requirements. Include lock-out tag-out procedures and devices as necessary.

B. Temporary Lighting

1. Provide lighting as required of the various trades and the work being performed.

C. Temporary Sanitary Facilities

1. Provide and maintain required facilities and enclosures.
2. Provide sufficient number for number of workmen and women employed. Locate near work areas. Perform regular maintenance as needed to control odors.
3. At end of construction, remove facilities or return existing facilities to same or better condition as originally found.

D. Temporary Water

1. Contractor shall supply its own water during construction. Contractor shall also provide its own piping, valves and appurtenances for its requirements. Connection to the existing water system shall be coordinated with the Owner and shall meet all code requirements including disinfection and backflow prevention.

E. Temporary Fire Protection

1. Contractor who maintain or provide an enclosed shed or trailer shall provide and maintain in operating order in each shed or trailer a minimum of one fire extinguisher. More extinguishers shall be provided as necessary. Fire extinguishers shall be minimum dry chemical, nonfreezing type, UL rating 2A-30BC, with 10 pound capacity for Class A, B and C fires.

1.03 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction activities and demolition.

B. Provide barricades required by governing authorities for public rights-of-way.

C. Protect vehicular traffic, stored materials, site, and structures from damage.

1.04 TREE REMOVAL

A. No tree removal will be permitted outside the designated construction work limits without permission of the Owner or Engineer.

B. Trees which are not removed will be protected by ensuring that trees to be removed are felled so as not to injure the remaining trees.

C. Prior to site clearing or tree trimming, the contractor and Owner shall walk the site in an effort to designate the trees to be saved and those to be trimmed back or removed. A barrier will be placed at an appropriate distance from the trunks and root systems of the trees to remain.

D. Soil and other materials will not be stored next to or within the drip-line of trees.

E. The Contractor shall repair all injuries to bark, trunks, limbs, and roots of remaining vegetation by properly dressing, cutting, bracing, and painting using only approved tree surgery methods, tools, and materials.

F. Selective pruning of tree limbs prior to initiation of construction should only be used within the established construction work limits where removal is required for construction activities.

1.05 CONTRACTOR OFFICE AND STORAGE SHED(S)

A. Contractor shall provide facilities to meet Contractor's needs.

B. Provide telephone as required for Contractor's needs. At a minimum, Contractor shall maintain telephone service to the project site to facilitate communication with site supervisory personnel.

C. Maintain a copy of the Contract Documents for the specific use of marking to reflect the construction records. Clearly indicate in red the modifications or alterations to the original documents. Attach supporting documentation as necessary. The Contractor shall continually update these documents.

D. Provide storage areas and sheds of size to meet storage requirements for products of individual sections, allowing for access and orderly provision for maintenance and for observation of products to meet requirements of Section 01600 – Materials and Equipment.

1.06 ENGINEER'S FIELD OFFICE

A. None Required.

1.07 PROTECTION OF INSTALLED WORK

A. Protect installed Work and provide special protection where specified in individual specification sections.

B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.

C. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

D. Prohibit traffic from landscaped areas.

1.08 TEMPORARY SUPPORT FACILITIES

A. Contractor shall provide whatever facilities and services which may be needed to properly support primary construction processes and meet compliance requirements and governing regulations.

B. Contractor shall not use permanent facilities except as otherwise indicated, unless authorized by Owner.

1.09 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, and materials just prior to final completion inspection.

B. Clean and repair damage caused by installation or use of temporary facilities.

C. Restore existing facilities used during construction to specified, or to original or better condition.

1.10 ADHERANCE TO ENVIRONMENTAL CONDITIONS

A. If any archaeological remains or artifacts are encountered, Contractor shall stop work until John Schweikart with the Ohio Historic Preservation Office is notified at 614-298-2049.

B. Project is within the range of the federally endangered Indiana Bat and the federally threatened Northern Long-Eared Bat. Therefore, tree cutting (>3 inches diameter at breast height) shall only occur between the period

between October 1 and March 31. If seasonal tree removal is not possible, then a survey by an approved surveyor must be designed and conducted in coordination with the Endangered Species Coordinator with the U.S. Fish and Wildlife Service. Surveyors must have a valid federal permit, and the survey must be conducted between June 1 and August 15 prior to any tree removal.

C. Contractor shall not dispose of any material in the floodplain or wetlands.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 DUST CONTROL

A. Contractor shall execute the Work by methods to minimize raising dust from construction operations.

B. Contractor shall provide positive means to prevent airborne dust from dispersing into atmosphere.

3.02 WATER, EROSION AND SEDIMENT CONTROL

A. Contractor shall grade site to drain and shall maintain excavations free of water. Provide, operate and maintain pumping equipment.

B. Contractor shall protect site from puddling or running water.

C. Contractor shall provide erosion control measures as necessary to control discharge of sediment laden water to surface waters and wetlands.

D. Except as provided in the Contract Documents, overland discharge of water from dewatering operations shall not be allowed. Depending on water quality, such water shall either be piped directly to the surface water or shall be directed to sedimentation basins or other such structures or features prior to discharge to surface waters so as not to cause damage to existing ground and improvements, erosion, or deposition in the discharge area.

E. Contractor shall use jute or synthetic netting, silt fences, straw bales, dikes, channels and other applicable measures to prevent erosion of soils disturbed by its construction operation.

F. Restoration of the site shall proceed concurrently with the construction operation. See Drawings and Specifications for erosion control measures in

addition to that which may be required above.

3.03 NOISE CONTROL

A. Provide methods, means and facilities to minimize noise produced by construction operations.

3.04 TRAFFIC CONTROL

A. Contractor shall be responsible for providing all signs, barricades, flagmen and other traffic control devices in the construction zone.

B. All traffic control measures shall meet the requirements of the Ohio Manual of Uniform Traffic Control Devices.

C. Do not close or obstruct roadways without approval of the Owner.

D. Maintain two-way traffic on streets at all times unless the Owner and the governing agency authorize one-way traffic for given areas and during specific operations.

E. Conduct construction operations with minimum interference to roadways.

3.05 SITE SECURITY

A. Contractor shall have the sole responsibility of safeguarding the Site perimeter to prevent unauthorized entry to the Site throughout the duration of the Project. Contractor shall at all times provide such permanent and temporary fencing or barricades or other measures as may be necessary to restrict unauthorized entry to its construction area including construction in public right-of-way or easements. Site security measures shall include safeguards against attractive nuisance hazards as a result of construction activity.

B. Contractor shall at all times be responsible for the security of the Work including materials and equipment. Owner will not take any responsibility for missing or damaged equipment, tools, or personal belongings. Contractor shall have the sole responsibility of safeguarding the Work and the Site throughout the duration of the Project.

3.06 SITE CLEANUP

A. Contractor shall cleanup the Site and remove all rubbish on a weekly basis unless a more frequent interval is warranted by the volume or type of rubbish present.

B. Contractor shall cleanup public streets and highways and remove any dirt, mud, or other materials due to project traffic on a daily basis and shall comply with all local and state ordinances and permit regulations.

END OF SECTION

SECTION 01600

MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.01 SUMMARY

A. Work Included: Contractor shall be responsible for the delivery, handling, storage and protection of all material and equipment required to complete the Work as specified herein.

B. Related Sections and Divisions: Specific requirements for the handling and storage of material and equipment are described in other sections of theses Specifications.

1.02 RELATED SECTIONS

A. Bid Documents - Instructions to Bidders: Product options and substitution procedures.

B. Section 01300 - Submittals

1.03 PRODUCTS

A. Products: Means new material, machinery, components, equipment, fixtures, and systems forming the Work. Does not include machinery and equipment used for preparation, fabrication, conveying and erection of the Work. Products may also include existing materials or components required for reuse.

B. Provide interchangeable components of the same manufacturer, for similar components.

C. When any construction deviations from the Drawings and/or Specifications necessary to accommodate equipment supplied by Contractor result in additional costs to the Contractor or other contractors, such additional costs shall be borne by the Contractor. Contractor shall also pay any additional costs necessary for revisions of Drawings and/or Specifications by the Engineer.

D. Each major component of equipment shall bear a nameplate giving the name and address of the manufacturer and the catalog number or designation.

1.04 TRANSPORTATION AND HANDLING

A. Materials, products and equipment shall be properly containerized, packaged, boxed and protected to prevent damage during transportation and handling.

B. Contractor shall not overload any portion of the structure in the transporting or storage of materials.

C. Contractor shall not damage other construction by careless transportation, handling, spillage, staining or impact of materials.

D. Contractor shall provide equipment and personnel to handle products, including those provided by Owner, by methods to prevent soiling and damage.

E. Contractor shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging and surrounding surfaces.

F. Contractor shall handle products by methods to avoid bending or overstressing. Lift large and heavy components only at designated lift points.

1.05 DELIVERY AND RECEIVING

A. Contractor shall arrange deliveries of products in accordance with the Progress Schedule, allowing time for observation prior to installation.

B. Contractor shall coordinate deliveries to avoid conflict with the Work and conditions of the Site; limitations on storage space; and availability of personnel and handling equipment.

C. Contractor shall deliver products in undamaged, dry condition, in original unopened containers or packaging with identifying labels intact and legible.

D. Contactor shall clearly mark partial deliveries of component parts of equipment to identify equipment and contents to permit easy accumulation of parts and to facilitate assembly.

E. Immediately upon delivery, Contractor shall inspect shipment to assure:

1. Product complies with requirements of Contract Documents and reviewed submittals.
2. Quantities are correct.

3. Accessories and installation hardware are correct.
4. Containers and packages are intact and labels legible.
5. Products are protected and undamaged.

1.06 STORAGE AND PROTECTION

A. Contractor shall store products, immediately on delivery, in accordance with manufacturer's instructions, with seals and labels intact and legible.

B. Equipment Manufacturer shall coordinate with Contractor to clarify storage requirements for equipment to be delivered to the site. Coordination shall be completed in advance of the projected delivery date to assure adequate facilities will be available for protection of the equipment.

C. In enclosed storage, Contractor shall:

1. Provide suitable temporary weather tight storage facilities as may be required for materials that will be damaged by storage in the open.
2. Maintain temperature and humidity within ranges stated in the manufacturer's instructions.
3. Provide ventilation for sensitive products as required by manufacturer's instructions.
4. Store unpacked and loose products on shelves, in bins or in neat groups of like items.
5. Store solid materials such as insulation, tile, mechanical and electrical equipment, fittings, and fixtures under shelter, in original packages, away from dampness and other hazards.
6. Store liquid materials away from fire or intense heat and protect from freezing.

D. At exterior storage, Contractor shall:

1. Store unit materials such as concrete block, brick, steel, pipe, conduit, door frames and lumber off ground, out of reach of dirt, water, mud and splashing.
2. Store tools or equipment that carry dirt outside.
3. Store large equipment so as to not damage the Work or present a fire hazard.
4. Cover products subject to discoloration or detention from exposure to the elements, with impervious sheet material and provide ventilation to avoid condensation.
5. Completely cover and protect equipment or material that is prime coated or finish painted with secured plastic or cloth tarps. Store out of reach of dirt, water, mud and splashing.

6. Store loose granular materials on clean, solid surfaces such as pavement, or on rigid sheet materials, to prevent mixing with foreign matter.
7. Provide surface drainage to prevent erosion and ponding of water.
8. Prevent mixing of refuse or chemically injurious materials or liquids.
9. Cover aggregates such as sand and gravel in cold wet weather.
10. Remove all traces of piled bulk materials at completion of work and return site to original or indicated condition.

1.07 MAINTENANCE OF STORAGE

A. Contractor shall periodically inspect stored products on a scheduled basis.

B. Contractor shall verify that storage facilities comply with manufacturer's product storage requirements, and verify that the manufacturer's required environmental conditions are maintained continually.

C. Contractor shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of the Contract Documents.

D. Contractor shall perform scheduled maintenance of equipment in storage as recommended by the manufacturer. A record of the maintenance shall be kept and turned over to the Engineer when the equipment is installed.

1.08 INSTALLATION REQUIREMENTS

A. Manufactured articles, materials, and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as directed by the respective manufacturers, unless otherwise noted.

B. After installation, Contractor shall protect all materials and equipment against weather, dust, moisture, and mechanical damage.

C. Contractor shall be responsible for all damages that occur in connection with the care and protection of materials and equipment until completion and final acceptance of the Work by the Owner. Damaged material and equipment shall be immediately removed from the Site.

1.09 PRODUCT OPTIONS

A. Products Specified by Reference Standards or by Description Only: Any product meeting those standards or description.

B. Products Specified by Naming One or More Manufacturers: Products of manufacturers named and meeting specifications, no options or substitutions allowed.

C. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

1.10 SUBSTITUTIONS AFTER NOTICE TO PROCEED

A. Engineer will consider requests for Substitutions only within 45 days after date of Notice to Proceed.

B. Substitutions may be considered when a product becomes unavailable through no fault of the Contractor.

C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.

D. A request constitutes a representation that the Contractor:

1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
2. Will provide the same warranty for the Substitution as for the specified product.
3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
4. Waives claims for additional costs or time extension which may subsequently become apparent.
5. Will reimburse Owner for review or redesign services associated with re-approval by authorities.
6. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

1.11 SUBSTITUTION SUBMITTAL PROCEDURE

A. Submit in accordance with Section 01300 - Submittals.

B. The Engineer will notify Contractor, in writing, of decision to accept or reject request.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Closeout procedures.

B. Final cleaning.

C. Adjusting.

D. Operation and maintenance data.

E. Warranties.

F. Spare parts and maintenance materials.

1.02 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Owner's inspection.

B. Provide submittals to Owner that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.03 FINAL CLEANING

A. It is the Contractor's responsibility to completely clean up the construction site at the completion of the Work.

1.04 ADJUSTING

A. Contractor shall adjust operating products and equipment to ensure smooth and unhindered operation.

1.05 OPERATION AND MAINTENANCE DATA

A. Provide per Section 01730.

1.06 WARRANTIES

A. Contractor shall provide warranties beyond one-year warranty as required by technical sections and as follows:

1. Provide duplicate notarized copies of equipment warranty.
2. Execute and assemble transferable warranty documents from Subcontractors, suppliers, and manufacturers.

B. Include in the Operation and Maintenance Manual.

C. Submit prior to request for Substantial Completion.

D. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten days after acceptance, listing date of acceptance as start of warranty period.

1.07 SPARE PARTS AND MAINTENANCE MATERIALS

A. Contractor shall provide spare parts and maintenance materials as outlined in the specification sections related to the equipment supplied.

B. Include in the Operation and Maintenance Manual.

C. Submit prior to final Application for Payment.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Format and content of manuals.

B. Schedule of submittals.

1.02 RELATED SECTIONS

A. Section 01300 - Submittals: Submittals procedures; Shop drawings, product data, and samples.

B. Section 01600 - Material and Equipment: Systems demonstration.

C. Section 01700 - Contract Closeout: Contract Closeout Procedures; Project Record Documents.

D. Individual Specifications Sections: Specific requirements for operation and maintenance data.

1.03 QUALITY ASSURANCE

A. Prepare instructions and data by personnel experienced in maintenance and operation of described products.

1.04 FORMAT

A. Prepare data in the form of an instructional manual.

B. Binders: Commercial quality, 8-1/2 x 11 inch three-ring binders with hardback, cleanable, plastic covers. When multiple binders are used, correlate data into related consistent groupings.

C. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; list title of Project; identify subject matter of contents.

D. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.

E. Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

F. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.

G. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.05 CONTENTS, EACH VOLUME

A. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect/Engineer, subconsultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

B. For Each Product or System: List names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.

C. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

D. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

E. Type Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

F. Warranties and Bonds: Bind in copy of each.

1.06 MANUAL FOR MATERIALS AND FINISHES

A. Building Products, Applied Materials, and Finishes: Include product data, with catalog number, size, composition, and color and texture designations. Provide information for re-ordering custom manufactured products.

B. Instructions for Care and Maintenance: Include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

C. Moisture Protection and Weather Exposed Products: Include product data listing applicable reference standards, chemical composition, and details of installation. Provide recommendations for inspections, maintenance, and repair.

D. Additional Requirements: As specified in individual product specification Sections.

1.07 SUBMITTALS

A. Submit one copy of preliminary draft or proposed format and outline of content before start of Work. Engineer will review draft and return copy with comments.

B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.

C. Submit one copy of completed volumes in final form 15 days prior to final inspection. Copy will be returned after final inspection, with Engineer comments. Revise content of documents as required prior to final submittal.

D. After approval of draft by Engineer, Contractor shall submit three copies to Owner.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

Not Applicable.

END OF SECTION

SECTION 02015

CLOSED-CIRCUIT TELEVISION INSPECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. After cleaning, the sewer pipe sections shall be visually inspected by means of closed-circuit television (CCTV). The inspection will be done one piping section at a time and the flow in the section being inspected will be suitably controlled.

B. Upon completion of the work, the rehabilitated sections of sewer shall be visually inspected by means of CCTV. The entire pipe section rehabilitated shall be recorded on CD/DVD and presented to the Owner and Engineer.

1.02 RELATED SECTIONS

A. Section 02751, Testing and Grouting of Sewer Joints and Laterals

B. Section 02762, Sewer Line Cleaning

1.03 SUBMITTALS

A. See Section 01300 for submittal procedures.

B. Contractor shall submit exact procedures to be used along with equipment descriptions. Review all procedures with Owner prior to starting work.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. The television camera used for the inspection shall be one specifically designed and constructed for such inspection.

B. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe.

C. The camera shall be operable in 100% humidity conditions.

D. 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.

PART 3 EXECUTION

3.01 FILMING PROCEDURE

A. The camera shall 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.

B. 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. Tractor type crawler cameras may also be used unless debris or other obstructions prevent it.

C. If during the inspection operation the television camera will not pass through the entire pipe section, the Contractor shall set up his equipment so that the inspection can be performed from the opposite manhole. If the camera again fails to pass through the entire pipe section, the inspection shall be considered complete and no additional inspection will be required.

D. 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 ensure good communications between members of the crew.

3.02 QUALITY CONTROL

A. The importance of accurate distance measurements is emphasized. Measurement for location of defects shall be above ground by means of a meter device.

B. Marking on cable, or the like, which would require interpolation for depth of manhole, will not be allowed.

C. Accuracy of the distance meter shall be checked by use of walking meter, roll-a-tape, or other suitable device, and the accuracy shall be satisfactory to the Owner's Representative.

3.03 DOCUMENTATION OF RESULTS

A. 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 discernable features will be recorded and a copy of such records will be supplied to the Owner.

B. Photographs: Instant developing, digital, or other standard-size photographs of the television picture of problems shall be taken by the Contractor upon request of the Owner's Representative, as long as such photographing does not interfere with the Contractor's operations.

C. Video Recordings: The purpose of recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. It is just as important to have good audio as it is to have good video. The first section of pipe videoed shall be utilized as a test. If either audio or video portion of the tape playback is not satisfactory to the Owner or Owner's Representative, the section shall be re-videoed until satisfactory results are obtained. 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 Contractor. Copies of inspection recordings shall be provided to the Owner at the end of the Project. The Contractor shall have all videos and necessary playback equipment readily accessible for review by the Owner during the project.

D. Record of inspection: At the completion of the project, the Contractor shall provide to the Owner one (1) copy of all internal audiovisual inspections on one (or more) CD's and one (1) copy of all inspection logs and photos compiled during the project.

END OF SECTION

SECTION 02750

SERVICE EXCAVATION AND REPAIR

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Excavation and removal of protruding/hammer tap service connections to main line sanitary sewer.

B. Installation of new vitrified clay service wye with appropriate repair couplings, fittings and accessories as recommended by clay pipe manufacturer.

1.02 RELATED SECTIONS

A. Section 02015, Television Inspection

B. Section 02762, Sewer Line Cleaning

1.03 REFERENCES

A. ASTM C 700: Standard Specification for Vitrified Clay Pipe, Extra Strength, Standard Strength, and Perforated; latest revision.

1.04 SUBMITTALS

A. See Section 01300 for submittal procedures.

B. Product Data: Provide data indicating pipe and pipe accessories.

C. Manufacturer's Installation Instructions: Indicate special procedures required to install products specified.

D. Manufacturer's Certificate: Certify that products meet specified requirements.

E. Project Record Documents:

1. Record location of pipe runs, connections and invert elevations.
2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

1.05 REGULATORY REQUIREMENTS

A. Conform to applicable local codes for installation of the Work of this section.

1.06 PROJECT CONDITIONS

A. Coordinate the Work as outlined in Section 01100, Summary of Work.

PART 2 PRODUCTS

2.01 SEWER PIPE MATERIALS

A. Vitrified Clay Pipe: ASTM C 700; inside nominal diameter to match existing; branch shall be "O" ring joint end, wye branch to match existing.

B. Joint Seals: "O" ring compression system joints installed according to ASTM C 12, latest revision.

C. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tees, bends, elbows, cleanouts, reducers, traps and other configurations required. All fittings shall be in accordance with ASTM C 425, latest revision.

D. Couplings: Connection between new pipe and existing pipe shall be appropriately sized repair couplings as recommended by clay pipe manufacturer.

2.02 BEDDING AND COVER MATERIALS

A. Pipe Bedding Material: As specified on Construction Drawings.

B. Pipe Cover Material: As specified on Construction Drawings.

PART 3 EXECUTION

3.01 TRENCHING

A. Hand trim excavation for accurate placement of pipe to required elevations.

B. Backfill according to Drawing Detail.

3.02 REMOVAL OF EXISTING SERVICE WYE

A. Remove old protruding/hammer taps as indicated on Contract Drawings.

For services in use, replace wyes. Use repair couplings as recommended by clay pipe manufacturer for coupling between new and old pipe. Pipe interior dimension shall be maintained in service line and main line pipe.

B. For services not in use, remove old fittings and do not replace. Instead, replace with a straight section of main line pipe to match diameter of existing.

C. Service line shall be removed to the closest intact piece of pipe. Riser pipe shall be replaced in kind.

3.03 INSTALLATION OF PIPE

A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are such that service line and/or sewer will function normally.

B. Install pipe, fittings and accessories in accordance with manufacturer's instructions. Seal watertight.

C. Lay pipe to existing slope gradients

D. Connections to Existing Sewers

1. Watertight connections shall be repair couplings as recommended by the clay pipe manufacturer.
2. Vitrified clay pipe shall be connected in conformance with the manufacturer's recommendations as approved by the Owner.

3.04 PROTECTION

A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

3.05 ONE-YEAR CORRECTION PERIOD

A. All sewer service excavation and repair work performed shall be assured against faulty workmanship and/or materials for a period of one year after the substantial completion of the work.

B. Prior to the expiration of the one-year period after substantial completion (but more than 6 months after substantial completion), the sewer pipes containing the repaired laterals shall be videoed by the Contractor. The Owner or Owner's Representative shall be present at the time of the video inspection.

C. The Contractor shall video the repaired laterals up to 18 inches beyond the

main line where applicable. The resulting video will be turned over to the Owner immediately. Any leaking servicing connections shall be re-repaired. Payment for the video of the repaired sewer service connections shall be included as part of the Bid Item, "Warranty Inspection of Mainline Sewers." No compensation shall be provided for re-repairing service connections that have failed.

END OF SECTION

SECTION 02751

TESTING AND GROUTING OF SEWER JOINTS AND LATERALS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, materials, tools, equipment and incidentals as shown, specified, and required for testing sewer pipe joints by applying a positive air pressure to the joints, monitoring and recording the pressure in the void. The intent of joint and connection testing is to identify those sewer joints, lateral connections, and laterals that are not watertight and that can be successfully sealed by packer injection grouting. This document can be utilized for the following applications:

1. Test all joints in a mainline segment
2. Test all service lateral connections from the sewer main to a predetermined distance up the sewer lateral.
3. Test all joints within a predetermined distance in laterals directly connected to manholes.

B. Provide all labor, materials, tools, equipment, and incidentals as shown, specified, and required to grout pipeline joints, joints in laterals connected to manholes and lateral connections to the mains using the packer injection method.

1. Packer injection grouting is used to reduce the infiltration within the pipeline, seal annular space between liners and host pipes at lateral connections, seal pipe joints that have failed the joint test criteria, provide external pipe support, but not a structural rehabilitation, by stabilizing soils outside the pipe and prevent further loss of pipe bedding into the pipe.
2. Packer injection grouting shall be accomplished by pressure injection of chemical grout into the soils encompassing the exterior of pipe joint. Chemical grouts shall be designed to be injected into the soil surrounding the pipe, which stabilizes the soil and forms a permanent impermeable seal called a grout/soil ring, and into the annular space between liners and host pipes. Adequate volumes of grout must be injected to form an effective seal. Adequate amounts of grout are based generally upon pipe size and field conditions. This application will be through structurally sound joints and lateral connections through penetrations from within the pipe by using the packer method in tandem with a closed circuit television (CCTV) inspection system.

1.02 RELATED SECTIONS

A. 01300 – Submittals

B. 02015 – Closed Circuit Television Inspection

C. 02762 – Sewer Line Cleaning

1.03 QUALIFICATIONS

A. Work shall be performed by a company specializing in performing work of this section with minimum three years documented experience.

1.04 SUBMITTALS

A. See Section 01300 for submittal procedures

B. Contractor shall submit the description of chemical grout and additives; manufacturer's recommendation for storing, mixing, testing, and handling of chemicals; manufacturer's recommended gel time calculations; and MSDS sheets for all materials.

C. Contractor shall submit exact procedures to be used. Review all procedures with Owner prior to starting work.

D. Identify the manufacturers and models of the equipment to be utilized on the project.

E. Upon completion of each pipe segment, submit to ENGINEER a report showing the following data for each joint and/or lateral connection tested, grouted or attempted to be grouted.

1. Identification of the sewer pipe section tested by assigned sewer ID (if available) and length.
2. Type of pipe material, diameter, and depth of pipe to the surface at manholes.
3. Length of pipe sections between joints.
4. Test pressure used and duration of test.
5. Pass/fail results for each joint/connection tested.
6. Location stationing of each joint/connection tested and location of any joints/connections not tested with an explanation for not testing.
7. Volume of grout material used on each joint or connection.
8. Gel set time used (cup test results from tanks)
9. Grout mix record of the batches mixed including amount of grout and catalyst, additives, temperature of the grout solution in tanks.
10. Operator conducting testing and sealing shall be noted on the reports.
11. Video recordings
    a. Video recording shall include testing and sealing operations for each

joint/lateral (including inflation and deflation over the joint/lateral) displaying the final air test of joints or laterals.

b. Additional final recording, if specified, shall include inspection of the pipe or lateral after all grouting work is complete.

1.05 SAFETY

A. The Contractor shall perform all of the Work in accordance with applicable OSHA safety standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for manhole rehabilitation.

B. The Contractor shall be responsible for providing appropriate protective measures to minimize any hazard to personnel due to potentially toxic materials. Chemicals shall be handled only by qualified personnel familiar with the material.

PART 2 PRODUCTS

2.01 BASIC EQUIPMENT

A. The basic equipment used for mainline pipe joints and for laterals connected to the mainline shall consist of a remotely operated color television camera capable of pan and tilt, joint testing device (referred to hereafter as a packer), lateral testing device, and test monitoring equipment, and necessary chemical sealant containers, pumps, regulators, valves, hoses, etc.

2.02 TESTING AND GROUTING EQUIPMENT

A. The ends of the packer shall be expanded by air pressure against the host pipe to create a void space in which to work. Packers shall be of low void space construction with void volume given by the packer manufacturer.

B. The equipment shall provide means to pressurize the void space with air and to continuously monitor the actual static pressure of air and grout within the void area only.

C. The packer shall be of a size less than the diameter of the host pipe, with the cables at either end used to pull it through the line.

D. Packer may be constructed in such a manner as to allow a restricted amount of sewage to flow at all times. Generally, the equipment shall be capable of performing the specified operations in sewers where flows do not exceed 25 percent of pipe diameter unless permitted by Engineer.

E. The device for testing lateral connections shall consist of inflatable mainline end elements and a lateral grouting plug that creates a void area extending

beyond the main connection. Whenever possible, use a lateral grouting plug sized to match the diameter of the lateral being grouted with an effective sealing length of at least 4 feet.

F. Where the lateral is capped, utilize alternate lateral grouting plug or equipment sized appropriately for the capped lateral.

G. The basic equipment for 4-inch and 6-inch laterals connected to manholes shall consist of a flexible push-type packer and mini-push camera. The device for testing lateral pipe connected to the manhole shall be capable of testing the joints within 4 feet of the lateral.

H. Grouting equipment shall be capable of supplying an uninterrupted flow of sealing materials at a minimum of 3 gpm for 10 minutes to completely fill the voids. Volume of mixed grout pumped must be capable of being measured and recorded for each grouted joint/connection.

I. Provide back-up bladders for each packer on-site at all times during grouting procedure.

J. Equipment for cleaning lateral blockages shall be readily available while any lateral grouting work is being performed.

2.03 MONITORING EQUIPMENT

A. Void pressure data shall be continuously transmitted electrically from the void to the monitoring equipment. Example: via a TV picture of a pressure gauge located at the void, or via an electrical pressure transducer located at the void.

B. All test monitoring shall be above ground and in a location to allow for simultaneous and continuous observation of the television monitor and test monitoring equipment by the Owner's Representative.

2.04 GROUTS

A. Handle, mix, and store grout in accordance with the manufacturer's recommendations. The materials shall be delivered to the site in unopened original manufacturer's containers.

B. All grout materials must have the following characteristics:

1. While being injected, the grout must be able to react /perform in the presence of water (groundwater).
2. The ability to increase grout mix viscosity, density and gel strength by increased concentration of constituents or the use of approved additives.
3. The cured grout must withstand submergence in water without

degradation.

4. The resultant grout formation must be homogeneous and prevent the passage of water (infiltration) through the pipe joint.
5. The grout must not be biodegradable.
6. The cured grout should be chemically stable and resistant to organics found in sewage.
7. Residual grout shall be easily removable from the sewer line to prevent blockage of the sewage flow.

C. Acrylate-based or acrylamide-based grout shall have the following characteristics:

1. A minimum of 10% acrylate or acrylamide base material by weight in the total grout mix.
2. The ability to tolerate some dilution and react in moving water during injection.
3. A viscosity of approximately 1-3 centipoise, which can be increased with approved additives.
4. A controllable reaction time from 10 seconds to 1 hour.
5. A reaction (curing) that produces a homogenous, chemically stable, non-biodegradable, firm, flexible gel.
6. The ability to increase mix viscosity, density, and gel strength by the use of approved additives.
7. Product Manufacturer: DeNeef AC-400, DeNeef Gelacryl SR, Avanti AV-160, Avanti AV-100, Avanti AV-118, or approved equal.

D. Chemical Grout Additives

1. At the Contractor's discretion and according to field conditions, additives may be selected and used within the manufacturers recommended quantities.
2. Strengthening Agents
   a. For joint grouting, a latex or "diatomaceous earth" additive may be added to increase compressive and tensile strength. The quantity of strengthening agent additive shall be as recommended by the manufacturer and approved by the Engineer.
   b. Product Manufacturer: Avanti AV-257 Icoset, DeNeef Reinforcing Agent, or approved equal.
3. Root Inhibitor
   a. When roots are present, for joint and lateral connection joint grouting, a root deterrent chemical shall be added to control root re-growth. The quantity of inhibitor shall be as recommended by the manufacturer and approved by the Engineer.
   b. Product Manufacturer: Avanti AC-50W, or approved equal.
4. Dye – A manufacturer approved water soluble dye without trace metals may be added to the grout tank(s) for visual confirmation.

5. Gel Time Modifier – A gel time extending agent may be used in accordance with the manufacturer's recommendations to extend gel time as necessary.
6. Freeze/Thaw – In those lines where the grouting material may be exposed to a freeze-thaw cycle, ethylene glycol or other Engineer approved additive shall be used to prevent chemical grout cracking once set.
7. When using non-soluble additives the grout tanks must have mechanical mixing devices to keep the additives in suspension and maintain a uniform solution of grout and additive.

PART 3 EXECUTION

3.01 CONTROL TESTS

A. Prior to starting the pipe joint testing phase of the work a two-part control test shall be performed as follows:

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. This test may be required at any other time during the joint testing work if the Owner's Representative 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 reality of the test requirement, as no joint will test in excess of the pipe capability. 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. If these tests cannot be performed successfully, the Contractor shall repair or otherwise modify his equipment and re-perform the test until the results are satisfactory to the Owner's Representative.

B. At the beginning of the contract, prior to application of grout, perform a pump test to determine if proper ratios are being pumped from the grout component tanks at the proper rates and to measure pump rates. Use separate containers to capture the discharges from the interconnect hoses, hose reel and length of grout hose and confirm accuracy of grout pump totalizer. Take corrective action if ratios or rates are not within manufacturer's recommended standards.

C. Perform and record a grout gel test in the presence of the Engineer by

recording the grout tank solution temperature, catalyst tank solution temperature, ambient air temperature in truck, and gel time of the sample whenever the following conditions occur:

1. At the beginning of each day; the material in the hoses shall be recycled to the tanks and a sample shall be taken.
2. When new batches of grout are mixed.
3. Whenever the temperature in the tanks or ambient temperature have changed by more than ±10°F from the previous gel test.

3.02 PIPE PREPARATION

A. Clean sewers prior to grouting and testing per Section 02762 – Sewer Line Cleaning.

B. Remove all roots and loose debris form laterals connected to manholes for the length of lateral to be tested/grouted.

3.03 LATERALS REQUIRING CORRECTION

A. The Contractor will identify the service connections which will require correction and document each service connection in a pass/fail manner. Each failing connection shall be grouted. For service connections that cannot be grouted from the main line sewer, see Part 3.04A below.

B. Service connections protruding more than 5/8" in mainlines 8", 10", 12" and more than 1" in mainlines 15" and over, will interfere with the passage of the packer and shall be cut within the above acceptable limits.

C. Roots and other debris must be removed, as they will interfere with the inversion and the proper sealing of the lateral plug.

3.04 LATERALS THAT CANNOT BE GROUTED FROM THE MAIN

A. The Contractor will identify the service connections which cannot be grouted from the main and submit a list with his recommendations and the cost to grout them from another access. No work shall be performed on such service connections without written approval from the Owner.

B. When there are two connections face to face or without a sufficient distance to seat the packer (6 inches of sound pipe between consecutive holes), they could be grouted from the main only if a push type plug is installed from another access to avoid filling up the second the lateral while grouting the first one.

C. When there is more than one lateral on a connection, only the length of the common trunk will be grouted, unless a push type plug could be installed to avoid filling up the second lateral while grouting the first one.

3.05 TESTING AND GROUTING DEFECTS

A. Testing and grouting will not be required on pipe exhibiting the following conditions or characteristics:

1. Longitudinally cracked, fractured or broken pipe.
2. Sections of the pipe with structural defects between joints.
3. Any sections of pipe or joints that re in such poor structural condition that in the judgment of Engineer or Contractor, significant structural damage of the pipe would occur as a result of the pressure test.

B. Any structurally undamaged joint that structurally fails (breaks) or any structurally failed pipe or joint that is grouted at the Engineers direction that further breaks during testing and grouting that are documented on video to have been done under normal pressure conditions shall be the Owner's responsibility and cost to repair.

C. Grout all circumferential cracks and fractures or other defects as specified or as directed by Engineer. Do not test or grout any other pipe defects unless so specified or shown, or directed by Engineer to do so.

3.06 JOINT TESTING PROCEDURE FOR MAINLINE SEWER AND LATERALS CONNECTED TO MANHOLES

A. Joint testing pressure shall be equal to 0.5 psi per vertical foot of pipe depth plus 2 psi; however, test pressure shall not exceed 10 psi without the approval of the Engineer.

B. Test joints in laterals which are directly connected to manholes to 4 feet. If there is a transition in the laterals connected to manholes test the transition. Direct visual observation and measured cable lengths shall be used to position the lateral packer.

C. Individually test each sewer pipe joint at the above-specified pressure (and retest after sealing) in accordance with the following procedure:

1. The packer shall be positioned within the pipe in such a manner as to straddle the joint to be tested.
2. The packer ends shall be expanded so as to isolate the joint from the remainder of the pipe and create a void area between the packer and the pipe joint. The ends of the testing device shall be expanded against the pipe as per manufacturer's recommendations. If all attempts to isolate the joint fail, pump grout in an attempt to seal the leak around the packer elements. The Contractor shall be paid the unit price for grout to seal the packer unless the Engineer determines that the sewer was inadequately cleaned or the packer is not performing properly, but will not be paid the unit price for joint grouting for this activity.

3. 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 1.0 psi within 15 seconds, the joint will have failed the test and shall be sealed.

D. Upon completing the testing of each individual joint, the packer shall be deflated with the void pressure meter continuing to display void pressure. Should the void pressure meter fail to drop to 0.0 ± 0.5 psi, clean the test equipment of residual grout material or make the necessary equipment repairs to provide for an accurate void pressure reading.

3.07 LATERAL CONNECTION TESTING PROCEDURE

A. Lateral connection joint testing pressure shall be equal to 0.5 psi per vertical foot of pipe depth plus 2 psi; however, test pressure shall not exceed 10 psi without approval of the Engineer.

B. Air testing lateral connections shall be accomplished by isolating the area to be tested with the lateral connection packer and by applying positive pressure into the isolated void area. A pan and tilt camera shall be used to position the lateral packer for laterals directly connected to the mainline sewer. The lateral bladder shall be inverted from the mainline assembly into the lateral pipe and inflated. The mainline elements shall then be inflated to isolate the lateral connection and the portion of the lateral to be tested. A sensing unit shall monitor the pressure of the packer void and will accurately transmit a continuous readout of the void pressure to the control panel at the grouting truck or to a pressure gauge on the packer recorded by the CCTV camera.

C. The test procedure will consist of applying a controlled air pressure into each isolated void area. Air shall then be slowly introduced into the void area until a pressure equal to or greater than the required test pressure, but in no cases greater than 2 psi above the required test pressure, is observed on the pressure monitoring equipment. Once the designated pressure in the isolated void is displayed on the meter of the control panel, the application of air pressure will be stopped and a 15 second waiting period will commence. The void pressure will be observed during this period. If the void pressure drop is greater than 2.0 psi within 15 seconds, the lateral shall be considered to have failed the air test and shall be grouted and retested.

D. After completing the air test for each individual lateral specified herein, deflate the lateral packer, with the void pressure meter continuing to display void pressure. If the void pressure does not drop to 0.0 +/- 0.5 psi, the equipment shall be adjusted to provide a zero void pressure reading at the monitor.

3.08 GROUTING – GENERAL

A. Contractor shall follow the manufacturer's recommendations for the mixing and safety procedures.

B. Adjust gel time as necessary to compensate for changes in temperature in grout component tanks or hoses. The addition of dilution water to extend gel times is not acceptable unless resulting base grout tank only material exceeds 20% by weight for solution grouts.

C. During the grouting process, the Contractor shall monitor the grout component tanks to make sure that proper ratio is being pumped. If improper ratios are noted Contractor shall correct any defective equipment and perform any necessary pump tests to ensure the proper ratio is being pumped prior to resuming grouting.

D. Grout all joint and lateral connections that failed the pressure test by the injection method. This shall be accomplished by forcing grout through a system of pumps and hoses into and through the joints of the sewer from the packer within the sewer pipe.

E. Remove excess grout from pipe and laterals. Excess grout shall be defined as a thickness of grout that given its location, size and geometry, could cause a blockage. Flush or push forward to the next downstream manhole, remove from the sewer system, and properly dispose of excess grout.

3.09 PIPE AND JOINT SEALING FOR MAINLINE SEWERS AND LATERALS CONNECTED TO MANHOLES

A. Position the mainline packer over the joint or defect to be sealed by means of a CCTV camera in the line. Position the push/pull packer over the joint or defect to be sealed by a means of visual observation, marked push rod, or where a cleanout is available, through a CCTV camera in the lateral. For push packers, start work at the most distant point to be grouted. Take an accurate measurement of the location of the defect to be sealed using a portion of the packer as a point of reference for positioning the injection area of packer over the defect.

B. Pneumatically expand the packer sleeves such that they 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.

C. Pump grout materials, in stages if needed, into this isolated area to refusal until and the void or surrounding soil has been filled or solidified with the goal of applying 0.25 to 0.5 gallons of grout per inch-diameter per pipe joint. Refusal is when the packer void pressure during grout pumping instantaneously rises or "spikes" by 4 to 5 psi or more above the normal void pressure experienced during grout pumping operation. Refusal may

also be revealed when pumping void pressure exceeds the holding pressure of the packer end elements as evidenced by "blowby" past the packer sealing end elements. Refusal shall mean, when the joint will not accept any more grout because it has flowed throughout the void, through any joint failure and into the surrounding soil; gelled or filled the available void space; and formed a cohesive seal stopping further grout flow. Record the amount of grout pumped on the sealing log. If sealing is not achieved refer to Part 3.09E.

D. Upon completion of the injection, deflate the packer to break away from the ring of gel formed by the packer void. The packer should then be re-inflated and the joint retested at a pressure equal to the initial test pressure. If the joint fails this air test, repeat the grouting procedure at no additional cost to the OWNER, except for the additional grout used. Repeat this sequence of air testing, grouting and subsequent air testing until either the joint is sealed or it is determined that the grout consumption is too high (see Part 3.09E). The final determination to stop subsequent attempts to seal a joint will be made jointly between the Engineer and the Contractor. Should the void pressure meter not read zero ± 0.5 psi, clean the equipment of residual grout or make the necessary equipment repairs/adjustments to produce accurate void pressure readings.

E. If a mainline or lateral joints require more than 0.5 gallon of grout per inch-diameter per pipe joint, modify grouting procedure to perform stage grouting by pumping additional grout in up to 4 gallon increments, waiting 1 gel set cycle time or 1 full minute, whichever is greater between stages. Maximum number of stages shall not exceed two stages of 4 gallons each unless approved by Engineer.

3.10 LATERAL SEALING FROM THE MAINLINE

A. Lateral connection sealing begins if the lateral connection does not pass the air test, shows evidence of leakage, has been successfully cleaned to remove roots, or where Contractor has been directed. The lateral packer shall remain in position during the pressure test, thus maintaining the isolated void. Pressure-inject grout through the lateral packer into the annular space between the lateral grouting plug and the lateral pipe.

B. When pumping grout, operate the pumps until the mixed grout has flowed through any joint failure, through any annular space, and into the surrounding soil; gelled or filled the available void space; formed a cohesive seal stopping further grout flow; and minimum of 8 psi back pressure is achieved while pumping. As grout pumping continues the void pressure will slowly rise to a range of about 2 to 4 psi, continue pumping until a point where there is a sudden increase in the void pressure. This increase from 2 to 4 psi to over 8 to 10 psi takes place in a matter of a few seconds. If the grout pumped exceeds 1 gallon per foot of lateral bladder plus 3 gallons, it

will be suspected that there are significant voids on the outside of the pipe or that the packer is not properly sealed. Check that the packer is sealed properly. If it is, modify grouting procedure to stage grouting by pumping additional grout equivalent to1 gallon plus 0.25 gallon per foot of lateral bladder, waiting 1 full minute, and retesting. The maximum number of stages shall not exceed two stages unless authorized by Engineer.

C. Upon completion of the lateral connection sealing procedure, deflate the lateral bladder, reinflate and air test the lateral connection a second time to confirm the sealing of the connection in accordance with the air testing procedure. If the lateral connection fails this air test, repeat the grouting procedure at no additional cost to the OWNER, except for the additional grout used. Air tests after grouting laterals containing roots is not required.

D. Confirm lateral flow after sealing of each lateral connection. If a grout blockage exists, the CONTRACTOR shall immediately clear the lateral at no additional cost to the OWNER. Blockages in the lateral that are not the result of grouting operations shall not be the responsibility of the CONTRACTOR.

E. After grouting lateral connections (with the appropriate size lateral bladder), a thin residual grout film may be present inside the lateral wall. The amount of residual grout film present is dependent on the lateral bladder used, geometry of the lateral and positioning of the packer. This thin layer of cured grout is normal and will eventually peel off the sidewall of the pipe. The residual chemical grout film is not "sandwiched" between two structures and will eventually peel off the sidewall of the pipe. This residual chemical grout film is not considered excess grout. Removal of residual grout shall be requested by the ENGINEER and paid for under the unit price for post lateral connection residual grout cleaning.

3.11 JOINT SEALING VERIFICATION

A. Record grouting of joints in conjunction with the testing of joints. Record the void pressure drop continuously on video and in writing immediately before sealing, and immediately after grouting. After the packer is deflated and moved, record on video the visual inspection of the joint.

B. Use of standardized test and seal data sheets and PACP data codes is highly recommended.

3.12 DISPOSAL

A. Collect and properly dispose of cleaning materials used in the cleaning of the grouting equipment.

3.13 POST-CONSTRUCTION INSPECTION

A. After grouting is complete, all pipe sections shall be televised. See Section 02015 – Closed Circuit Television Inspection

3.14 ONE YEAR CORRECTION PERIOD

A. All sewer pipe joint sealing work performed shall be assured against faulty workmanship and/or materials for a period of one year after the completion of the work.

B. Prior to the expiration of the one-year period after substantial completion (but more than 6 months after substantial completion), the sewer pipes containing the repair work shall be videotaped by the Contractor. The Owner or Owner's Representative shall be present at the time of the video inspection.

C. The Contractor shall videotape the sewer lines containing the repair work and the resulting videotape will be turned over to the Owner immediately. Any liner damage resulting from leaking joints shall be re-repaired. Payment for videotaping the repaired sewer lines shall be included as part of the lump sum bid for the Bid Item, "Warranty Inspection of Mainline Sewers" No compensation shall be provided for re-repairing work that has failed.

END OF SECTION

SECTION 02754

MANHOLE REHABILITATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. This section includes cleaning, plugging, sealing, lining, and general repairs of defective manholes.

B. The Contractor shall be responsible for furnishing all labor, supervision, materials, and equipment required to complete all manhole rehabilitation work, testing, and surface restoration in accordance with this Specification.

1.02 RELATED SECTIONS

A. 01300 – Submittal Procedures

B. 02769 – Temporary Bypass Pumping Systems

1.03 SUBMITTALS

A. Comply with Section 01300 – Submittal Procedures

B. Submit information for each material to be used including admixtures.

C. Product Data: Submit manufacturer's product data for all component materials:

1. Recommended purpose or use,
2. Material composition,
3. Physical properties and chemical resistance,
4. Mixing and handling requirements and procedures,
5. Required surface preparation,
6. Application or installation procedure,
7. Manufacturer and models of application equipment,
8. Curing, and
9. Field quality control.

D. Manufacturers Qualification: Submit list of a minimum of 10 manhole rehabilitation projects completed during past 3 years.

E. Applicator Qualifications: Submit qualifications of applicator:

1. Certification stating applicator is factory trained and approved by manufacturer in application of the specified products.
2. List of recently completed manhole rehabilitation, projects, including

project name and location, names of owner and engineer, and description of products used, substrates, and application procedures.

1.04 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.

B. Installer: Company specializing in performing work of this section with minimum three years documented experience and approved by manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Contractor shall deliver materials to job site in undamaged, unopened containers bearing manufacturer's original labels. Keep containers sealed until ready to use.

B. All supplies shall be stored and maintained by the Contractor in accordance with manufacturer's recommendations. Materials shall be kept dry, protected from weather, and stored undercover at temperatures as recommended by the manufacturer. All materials shall be kept in a secured area and away from general public access. The Contractor shall review and maintain all Material Safety Data Sheets (MSDS), product labeling, and technical literature at the project site.

1.06 SAFETY

A. The Contractor shall perform all of the Work in accordance with applicable OSHA safety standards. Emphasis shall be placed upon the requirements for entering confined spaces and with the equipment being utilized for manhole rehabilitation.

B. The Contractor shall be responsible for providing appropriate protective measures to minimize any hazard to personnel due to potentially toxic materials. Chemicals shall be handled only by qualified personnel familiar with the material.

1.07 WARRANTY

A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the component to be free from defects in raw materials for one year after installation or from the date of acceptance by the Owner, whichever is later.

B. The Contractor shall warrant the installation of the rehabilitation component for one year.

C. During the one year warranty period, if the rehabilitation component fails or shows any defect which may materially affect the integrity, strength, function and/or operation of the manhole structure, it shall be immediately repaired at the Contractors expense. The repair shall be as recommended by the manufacturer. All repairs shall have the same estimated life expectancy of the intended rehabilitation.

PART 2 MATERIALS

2.01 GROUTS

A. General Grout Material Requirements

1. Acceptable manufacturers of the various grouts specified herein are Parson Environmental Products, Inc.; Avanti International; De Neef; The Strong Company, Inc.; and approved equals.
2. Each sealing material specified in 2.01B or C has discrete properties and may or may not be interchangeable with another material for a particular application or purpose. Grout material shall be selected for the specific application for which it is used based on manufacturer recommendations.
3. Grouts shall be mixed and applied per manufacturer's specifications.
4. All grouts used shall have documented service of satisfactory performance in similar usage.
5. Grout materials shall be compatible with subsequent manhole treatments (such as liners) if used in the same manhole.

B. Cementitious Grout

1. Patching material shall be quick-setting, fiber reinforced, corrosion-resistant, cementitious material with the following minimum requirements:
   a. Cement – calcium aluminate, corrosion resistant
   b. Compressive Strength ASTM C109 – 1800 psi at 1 hour; 2600 psi at 24 hours
   c. Bond ASTM C882 – 1600 psi at 28 days
   d. Applied Density – 105 lb/ft^3
   e. Shrinkage ASTM C596 – 0% at 90% relative humidity
2. Active leak cementitious grout shall be specifically formulated for leak control. It shall be rapid-setting, high-early-strength, and hand-applied.
   a. Compressive Strength, ASTM C109 – 1000 psi at 1 hour; 2500 psi at 24 hours.
   b. Sulfate Resistance, ASTM C267 – No weight loss after 15 cycles; 2,000 ppm
   c. Freeze/Thaw Resistance, ASTM C666, Method A – 100 cycles.
   d. Pull-Out Strength, ASTM C234 – 14,000 pounds.
   e. Set Time – Less than 1 minute.

C. Chemical Grout

1. Chemical Grouts shall be acrylic, acrylate, or urethane based.
2. Solution shall have ability to tolerate dilution and react in moving water.
3. Material must be capable of withstanding movement caused by thermal cycle changes and settling of the structure
4. Grout shall have controllable reaction times and shrinkage through the use of additives supplied by the same manufacturer.
5. Grout shall be resistant to chemicals; to most organic solvents, mild acids and alkali.
6. The chemical shall be essentially non-toxic in its cured form.
7. Final reaction shall produce a continuous, irreversible, stiff, impermeable, yet flexible gel. Sealing material shall not become rigid or brittle when subjected to a dry environment.
8. Additives may be utilized for catalyzing the reaction, lowering the freezing temperature of the chemical, and minimizing dehydration of the materials. Additives shall be provided by the same manufacturer as the grout and mixed as specified by the grout manufacturer.

2.02 MANHOLE LINER-TYPE B

A. Manufacturer:

1. SPECTRASHIELD, by CCI Spectrum, Inc.
2. Armor 1000F, by OBIC LLC
3. Approved Equal

B. The materials to be utilized in the lining of manholes shall be designed and manufactured to withstand the severe effects of hydrogen sulfide in a wastewater environment. Manufacturer of corrosion protection products shall have long proven experience in the production of the lining products utilized and shall have satisfactory installation record.

C. Equipment for installation of lining materials shall be high quality grade and be as recommended by the manufacturer.

D. The lining system to be utilized for manhole structures shall be a multi-component stress skin panel liner system as described below:

1. Liner

Installation	Liner
Moisture barrier	Modified Polymer
Surfacer	Polyurethane/Polymeric blend foam
Final corrosion barrier	Modified polymer

2. Modified polymer shall be sprayable, solvent free, two-component

polymeric, moisture/chemical barrier specifically developed for the corrosive wastewater environment.

TYPICAL CHEMICAL ANALYSIS

"A" Component

Viscosity, 77° F, cps.	450
Physical State	Liquid
Color	Clear to amber
Hygroscopicity	Reacts with water

"B" Component

Viscosity, 77° F, cps.	500
Physical State	Liquid
Color	Flamingo Pink
Non-Volatile	100%

Reaction Profile (100 grams, 175° F sample)

Gel Time, seconds	10
Tack Free Time, seconds	20
Cure Time, seconds	90

Processing

A System/B System, volume ratio	1.00 / 1.00

Typical Physical Properties

Tensile Strength, PSI	>3600
Elongation, %	>300
Tear Strength, PLI	>500
Shore A Hardness	96
100% Modulus, PSI	>2400

3. Polyurethane Rigid Structure Foam, low viscosity two-component, containing flame retardants.

TYPICAL CHEMICAL ANALYSIS

"A" Component

Viscosity, 77° F, cps.	200
Physical State	Liquid
Color	Dark Brown
Hygroscopicity	Reacts with water and evolves CO2 gas

"B" Component

Viscosity, 77° F, cps.	660
Physical State	Liquid
Color	Transparent Dark
Hygroscopicity	Absorbs water rapidly thus changing ratio

Reaction Profile (100 grams, 77° F sample)

Cream Time, seconds	1-4
Tack Free time, seconds	5-8
Rise Time, seconds	6-10

Processing

A System / B System, volume ratio	1.00 / 1.00

Typical Physical Properties

Density, nominal, core, lbs/ft3 (ASTM D-1622 @ 74° F)	4-10
Compression Strength (ASTM D-1621 @74° F parallel rise; PSI)	90-150
Closed Cell Content, % @ 74° F	Over 95
Shear Strength (PSI - ASTM C-273 @ 74° F)	225-250

4. Total thickness of multi-component stress panel liner shall be a minimum of 500 mils.

2.03 CHIMNEY SEALS

A. Polymer Chimney Seal

1. Polymer manhole chimney seals shall be designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone including all extensions to the chimney area. Extensions shall include but are not limited to lifting rings, brick and/or block material that may have been used to achieve grade.
2. The sealing system shall be Parsonpoxy FP by Parson Environmental, Inc., EasySeal SG by Cretex, or approved equal.
3. Material shall be corrosion resistant.
4. Primer resin shall be as required by the sealant manufacturer.
5. Material Requirements:
   a. Hardness, Shore A ASTM D2240 – 80
   b. Elongation ASTM D412 – 600 percent
   c. Tensile Strength ASTM D412 – 1,600 psi
   d. Adhesive Strength ASTM D4541 – 350 psi

e. Impact Flexibility ASTM D256 – 120 in-lbs
f. Slant Shear Strength ASTM D638 – 2,000 psi

B. Mechanical Chimney Seal

1. Chimney seals shall be designed to provide a watertight, interior, flexible seal between the manhole cover frame and manhole cone section.
2. The seal shall consist of a rubber seal, stainless steel expansion bands for compressing the seal against the manhole surfaces, and preformed extension(s) and band.
3. The frame seal shall be certified capable of repeated vertical movement of not less than 2 inches and repeated horizontal movement of not less than 2 inches after installation and throughout its 25-year design life.
4. Rubber sleeves shall be extruded from a high grade rubber compound meeting the applicable requirements of ASTM C923. Sleeves shall be double or triple pleated with a minimum unexpanded vertical height of 8 inches, a minimum thickness of 2/16 inches, and capable of expanding not less than 2 inches vertically when installed. They shall have integrally formed top and bottom expansion band recesses and multiple sealing fins. Andy splices shall be factory vulcanized and shall be able to withstand a 180 degree bend with no visible separation at splices.
5. Expansion Bands shall be l6 gauge thickness, 1-3/4 inches wide and made of stainless steel meeting the requirements of ASTM A240, Type 304. Bands shall have an expansion mechanism capable of developing the necessary pressure to provide a watertight seal, a minimum adjustment range of not less than 2 inches and a positive locking mechanism. Bands must be removable with minimum effort and reusable.

2.04 FRAMES AND COVERS

A. Castings

1. Use castings for frames, grates, rings and covers conforming to ASTM A48, Class 35B.
2. Use clean castings capable of withstanding application of AASHTO M306-40,000 pound proof loading without detrimental permanent deformation, or in accordance with local requirements.

B. Bearing Surfaces

1. Machine bearing surfaces between covers or grates and their respective frames so that even bearing is provided for position in which casting may be seated in frame.

C. Frames and Covers

1. Provide manhole frames and covers with no holes with lid marked "Sanitary Sewer." No gasket is necessary to seal cover to frame.
2. Provide manhole frames and covers with clear openings that match existing.
3. The edge of the casting that holds the lid must be at least one (1) inch wide so that the total opening diameter is 22" and the outside diameter of the casting is 24".

2.05 MANHOLE INSERTS

A. Manhole inserts shall be manufactured from high density polyethylene and have no corrosive parts. Insert shall include a ventilation valve. Insert shall be manufactured by Parson Environmental, Inc., Cretex Specialty Products, or approved equal. The insert shall rest on a one inch ledge on the manhole casting, minimum and shall have a sturdy, corrosion resistant handle for removal of the insert.

PART 3 EXECUTION

3.01 GENERAL

A. Application of all products must also be in accordance with manufacturer's directions.

B. When freezing temperatures are expected in the area, the Contractor shall take measures to keep applied materials warm and provide the required heat in the manhole before repair work is started and the 24 hour period following application. Do not apply materials to frozen surfaces or if freezing is expected within 24 hours after application. Comply with temperature requirements of material manufacturer for storage and application.

C. The invert shall be covered during all stages of manhole rehabilitation operations to prevent loose materials from collecting in the invert. Remove debris from manhole and incoming sewer connections. Properly dispose of debris and residue from cleaning and other construction operations in a manner satisfactory to Owner. Do not discharge debris downstream through the sanitary sewer system.

D. Bypassing and/or blocking of flow in the manholes shall be done only with prior approval of the Owner and shall comply with SECTION 02769 – TEMPORARY BYPASS PUMPING SYSTEMS.

E. The Owner will supply access to water source for the project to the Contractor at no cost, when a nearby water supply is readily available. Contractor shall provide required backflow prevention and other necessary appurtenances including a water meter to record water use. Contractor to supply water if not readily available.

F. Use approved equipment designed and manufactured by the material supplier specifically for the application of all materials in sanitary sewer manholes.

3.02 EXAMINATION

A. Examine surfaces to receive manhole rehabilitation. Notify the Engineer in writing if surfaces are not acceptable. Do not begin surface preparation, repair, or application until unacceptable conditions have been corrected.

3.03 MANHOLE CLEANING AND PREPARATION

A. The manhole shall be sufficiently cleaned per the manufacturer's requirements of subsequently used rehabilitation products.

B. The floor and interior walls of the manhole shall be thoroughly cleaned and made free of all foreign materials including dirt, grit, roots, grease, sludge and all debris or material that may be attached to the wall or bottom of the manhole.

C. When grease and oil are present within the manhole, and conditions allow, an approved detergent or muriatic acid may be used integrally with the high pressure cleaning water.

D. Water blasting shall be done at a minimum of 3,000 psi operating pressure.

E. All materials resulting from the cleaning of the manhole shall be removed prior to applying specified coatings.

F. All loose or defective brick, grout, ledges, steps and protruding ledges shall be removed to provide an even surface prior to application of specified coating.

G. Cover invert per Part 3.01C.

3.04 JOINT/CRACK REPAIR AND MISCELLANEOUS GROUTING

A. Grouts shall be mixed and applied per manufacturer's specifications.

B. Seal all cracks, joints, and other manhole defects with cementitious patching grout to provide a smooth interior wall.

C. Grouting included as a pretreatment for liner systems (or chimney seals) shall meet the pretreatment requirements specified by the liner manufacturer.
   1. The patching/plugging of manhole defects shall be performed as necessary to provide a smooth surface for application of the liner material.

2. A smooth surface in this case shall be as defined by the liner manufacturer. Small voids less than 1 inch in depth may not require smoothing if liner material can be applied at a greater thickness to compensate. This shall only be done if explicitly stated in liner manufacturer specifications.
3. All active leaks shall be completely sealed prior to the application of any liner system.
4. Allow mortar time to cure before applying liner.

D. Sealing of active leaks

1. Stop active leaks with patching material or infiltration control material. If necessary for stronger active leaks, pressure grout per Part 3.04E.
2. Install weep holes as required to localize infiltration during application of patching material or infiltration control material.
3. Plug weep holes after application with infiltration control material.

E. Pressure Grouting

1. Injection holes shall be drilled through the manhole wall at locations recommended by the manufacturer.
2. Grout shall be injected through the holes under pressure with suitable injection packers and/or wall spears. Injection pressure shall not cause damage to the manhole structure or surrounding surface.
3. For vertical cracks, grout shall be injected in the lowest holes first, working upwards until the manhole is externally sealed with grout. Horizontal cracks and joints shall similarly be sealed from one end to the other.
4. Grout travel shall be verified by observation of grout to defects or adjacent injection holes. Provide additional holes, if necessary, to ensure grout travel.
5. Injection holes shall be cleaned with a drill and patched with a waterproof quick-setting mortar such as Parson Quick Plug, De Neef Dene-Plug, or equivalent.
6. Allow adequate time for materials to cure.
7. For large cracks, apply a patching material to the surface of the crack to restrict the flow of water and grout, keeping it within the crack.
8. The use of water diversion holes may be necessary for large active leaks. Perform work as recommended by manufacturer.

3.05 REPAIRING INVERT, BENCH, AND TROUGH

A. Execution

1. Reconstruct invert channels to provide a smooth flow transition waterway with no disruption of flow at pipe-manhole connections. Conform to the following criteria:

a. Slope of invert bench: 1 inch per foot minimum; 1-1/2 inches per foot maximum
b. Depth of bench to invert:
    i. Pipes smaller than 15 inches: one-half of the largest pipe diameter.
    ii. Pipes 15-24 inches: three-fourths of the largest pipe diameter.
    iii. Pipes larger than 24 inches: equal to the largest pipe diameter.
c. Slope invert to provide a smooth transition from inlet to outlet.

2. For direction changes of mains, construct channels tangent to mains with maximum possible radius of curvature. Provide curves for side inlets and smooth invert fillets for flow transition between pipe inverts.
3. Hand mix and use a rapid setting, high early strength, non-shrink patching material to fill all large voids and repair inverts prior to lining the manhole. For invert repairs, flow must be temporarily restricted by inflatable or mechanical plugs prior to cleaning or a bypass may be installed in accordance with SECTION 02769 – TEMPORARY BYPASS PUMPING SYSTEMS.
4. Clean per Part 3.03
5. Mix water shall be clean potable water and require no additives or admixtures for use with cementitious patching materials.
6. Cementitious material shall be mixed in a mortar tub or 5-gallon pail with water per manufacturer's specifications. Material shall be mixed in small quantities to avoid setting prior to placement in voids or inverts.
7. Once mixed to proper consistency, the materials shall be applied to invert or void areas by hand or trowel. In invert applications, care should be taken to apply excessive material in the channel, which could restrict flow. Once applied, materials shall be smoothed either by hand or trowel in order to facilitate flow.
8. Flows from inverts can be reestablished within 60 minutes of material placement.

3.06 APPLICATION OF LINER SYSTEM

A. Prepare manhole surfaces per Parts 3.03 and 3.04 and cut all existing manhole steps flush with the wall.

B. All materials shall be mixed using manufacturer recommended procedures and equipment.

C. Liner shall be applied to manhole walls, bench, and inverts unless otherwise directed by the Engineer.

D. Liner shall provide a continuous monolithic surfacing with uniform thickness throughout the manhole interior.

E. Type-B Liner

1. Material shall be applied only when manhole is in a saturated surface dry state, with no visible water dripping or running over the manhole walls.
2. The work consists of spray applying and/or centrifugally spin-casting a cementitious based liner to the inside of the existing manhole. All material shall be applied and finished using equipment and procedures specified by the manufacturer.
3. Material shall be mixed on-site in accordance with manufacturer's specifications. Water shall be mixed prior to pumping or spraying.
4. Material shall be applied to a specified uniform minimum thickness as required by the manufacturer or as necessary for proper curing and application.
5. Liner shall be trowelled into a smooth surface.

6. All manholes to be lined are to be lined with a Type B liner

3.07 CHIMNEY SEAL

A. Polymer Chimney Seal

1. Clean and patch the surface, and seal all active leaks. See Parts 3.03 and 3.04.
2. Prepare internal surface by sand blasting casting section to white metal. After sandblasting, check the entire area to remove any loose sand, debris, laitances, dust, dirt, oil, grease or chemical combination. Sand is to be captured and not allowed to enter the manhole.
3. Use of a blower may be required to completely dry the surface as recommended by the manufacturer.
4. Primer resin, if required, shall be applied per manufacturer recommendations.
5. The sealing system shall line the interior of the adjustment area from the top of the cone/corbel onto the inside of the casting. If the manhole has been relined prior to the seal installation, the seal shall, at a minimum, cover from 3 inches below the top of the liner system to 3 inches onto the casting.

B. Mechanical Chimney Seal

1. Chimney seals and extensions shall be installed in accordance with the manufacturer's recommendations, including use of butyl caulk on the lower portion of the seal when installed in brick manholes. The installation of the chimney seal and extension shall include the preparation of the wall surfaces in the chimney area and the adjustment of the frame as required by the manufacturer's specifications and recommendations. Measurements shall be the responsibility of the Contractor.
2. Precast manholes shall be sealed from the bottom 2 inches of the steel

casting to the top 2 inches of the precast manhole cone and include all grade rings.

3. Brick manholes shall be sealed from the bottom 2 inches of the steel casting to the second level of brick courses of the manhole chimney.

3.08 ADJUSTING MANHOLES TO GRADE

A. Carefully remove and clean the existing frame or replace if indicated in the Drawings, adjust the height of supporting walls, and reset the existing frame in a bed of concrete mortar or structure concrete to the new grade.

B. Carefully remove the existing cover or grate and install a casting or an adjusting device approved by the Engineer to the new grade and install per the manufacturer's recommendations.

C. The maximum allowable tolerance for manholes in paved areas is minus ¼-inch for all structure lids and grates below the finished pavement surface. There is no allowable tolerance for structure lids and grates above the finished pavement surface.

D. Backfill area of excavation surrounding each adjusted manhole.

E. Restore surface to pre-exiting condition. Grade ground surface to drain away from each manhole.

3.09 FIELD QUALITY CONTROL

A. Inspection by the Engineer or the waiver of inspection of any portion of the work shall not relieve the Contractor of responsibility to perform the work as specified.

B. Field acceptance of manhole liner shall be based on the Engineer's field inspection and evaluation of the appropriate installation and curing test data.

C. Vacuum Testing

1. All rehabilitated manholes shall be vacuum tested when all repairs have been completed. Manholes shall not be tested until at least 7 days after installation of lining.
2. Vacuum testing shall be performed in accordance with ASTM C1244 with all associated costs paid for by the Contractor and included in the bid price for manhole lining.
3. The Engineer shall be present for all testing. The Contractor shall notify the Engineer 48 hours prior to testing.
4. The Contractor shall submit test reports of the testing with include: the project name, manhole tested, testing data (vacuum pressure, duration of test, etc.) and whether the manhole passed or failed the test. Test

reports must be submitted citing the reason for failure noted on the report.

5. Any manhole failing the test shall be repaired and retested immediately by the Contractor at no additional cost to the Owner.

D. Finished Systems

1. There shall be no groundwater infiltration or other leakage through the rehabilitated portions of the manhole.
2. If leakage is detected, it shall be eliminated with an appropriate grout or sealant and over-coated as recommended by the manufacturer at no additional cost to the Owner.

END OF SECTION

SECTION 02755

CURED-IN-PLACE PIPE LINING

PART 1 GENERAL

1.01 SCOPE

A. These specifications include the minimum requirements for the rehabilitation of sanitary sewer pipelines by the installation of Cured-In-Place Pipe (CIPP) within the existing, deteriorated pipe as shown on the Drawings.

B. The rehabilitation of pipelines shall be done by the installation of a resin-impregnated flexible tube, which, when cured, shall be continuous and tight fitting throughout the entire length of the original pipe and provide structurally sound, joint-less, and water-tight new pipe within a pipe. The Contractor is responsible for proper, accurate and complete installation of the CIPP using the system selected by the Contractor.

C. Neither the CIPP System nor its installation shall cause adverse effects to any of the Owner's processes or facilities. The use of the product shall not result in the formation of production of any detrimental compounds or by-products at the wastewater treatment plant. The Contractor shall notify the Owner and identify any by-products produced as a result of the installation operation, 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 COPP system determined to be defective. The Contractor shall conduct installation operation and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property owners or tenants.

D. 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 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.

1.02 DESCRIPTION

A. The specifications cover all work necessary to furnish and install, the CIPP. The Contractor shall provide all materials, labor, equipment, and services necessary for traffic control, bypass pumping and/or diversion of sewage

flows, cleaning and television inspection of sewers to be lined, liner installation, reconnection of service connections, sealing of reconnected services, all quality controls, samples, material certifications, final television inspection, testing of lined pipe system and warranty work, all as specified herein.

B. The CIPP shall be continuous and jointless from Manhole to Manhole 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 connection the Contractor shall seal these areas to stop all leakage using a material compatible with the CIPP as directed by the Owner at no additional cost to the owner. If leakage occurs through the wall of the pipe the liner shall be repaired or removed as recommended by the CIPP manufacturer. Final approval of the liner installation will be based on a leak tight pipe.

D. The CIPP shall be designed for a life of 50 years or greater.

E. The CIPP shall be designed as a fully structural stand-alone pipe-within-a-pipe. The installed CIPP shall meet or exceed all contract specified physical properties, fitting tightly within the existing pipe all within the tolerances specified. The installed CIPP shall withstand all applicable surcharge loads (soil overburden, live loads, etc.) and external hydrostatic (groundwater) pressure, for each specific installation location.

F. The installed CIPP shall have a long term (50 year) corrosion resistance to the typical chemicals found in domestic sewage.

G. All existing and confirmed active service connections and any other service laterals to be reinstated as directed by the Owner shall be re-opened robotically to their original shape and to a minimum of 95% of their original capacity. All over-cut service connections shall be properly repaired to meet the requirements of these specifications.

H. All materials furnished as part of this contract shall be marked with detailed product information, stored in a manner specified by the manufacturer and tested to the requirement of this contract.

1.03 RELATED SECTIONS

A. Section 01300, Submittals

B. Section 02015, Closed Circuit Television Inspection

C. Section 02750, Service Excavation and Repair

D. Section 02752, Cured-in-Place Service Lateral Connection Insert

E. Section 02754, Manhole Rehabilitation

F. Section 02762, Sewer Line Cleaning

G. Section 02769, Temporary Bypass Pumping Systems

1.04 REFERENCES

A. The following documents form a part of this specification to the extent stated herein and shall be the latest editions thereof. Where differences exist between codes and standards, the requirements of these specifications shall apply.

1. ASTM F1216 – Standard Practice of 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 Pull in and inflate and Curing of a Resin Impregnated Tube.
3. ASTM D543 – Standard 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 Un-reinforced and Reinforced Plastics and Electrical Insulating Materials.
6. ASTM D792 – Standard Test Methods for Density and Specific Gravity of Plastics by displacement.
7. ASTM F2019-03 - 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 D2122-98(2004) Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
9. ASTM D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
10. ASTM D3567-97(2002) – Standard Practice for Determining Dimensions of Fiberglass (Glass Fiber Reinforced Thermosetting Resin) Pipe in a Deflected Condition.
11. ASTM D5813 – Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe.

1.05 PERFORMANCE WORK STATEMENT (PWS) SUBMITTAL

A. The Contractor shall submit, to the Owner, a Performance Work Statement (PWS) at the pre-construction meeting, which clearly defines the CIPP

product delivery in conformance with the requirements of these contract documents. Unless otherwise directed by the Owner, the PWS shall at a minimum contain the following:

1. Clearly indicate that the CIPP will conform to the project requirements as outlined in the Description of Work as delineated in these specifications.
2. Where the scope of work is specifically delineated in the contract documents, a detailed installation plan describing all preparation work, cleaning operations, pre-CCTV inspections, by-pass pumping, traffic control, installation procedure, method of curing, service reconnection, quality control, testing to be performed, final CCTV inspection, warrantees furnished and all else necessary and appropriate for a complete CIPP liner installation. A detailed installation schedule shall be prepared, submitted and conform to the requirements of this contract.
3. Contractor's description of the proposed CIPP lining technology, including a detailed plan for identifying all active service connections maintaining service, during mainline installation, to each home connected to the section of pipe being lined, including temporary service if required by the contract.
4. A description of the CIPP materials to be furnished for the project. Materials shall be fully detailed in the submittals and conform to these specifications.
5. A statement of the Contractors experience. The Contractor shall have a minimum of three (3) years of continuous experience installing CIPP liners in pipe of a similar size, length and configuration as contained in this contract. A minimum of 100,000 linear feet of shop wet-out liner installation is required and a minimum of 4 onsite wet-out installations are required as applicable to this contract. The lead personnel including the superintendent, the foreman and the lead crew personnel for the CCTV inspection, resin wet-out, the CIPP liner installation, liner curing and the robotic service reconnections must have a minimum of three (3) years of total experience with the CIPP technology proposed for this contract and must have demonstrated competency and experience to perform the scope of work contained in this contract. The name and experience of each lead individual performing work on this contract shall be submitted with the PWS.
6. Engineering design calculations, in accordance with the Appendix of ASTM F-1216, for each length of liner to be installed including the thickness of each proposed CIPP. It will be acceptable for the Contractor to submit a design for the most severe line condition and apply the design to all of the line sections. All calculations shall include data that conforms to the requirements of these specifications or has been pre-approved by the Owner.
7. Proposed manufacturers technology data shall be submitted for all CIPP products and all associated technologies to be furnished.

8. Submittals shall include information on the cured-in-place pipe intended for installation and all tools and equipment required for a complete installation. The PWS shall identify which tools and equipment will be redundant on the job site in the event of equipment breakdown. All equipment shall be clearly described. The Contractor shall outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process.
9. A detailed description of the Contractor's proposed procedures for removal of any existing blockages in the pipeline that may be encountered during the cleaning process.
10. A detailed public notification plan shall be prepared and submitted including detailed staged notification to residents affected by the CIPP installation.
11. Compensation for all work required for the submittal of the PWS shall be included in the various pipelining items contained in the proposal.

1.06 PRODUCT SUBMITTALS

A. See Section 01300, Submittal Procedures

B. Manufacturer and description of the CIPP system components including the fabric tube, membrane coating material, and raw resin data.

C. Manufacturer's shipping, storage and handling recommendations for all components of the CIPP system.

D. All MSDS sheets for all materials to be furnished for the project.

E. Tube wet out and curing method including:

1. A complete description of the proposed wet-out procedure for the proposed technology.
2. The manufacturer's recommended cure method – for each diameter and thickness of CIPP liner to be installed. The PWS shall contain a detailed curing procedure detailing the curing medium and the method of application.

F. Contractor shall submit exact procedures to be used along with equipment descriptions. Review all procedures with Owner prior to starting work.

G. Compensation for all work required for the submittal of product data shall be included in the Lump Sum price contained in the Proposal for Mobilization.

1.07 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 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 of 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 submittal of the safety plan shall be included in the various pipelining items contained in the proposal.

1.08 QUALITY CONTROL PLAN (QCP)

A. A detailed quality Control plan (QCP) shall be submitted to the Owner that fully represents and conforms to the requirements of these specifications. At a minimum, the QCP shall include the following:

1. A detailed discussion of the quality controls to be performed by the Contractor.
2. Defined responsibilities, of the Contractor's personnel, for assuring that all quality requirements for this contract are met. These shall be assigned by the Contractor to specified personnel.
3. Proposed procedures for quality control, product sampling and testing shall be defined and submitted as part of the plan.
4. Proposed methods for product performance controls, including method of and frequency of product sampling and testing both in raw material form and cured product form.
5. A scheduled performance and product test result reviews between the Contractor and the Owner at a regularly scheduled job meeting.
6. Inspection forms and guidelines for quality control inspections shall be prepared in accordance with the standards specified in this contract and submitted with the QCP.
7. A system manufacturer furnished checklist containing key elements of the CIPP installation criteria that is important for the Owners inspector to ensure that the quality control and testing requirements are performed in accordance with the contract documents.

B. Compensation for all work required for the submittal of the QCP shall be included in the various pipelining items contained in the Proposal. Compensation for inspector training shall be included in the price bid therefore in the Proposal.

1.09 CIPP REPAIR/REPLACEMENT

A. Occasionally installation of CIPP will result in the need to repair or replace a defective CIPP. The Contractor shall outline specific repair or replacement procedures for potential defects that may occur in the installed CIPP. Repair/replacement procedures shall be as recommended by the CIPP system manufacturer and shall be submitted as part of the PWS.

B. Defects in the installed CIPP that will not affect the operation and long term life of the product shall be identified and defined.

C. Repairable defects that may occur in the installed CIP shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of these contract specifications.

D. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including the recommended procedure for the removal and replacement of the CIPP.

1.10 WARRANTY

A. The materials used for the project shall be certified by the manufacturer for the specified purpose. The manufacturer shall warrant the liner to be free from defects in raw materials for one (1) year from the date of installation and acceptance by the Owner. The Contractor shall warrant the liner 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 included in this specification.

B. After a pipe section has been lined 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 lined system. The specific locations will be selected at random by the Owner and will 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 this specification. If after inspection of a portion of the lined 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 this specification and per the original specifications, all at no additional cost to the Owner.

1.11 PRODUCT, MANUFACTURER/INSTALLER QUALIFICATION REQUIREMENTS

A. Since sewer products are intended to have a 50-year design life, and in order to minimize the Owner's risk, only proven products with substantial successful long-term track records will be approved.

B. Products and Installers seeking approval must meet all of the following criteria to be deemed Commercially Acceptable:

1. For a product to be considered Commercially Proven, a minimum of 500,000 linear feet or 2,000 manhole-to-manhole line sections of successful wastewater collection system installations in the U.S. must be documented to the satisfaction of the Owner to assure commercial viability.
2. For an Installer to be considered as Commercially Proven, the Installer must satisfy all insurance, financial, and bonding requirements of the Owner, and must have had at least 5 (five) years active experience in the commercial installation. In addition, the Installer must have successfully installed at least 50,000 feet of the product bid in wastewater collection systems. Acceptable documentation of these minimum installations must be submitted to the Owner.
3. Sewer rehabilitation products submitted for approval must provide third party test results supporting the structural performance (short-term and long-term) of the product and such data shall be satisfactory to the Owner. Test samples shall be prepared so as to simulate installation methods and trauma of the product. No product will be approved without independent third party testing verification.

C. Documentation for products and installers seeking pre-approved status must be submitted no less than two weeks prior to proposal due date to allow time for adequate consideration. The Owner will advise of acceptance or rejection a minimum of three days prior to the due date. All required submittals must be satisfactory to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS/INSTALLERS

A. Insituform®

B. CIPP Corp®

C. InLiner USA®

D. National Liner®

E. Or Engineer approved equal

2.02 MATERIALS

A. The CIPP system must meet the chemical resistance requirements of these contract documents.

B. All materials shipped to the project site, shall be accompanied by test reports certifying that the material conforms to the ASTM standards listed herein. Materials shall be shipped, stored, and handled in a manner consistent with written recommendations of the CIPP system manufacturer to avoid damage. Damage includes, but is not limited to, gouging, abrasion, flattening, cutting, puncturing, or ultra-violet (UV) degradation. On site storage locations, shall be approved by the Owner. All damaged materials shall be promptly removed from the project site at the Contractor's expense and disposed of in accordance with all current applicable agency regulations.

2.03 FABRIC TUBE

A. The fabric tube shall consist of one or more layers of absorbent non-woven felt fabric, felt/fiberglass or fiberglass and meet the requirements of ASTM F 1216, ASTM F 1743, ASTM D 5813, and ASTM F2019. 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. 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.

D. 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 (wetout) procedure.

E. No material shall be included in the fabric tube that may cause de-lamination in the cured CIPP. No dry or unsaturated layers shall be acceptable upon visual inspection as evident by color contrast between the felt fabric and the activated resin containing a colorant.

F. 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.

G. Seams in the fabric tube, if applicable, shall meet the requirements of ASTM D5813.

H. The outside of the fabric tube shall be marked 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 increments or greater as appropriate, may be fabricated into the fabric tube between installation entrance and exit points. The quantity of resin used in the impregnation shall be sufficient to fill all of the felt voids for the nominal felt thickness.

2.04 RESIN

A. The resin shall be corrosion resistant polyester or vinyl ester resin and catalyst system that when properly cured within the tube composite meets the requirements of ASTM F1216, ASTM F1743 or F2019, the physical properties herein, and those, which are to be utilized in the design of the

CIPP for this project. The resin shall produce CIPP which will comply with or exceed the structural and chemical resistance requirements of this specification.

2.05 STRUCTURAL REQUIREMENTS

A. The physical properties and characteristics of the finished liner will vary considerably, depending on the types and mixing proportions of the materials used, and the degree of cure executed. It shall be the responsibility of the Contractor to control these variables and to provide a CIPP system which meets or exceeds the minimum properties specified herein.

B. The CIPP shall be designed as per ASTM standards. The CIPP design shall assume no bonding to the original pipe wall.

C. The design engineer shall set the long term (50 year extrapolated) Creep Retention Factor at 50% of the initial design flexural modulus as determined by ASTM D-790 test method. This value shall be used unless the Contractor submits long term test data (ASTM D2990) to substantiate a higher retention factor.

D. The cured pipe material (CIPP) shall, at a minimum, meet or exceed the structural properties as listed below:

2.06 MINIMUM PHYSICAL PROPERTIES

Property	Test Method	Cured Composite Per ASTM F1216	Cured Composite Per Design
Flexural Modulus of Elasticity (Short Term)	ASTM D-790	250,000 psi	Contractor Value
Flexural Strength (Short Term)	ASTM D-790	4,500 psi	Contractor Value

A. The required structural CIPP wall thickness shall be based, as a minimum, on the physical properties of the cured composite and in accordance with the Design Equations contained in the appendix of the ASTM standards, and the following design parameters:

Design Safety Factor	2.0 (1.5 for pipes 36" or larger)
Creep Retention Factor	33%
Ovality	2% or as measured by field inspection
Constrained Soil Modulus	Per AASHTO LRFD Section 12 and AWWA Manual M45

Groundwater Depth	varies
Soil Depth (above the crown)	
Live Load	Highway, railroad or airport as applicable
Soil Load (assumed)	120 lb/cu. Ft.
Minimum service life	50 years

B. The contractor shall submit, prior to installation of the lining materials, certification of compliance with these specifications and/or the requirements of the pre-approved CIPP system. Certified material test results shall be included that confirm that all materials conform to these specification and/or the pre-approved system. Materials not complying with these requirements will be rejected.

2.07 LINER END SEALS

A. Form a tight seal between the CIPP liner and the manhole wall where the pipe meets the manhole. Do not leave any annular gaps, voids, or other openings between the CIPP and manhole surface. Provide hydrophilic end seals at each end of the CIP liner to prevent intrusion of water between the liner and the host pipe. End seals shall be Insignia End Seal Sleeve by LMK Technologies or equal.

PART 3 INSTALLATION

3.01 CONSTRUCTION REQUIREMENTS

A. Preparation, cleaning, inspection, sewage by-passing and public notification. The Contractor shall clean the interior of the existing host pipe prior to installation of the CIPP liner. All debris and obstructions, that will effect the installation and the final CIPP product delivery to the Owner, shall be removed and disposed of.

B. The CIPP liner shall be constructed of materials and methods, that when installed, shall provide a joint-less and continuous structurally sound liner able to withstand all imposed static, and dynamic loads on a long-term basis.

C. The Contractor may, under the direction of the Owner, utilize any of the existing manholes in the project area as installation access points. If a street must be closed to traffic because of the location of the sewer, the Contractor shall furnish a detailed traffic control plan and all labor and equipment necessary. The plan shall be in conformance with the requirements of the local agency having jurisdiction over traffic control.

D. Cleaning of Pipe Lines – 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. 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.

E. By-passing Existing Sewage Flows – 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 if alternate bid item for such work is approved by the Owner. 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 or others have installed a sewage by-pass 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 lining process has begun, existing sewage flows shall be maintained, until the resin/felt 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 3 business days 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 by-pass pumping and all associated plans and approvals shall be at the price bid therefore in the Proposal. Any necessary plugging of service connections shall be performed by the contractor in any case.

F. Contractor shall perform post-cleaning video inspections of the pipelines. Only PACP certified personnel trained in locating breaks, obstacles and service connections by closed circuit television shall perform the inspection. 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.

G. Line Obstructions – It shall be the responsibility of the Contractor to clear the line of obstructions that will interfere with the installation and long-term performance of the CIPP. If pre-installation inspection reveals an obstruction, misalignment, broken or collapsed section or sag that was not identified as part of the original scope of work and will prohibit proper

installation of the CIPP, the Contractor may be directed by the Owner to correct the problem(s) prior to lining by utilizing open cut repair methods. The Contractor shall be compensated for this work under a contingency pay item designated for open cut point repairs. Removal of any previously unknown obstructions shall be considered as a changed condition. The cost of removal of obstructions that appeared on pre-bid video documentation and made available to the Contractor, prior to the bid opening, shall be compensated for on a unit price basis in accordance with the contract documents.

H. The Contractor shall be responsible for confirming the locations of all branch service connections prior to installing and curing the CIPP. If required in the contract documents, each connection will be dye tested to determine whether or not the connection is live or abandoned. The cost for dye testing of existing service connections shall be compensated at the unit price bid in the Proposal for Dye Testing of Existing Service Connections. In the event the status of a service connection cannot be adequately defined, the Owner will make the final decision, prior to installation and curing of the liner, as to the status. Typically only service connections deemed "active" shall be reopened by the Contractor.

I. The Contractor shall be allowed to use water from an owner-approved fire hydrant in the project vicinity. Use of an approved double check assembly shall be required. Contractor shall provide his own approved assembly. Owner shall pay for water but Contractor shall meter water use.

3.02 INSTALLATION OF LINER

A. The CIPP Liner shall be installed and cured in the host pipe per the manufacturer's specifications as described and submitted in the PWS.

B. CIPP installation shall be in accordance with the applicable ASTM standards with the following modification:

C. The wet-out tube shall be positioned in the pipeline using the method specified by the manufacturer. Care should be exercised not to damage the tube as a result of installation. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extended to the next designated manhole or termination point.

D. 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 and/or host pipe interface temperature shall be monitored and logged during curing of the liner.

E. Curing shall be accomplished by utilizing the appropriate medium in accordance with the manufacturer's recommended cure schedule. The curing source or in and output temperatures shall be monitored and logged during the cure cycles. The manufacturer's recommended cure schedule shall be used for each line segment installed, and the liner wall thickness and the existing ground conditions with regard to temperature, moisture level, and thermal conductivity of soil, per ASTM as applicable, shall be taken into account by the Contractor.

3.03 COOL DOWN

A. The Contractor shall cool the CIPP in accordance with the approved CIPP manufacturer's recommendations as described and outlined in the PWS.

B. 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.

3.04 FINISH

A. 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 de-lamination. The lining shall be impervious and free of any leakage from the pipe to the surrounding ground or from the ground to inside the lined pipe.

B. Any defect, which will or could affect the structural integrity or strength of the linings, shall be repaired at the Contractor's expense, in accordance with the procedures submitted under Section 1.08 CIPP Repair/Replacement.

C. The beginning and end of the CIPP shall be sealed to the existing host pipe. The sealing material shall be compatible with the pipe end and shall provide a watertight seal.

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

E. If the wall of the CIPP leaks, it shall be repaired or removed and replaced with a watertight pipe as recommended by the manufacture of the CIPP system.

F. Compensation shall be at the actual length of cured-in-place pipe installed. The length shall be measured from center of manhole to center of manhole.

The unit price per linear foot installed shall include all materials, labor, equipment and supplies necessary for the complete CIPP liner installation. Compensation for service connection sealing shall be at the unit price bid therefore in the Proposal.

3.05 MANHOLE CONNECTIONS AND RECONNECTIONS OF EXISTING SERVICES

A. A seal, consisting of a resin mixture or hydrophilic seal compatible with the installed CIPP shall be applied at manhole walls in accordance with the CIPP System manufacturer's recommendations.

B. Existing services shall be internally or externally reconnected unless indicated otherwise in the contract documents. Contractor shall not reinstate existing capped laterals except as indicated otherwise in the Drawings or as instructed by the Owner.

C. 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.

D. 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.

E. A CCTV camera and remote cutting tool shall be used for internal reconnections. The machined opening shall be at least 95 percent of the service connection opening and the bottom of both openings must match. The opening shall not be more than 100 percent of the service connection opening. The edges of the opening shall not have pipe fragments or liner fragments, which may obstruct flow or snag debris.

F. In the event that service reinstatements result in openings that are greater than 100 percent of the service connection opening, the Contractor shall install a CIPP type repair, sufficiently in size to completely cover the over-cut service connection. No additional compensation will be paid for the repair of over-cut service connections.

G. 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.

H. All reconnected existing services shall be grouted per Section 02751, Testing and Grouting of Sewer Joints and Laterals.

I. Compensation shall be at the actual number of services re-connected using either internal or external means as contained in the Proposal. The unit price bid per service line re-connected shall include all materials, labor, equipment and supplies necessary to complete the work as required in these specifications.

3.06 TESTING OF INSTALLED CIPP

A. The physical properties of the installed CIPP shall be verified through field sampling and laboratory testing. All materials for testing shall be furnished by the Contractor to the Owner for testing. All materials testing shall be performed at the Owner's expense, by an independent third party laboratory selected by the Owner as recommended by the CIPP manufacturer. All tests shall be in accordance with applicable ASTM test methods to confirm compliance with the requirements specified in these contract documents.

B. The Contractor shall provide samples for testing to the Owner from the actual installed CIPP liner. Samples shall be provided, at a minimum from one location per 1000 linear feet of CIPP installed. The sample shall be cut from a section of cured CIPP that has been inverted or pulled through a like diameter pipe which has been held in place by a suitable heat sink, such as sandbags. All curing, cutting and identification of samples will be witnessed by the Owner and transmitted by the Owner to the testing laboratory.

On pipelines greater in diameter than is practical to produce restrained samples, the Owner may at its discretion; require plate samples cured with the CIPP or designate a location in the newly installed CIPP where the Contractor shall take a sample. The Opening produced from the sample shall be repaired in accordance with manufacturers recommended procedures.

C. The laboratory results shall identify the test sample location as referenced to the nearest manhole and station. Final payment for the project shall be withheld pending receipt and approval of the test results. If properties tested do not meet minimum requirements, the CIPP shall be repaired or replaced by the Contractor, at no additional cost to the Owner.

D. Chemical resistance – The CIPP system installed shall meet the chemical resistance requirements of ASTM standards. CIPP samples tested shall be of fabric tube and the specific resin proposed for actual construction. It is required that CIPP samples without plastic coating meet these chemical testing requirements.

E. Hydraulic Capacity – Overall, the hydraulic capacity shall be maintained as large as possible. The installed CIPP shall at a minimum be equal to the full flow capacity of the original pipe before rehabilitation. In those cases

where full capacity cannot be achieved after liner installation, the Contractor shall submit a request to waive this requirement, together with the reasons for the waiver request. Calculated capacities may be derived using a commonly accepted roughness coefficient for the existing pipe material taking into consideration its age and condition.

F. The installed CIPP thickness shall be measured for each line section installed. If the CIPP thickness does not meet that specified in the contract and submitted as the approved design by the Contractor then the liner shall be repaired or removed. The liner thickness shall have an allowable tolerance of minus 5% to plus 10%. In man-entry size piping the contractor shall remove a minimum of one sample or one sample every line section of installed CIPP, not meeting the specified design thickness, to be used to check the liner thickness. The samples shall be taken by core drilling 2-inch diameter test plugs at random locations selected by the Owner. As an alternative the Contractor may use industry proven, non-destructive methods for confirming the thickness of the installed CIPP.

G. All costs, to the Contractor, associated with providing cured CIPP samples for testing shall be included in the Lump Sum price bid for Mobilization. Payment for all testing by a laboratory will be paid for, by the Owner, directly to the laboratory under the lump sum reserve for testing item force bid in the Bid Proposal.

3.07 FINAL ACCEPTANCE

A. All CIPP sample testing and repairs to the installed CIPP as applicable shall be completed, before final acceptance, meeting the requirements of these specifications and documented in written form.

B. The Contractor shall perform a detailed closed-circuit television inspection in accordance with ASTM standards, in the presence of the Owner after installation of the CIPP liner and reconnection of the side sewers. A radial view (pan and tilt) TV camera shall be used. The camera shall be panned 360 degrees around the circumference of the pipe and along the wall of the finished pipe at 10-foot intervals. The finished liner shall be continuous over the entire length of the installation and shall be free of significant visual defects, damage, deflection, holes, leaks and other defects. Unedited digital documentation shall be submitted within Ten (10) working days of the liner installation. The data shall note the inspection date, location of all reconnected side sewers, debris, as well as any other defects in the liner, including, but not limited to, gouges, cracks, bumps, or bulges. If post installation inspection documentation is not submitted within Ten (10) working days of the liner installation, the Owner may at its discretion suspend any further installation of CIPP until the post-installation documentation is submitted. As a result of this suspension, no additional

working days will be added to the contract, nor will any adjustment be made for increase in cost. Immediately prior to conducting the close circuit television inspection, the Contractor shall thoroughly clean the newly installed liner removing all debris and build-up that may have accumulated.

C. Bypass pumping or plugging from the upstream manhole shall be utilized to minimize sewage from entering the line during the inspection. In the case of bellies in the line, the pipe shall be cleared from any standing water to provide continuous visibility during the inspection.

D. Where leakage is observed through the wall of the pipe, the Contractor shall institute additional testing including but not limited to air testing, localized testing and any other testing that will verify the leak-proof integrity of the installed CIPP to the satisfaction of the Owner.

END OF SECTION

SECTION 02762

SEWER LINE CLEANING

PART 1 GENERAL

1.01 SCOPE 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 seating of internal pipe joint sealing packers. 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. Should such conditions be encountered, the Contractor will not be required to clean those specific manhole sections. If in the course of normal cleaning operations, damage does result from preexisting and unforeseen conditions such as broken pipe, the Contractor will not be held responsible.

B. 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.

1.02 SUBMITTALS

A. See Section 01300 for submittal procedures.

B. Contractor shall submit exact procedures to be used along with equipment descriptions. Review all procedures with Owner prior to starting work.

PART 2 PRODUCTS

2.01 HYDRAULICALLY PROPELLED EQUIPMENT

A. 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.

B. If sewer cleaning balls or other equipment that cannot be collapsed is used, special precautions to prevent flooding of the sewers and public or private property shall be taken.

2.02 HIGH-VELOCITY JET (HYDROCLEANING) EQUIPMENT

A. All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation.

B. 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.

C. 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.

D. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose real.

2.03 MECHANICALLY POWERED EQUIPMENT

A. Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner.

B. 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.

C. 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

3.01 CLEANING PRECAUTIONS

A. During sewer cleaning operations, satisfactory precautions shall be taken in the use of cleaning equipment.

B. 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 insure that the water pressure created does not damage or cause flooding of public or private property being served by the sewer.

C. 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.

D. No fire hydrant shall be obstructed in case of a fire in the area served by the hydrant.

3.02 SEWER CLEANING

A. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment.

B. 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 Owner's Representative.

C. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the sewer lines and manholes.

D. 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 exists and the cleaning effort shall be abandoned.

3.03 ROOT REMOVAL

A. Roots shall be removed in the designated sections where root intrusion is a problem. Special attention should be used during the cleaning operation to assure almost complete removal of roots from the joints. Any roots which could prevent the seating of the packer or could prevent the proper application of chemical sealants shall be removed.

B. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners. If time constraints are not an issue, chemical root treatment may be used at the option of the Contractor.

3.04 CHEMICAL ROOT TREATMENT

A. If time constraints are not an issue, the Contractor may, at his option, use an approved herbicide to aid in the removal of roots. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation.

B. Any damaged vegetation so designated by the Engineer shall be replaced by the Contractor at no additional cost to the Owner.

C. All safety precautions as recommended by the manufacturer shall be adhered to concerning handling and application of the herbicide.

3.05 HANDLING AND DISPOSAL OF REMOVED MATERIAL

A. Contractor shall handle and dispose of removed material in a manner approved by the Owner and according to Ohio EPA regulations.

B. Consult with Owner to determine preferred method of disposal of removed materials (e.g.: flush down remaining sewer, take to wastewater treatment plant, etc.)

END OF SECTION

SECTION 02769

TEMPORARY BYPASS PUMPING SYSTEMS

PART 1 GENERAL

1.01 SCOPE

A. Under this item the Contractor is required to furnish all materials, labor, equipment, power, maintenance, etc., to implement a temporary pumping system for the purpose of diverting the existing flow around the work area for the duration of the project if sufficient flows are present to warrant bypass pumping system.

B. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies having jurisdiction.

1.02 REQUIREMENTS FOR SUBMITTING BIDS

A. The Contractor shall prepare a specific, detailed description of the proposed pumping system and submit it to the Engineer after the award of the Contract.

B. The Contractor shall submit to the Engineer detailed plans and descriptions outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing wastewater flow. This plan must be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials and all other incidental items necessary and/or required to insure proper protection of the facilities, including flows, and compliance with the requirements and permit conditions specified in these Contract Documents. No construction shall begin until all provisions and requirements have been reviewed by the Engineer.

C. The plan shall include but not be limited to details of the following:

1. Staging areas for pumps;
2. Sewer plugging method and types of plugs;
3. Number, size, material, location and method of installation of suction piping;
4. Number, size, material, method of installation and location of installation of discharge piping;
5. Bypass pump sizes, capacity, number of each size to be on site and power requirements;
6. Calculations of static lift, friction losses, and flow velocity (pump curves

showing pump operating range shall be submitted);
7. Standby power generator size, location;
8. Downstream discharge plan;
9. Method of protecting discharge manholes or structures from erosion and damage;
10. Thrust and restraint block sizes and locations;
11. Sections showing suction and discharge pipe depth, embedment, select fill and special backfill;
12. Method of noise control for each pump and/or generator;
13. Any temporary pipe supports and anchoring required;
14. Design plans and computation for access to bypass pumping locations indicated on the drawings;
15. Calculations for selection of bypass pumping pipe size;
16. Schedule for installation of and maintenance of bypass pumping lines;
17. Plan indicating selection location of bypass pumping line locations.

1.03 PREPARATION

A. Precautions

1. Contractor is responsible for locating any existing utilities in the area the Contractor selects to locate the bypass pipelines. The Contractor shall locate his bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from the Owner and the Engineer. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor.
2. During all bypass pumping operation, the Contractor shall protect the Pumping Station and main and all local sewer lines from damage inflicted by any equipment. The Contractor shall be responsible for all physical damage to the Pumping Station and main and all local sewer lines caused by human or mechanical failure.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. All pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system. The pumps may be electric or diesel powered. All pumps used must be constructed to allow dry running for long periods of time to accommodate the cyclical nature of effluent flows.

B. The Contractor shall provide the necessary stop/start controls for each pump.

C. The Contractor shall include one stand-by pump of each size to be

maintained on site Back-up pumps shall be on-line, isolated from the primary system by a valve.

D. Discharge Piping – Discharge piping system shall be submitted for review and approval by the Owner. Any spillage shall be the responsibility of the Contractor to clean up.

PART 3 EXECUTION

3.01 SYSTEM DESCRIPTION

A. Design Requirements

1. Bypass pumping systems shall have sufficient capacity to pump the peak flow upstream of the pipe being bypassed. Consult with Owner regarding the peak flows of the sanitary system. The Contractor shall provide all pipeline plugs, pumps of adequate size to handle peak flow, and temporary discharge piping to ensure that the total flow of the main can be safely diverted around the section to be repaired. Bypass pumping system will be required to be operated 24 hours per day.
2. The Contractor shall have adequate standby equipment available and ready for immediate operation and use in the event of an emergency or breakdown. One standby pump for each size pump utilized shall be installed at the mainline flow bypassing locations, ready for use in the event of primary pump failure.
3. Bypass pumping system shall be capable of bypassing the flow around the work area and of releasing any amount of flow up to full available flow into the work area as necessary for satisfactory performances of work.
4. The Contractor shall make all arrangements for bypass pumping during the time when the main is shut down for any reason. System must overcome any existing force main pressure on discharge.

B. Performance Requirements

1. Uninterrupted flow of sewage throughout the duration of the project is essential to the operation of the existing sewerage system. To this end, the Contractor shall provide, maintain and operate all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary power, and all other labor and equipment necessary to intercept the sewage flow before it reaches the point where it would interfere with his work, carry it past his work and return it to the existing sewer downstream of his work.
2. The design, installation and operation of the temporary pumping system shall be the Contractor's responsibility. The bypass system shall meet the requirements of all codes and regulatory agencies

having jurisdiction.

3. The Contractor shall provide all necessary means to safely convey the sewage past the work area. The Contractor will not be permitted to stop or impede the main flows under any circumstances.
4. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding.
5. The Contractor shall protect water resources, wetlands and other natural resources.

3.02 FIELD QUALITY CONTROL AND MAINTENANCE

A. Test

1. The Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The Engineer will be given 24 hours notice prior to testing.

B. Inspection

1. Contractor shall inspect bypass pumping system every two hours to ensure that the system is working correctly.

C. Maintenance Service

1. The contractor shall insure that the temporary pumping system is properly maintained and a responsible operator shall be on hand at all times when pumps are operating.

D. Extra Materials

1. Spare parts for pumps and piping shall be kept on site as required.
2. Adequate hoisting equipment for each pump and accessories shall be maintained on the site.

3.03 INSTALLATION AND REMOVAL

A. The Contractor shall remove manhole sections or make connections to the existing sewer and construct temporary bypass pumping structures as may be required to provide adequate suction conduit.

B. Plugging or blocking of sewage flows shall incorporate a primary and secondary plugging device. When plugging or blocking is no longer needed for performance and acceptance of work, it is to be removed in a manner that permits the sewage flow to slowly return to normal without

surge, to prevent surcharging or causing other major disturbances downstream.

C. When working inside manhole or force main, the Contractor shall exercise caution and comply with OSHA requirements when working in the presence of sewer gases, combustible or oxygen-deficient atmospheres, and confined spaces.

D. The installation of the bypass pipelines is prohibited in all saltmarsh/wetland areas. The pipeline must be located off streets and sidewalks and on shoulders of the roads. When the bypass pipeline crosses local streets and private driveways, the contractor must place the bypass pipelines in trenches and cover with temporary pavement. Upon completion of the bypass pumping operations, and after the receipt of written permission from the Engineer, the Contractor shall remove all the piping, restore all property to preconstruction condition and restore all pavement. The Contractor is responsible for obtaining any approvals for placement of the temporary pipeline within public ways from the Owner.

END OF SECTION

SECTION 02770

ONE-PIECE MAIN-TO-LATERAL CURED-IN-PLACE LINER ASSEMBLY

PART 1 GENERAL

1.01 SCOPE 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 pipe renovation shall be accomplished by the inversion and inflation of a resin impregnated, single-piece cured-in-place (CIPP) lateral and main connection liner outfitted with engineered, molded hydrophilic gasket seals that are designed specifically for sealing the CIPP/lateral connection interface and lateral termination. When cured, the liner extends over a predetermined length of the service lateral and the full circumference of the main pipe at the lateral connection. The materials and installation practices shall, at a minimum, adhere to the 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"

B. The insert shall extend from the mainline into the lateral connection in a continuous tight fitting, watertight pipe within-a-pipe to eliminate any visible ground water leakage and future root growth at the lateral to mainline connection.

C. If, within the warranty period, the Service Lateral Connection (SLC) product installed in the sewer system is not acceptable due to leakage or any other defects, although originally accepted, the Contractor shall repair or replace the affected portion at no cost to the customer. It is understood that if the Contractor fails to do such work as required, the Contractor shall be responsible for said costs of repair or replacement.

1.02 REFERENCES

A. 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.

B. ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.

C. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

D. ASTM D792 - Standard Test Methods for Density and Specific Gravity of Plastics by displacement.

E. ASTM D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.

F. ASTM D5813 - Standard Specification for Cured-in Place Thermosetting Resin Sewer Pipe.

PART 2 PRODUCTS

2.01 GENERAL

A. The reconstruction shall be accomplished using a resin absorbent textile tube of particular length and a thermo-set resin with physical and chemical properties appropriate for the application. The launching device and launching hose is winched through the mainline and positioned at the appropriate service lateral connection. The mainline bladder is inflated seating the hydrophilic molded gaskets and pressing the connection liner against the main pipe at the connection while the lateral tube inverts up into the lateral pipe by the action of the inversion bladder. The resin-saturated liner is cured with the molded gaskets embedded in-place between the host pipe and the new liner, and the inversion bladder and launching device are removed from the pipe.

2.02 APPROVED PRODUCTS

T-Liner® Main-to-Lateral Lining System
By LMK Technologies, LLC
1779 Chessie Lane
Ottawa, IL 61350
815-640-9302
www.lmktechnologies.com

Innerseal™
By Perma-Liner Industries, LLC
13000 Automobile Boulevard, Suite 300
Clearwater, FL 33762
1-866-336-2568

2.03 INSTALLER AND PRODUCT REQUIREMENTS

A. All sewer products must provide a 50 year design life, stamped by a licensed Professional Engineer (P.E.) in order to minimize the owner's long term risk of failure. Only skilled contractors utilizing products that are manufactured in a controlled factory environment with substantial successful long term track records and/or manufacturer's certification of training completion will be considered.

B. Product installers must document the following minimum criteria to be deemed commercially acceptable:

Product	Unit	Minimum Requirement for Installer*
Main/Lateral Connections	EA	200
Lateral Liner	LF	250
Lateral Transitions	EA	10

*Installers who have less than the minimum required installation experience can qualify by employing a Manufacturer's Technical Trainer who meets the requirements.

C. For installers to be considered commercially proven, the above referenced minimum number of units of successful wastewater collection system installations must be documented to the satisfaction of the owner to assure commercial viability of the proposed liner system.

D. All sewer rehabilitation products submitted for approval must provide third party test results supporting the long term performance and structural strength of the product and such data shall be satisfactory to the owner. Test results are to include the main, laterals, and main/lateral connection materials and hydrophilic molded gasket seals. Test samples shall be prepared so as to simulate installation methods and trauma of the product. No product will be approved without testing verification for all components proposed.

E. The Installer (the licensed company or subcontractor bidding) must meet the minimum requirements above or be pre-approved by the owner. This is a company requirement; personal history is valuable, however will not be considered in evaluating the company's ability to meet the minimum requirements of this specification. The Contractor must have installed the same product (in the same constructed configuration) proposed for a minimum of one year. Installers who have less than one year installation experience can qualify by having a manufacturer's representative present during installation.

2.04 MATERIAL

A. Liner Assembly - The liner assembly shall be continuous in length and consist of one or more layers of absorbent needle punched felt, circular knit or circular braid 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 delamination in the CIPP. 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 resin saturated textile tube and sheet shall meet ASTM F1216, 7.2 as applicable, and the tube shall have 5% to 10% excess resin distribution (full resin contact with the host pipe) that when compressed and cured will meet or exceed the design thickness.

B. Mainline Liner Tube - The main liner tube shall be formed from a flat sheet of resin absorbent material suitable for CIPP. The forming of the tube is accomplished by one end of the textile sheet overlapping the second end and sized accordingly to create a circular lining equal to the inner diameter of the lined main pipe. The interior of the textile sheet shall be laminated with an impermeable, translucent flexible membrane. The textile sheet before insertion shall be permanently marked on the membrane as a "Lateral Identification" correlating to the address of the building the lateral pipe provides service.

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. The lateral tube will be capable of conforming to offset joints, bends, bells and disfigured pipe sections. For pipe configurations that contain pipe diameter transitions, the transition liner tube must be formed by the manufacturer prior to installation to ensure proper wall thickness per ASTM F1216.

D. Mainline Connection - The main tube and lateral tube shall form a one-piece assembly by stitching the lateral tube to the mainsheet 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 shall be sealed by use of a flexible UV cured adhesive/sealant applied in a factory controlled setting. The main/lateral tube assembly shall take the shape of a "TEE" or "WYE" with corresponding dimensions such as a curved circle or a curved elliptical opening in the pipefitting.

E. Hydrophilic Gasket Seals - The mainline tube shall include a seamless molded flange shaped (aka Hydrohat) gasket attached to the main liner tube at the connection or four molded hydrophilic O-rings at the mainline termination ends. The gasket(s) must be a minimum of 2.5mm thick and must retain this consistent thickness under installation pressures. The lateral tube shall include two compression molded O-ring gaskets attached six-inches from the terminating end of the lateral tube. The hydrophilic gasket seals must be manufactured in a controlled factory environment with strict quality control and quality assurance protocols. A liquid sealant, adhesives or other fluid like materials having paste like consistency will not be accepted.

F. Mainline End Seal Test Data - The hydrophilic gasket seals shall include test

data that supports substantial expansion properties so to form a watertight compression end seal at the terminating ends of the CIP-lateral liner. The test protocol shall simulate subterranean conditions and hydraulic loading at surface. Gasket seal submittals must include tests data simulating hydration/dehydration conditions for a period of 10,000-hours 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, invertible, flexible translucent membrane bladder that will form a liner/bladder assembly. The translucent bladder shall facilitate vacuum impregnation while monitoring the resin saturation process.

2.05 RESIN SYSTEM

A. The resin/liner system shall conform to ASTM D5813 Section 8.2.2.

B. The resin shall be a corrosion resistant polyester, vinyl ester or epoxy 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 a CIPP, which will comply with the structural and chemical resistance requirements of ASTM F1216.

D. CIPP Initial Structural Properties per Table 1:

TABLE 1

PROPERTY	STANDARD	MINIMUM VALUE
Flexural Strength	ASTM D790	4,500 psi (31 MPa)
Flexural Modulus	ASTM D790	250,000 psi (1,724 MPa)

2.06 DESIGN CONSIDERATIONS

A. The CIPP shall be designed per ASTM F1216, Appendix X1

B. The CIPP design for the lateral tube and main sheet shall assume no bonding to the original pipe.

C. The resin saturated lateral tube and the main sheet must place the resin in full contact with the host pipe. The cured liner must provide coating on the interior of the lateral piping for an improved flow rate.

D. The liner must be smooth and have an average roughness coefficient "n" factor of 0.013 or lower.

PART 3 EXECUTION

3.01 PREPARATION

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 NASSCO Standards.

C. Accessing the Lateral Pipe - A cleanout is strongly recommended and is required to be located on the exterior of the building. The cleanout fitting shall be TEE shaped so to allow upstream and downstream access to the lateral pipe. The cleanout shall be located within two (2) feet of where the finished liner is to terminate.

D. Plugging – When steaming out of the cleanout, the upstream side of the cleanout shall be plugged during insertion and curing of the liner assembly to ensure no flow enters the pipe and no air, steam, or odors will enter the building. When required, the main pipe flow will be by-passed. The pumping system shall be sized for 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, severe offsets, and collapsed or crushed pipe sections. Experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television shall perform inspection of pipelines.

F. Line Obstructions - The existing lateral pipe 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.

3.02 INSERT INSTALLATION

A. Resin Impregnation -The liner assembly is encapsulated within the translucent bladder (liner/bladder assembly), the entire liner including the flat sheet 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.

B. Liner Insertion -The lateral tube and inversion bladder shall be inserted into the launching hose. The main bladder and flat textile sheet (main liner tube) shall be wrapped around a "T-Launcher" launching device, formed into a tube and secured by use of rubber bands. A seamless molded flange shaped gasket shall be attached to the main liner tube by use of stainless steel snaps. Alternatively, when the flange shaped gasket is not used, the four hydrophilic O-rings may be used to secure the main bladder and flat textile sheet to the launching device. The flanged gasket shall be inserted into the lateral pipe at the main/lateral juncture so that the brim of the flanged gasket is firmly seated against the mainline pipe liner. Two hydrophilic O-rings shall be positioned 6-inches from the terminating end of the lateral liner tube one to two inches apart. The launching device is inserted into the pipe and pulled to the point of repair. The pull is complete when the lateral tube is exactly aligned with the lateral pipe connection. The lateral tube is completely protected during the pull. The mainline liner is supported on a rigid T-Launcher device 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 or debris during the pull.

C. Bladder -The main bladder shall be inflated causing the main sheet to unwrap and expand; pressing the main tube firmly into contact with the main pipe and embedding the flange shaped gasket between the main tube and the main pipe at the lateral opening. The lateral tube is inverted through the main tube aperture by the action of the lateral bladder extending into the lateral pipe to a termination point that shall be no less than two (2) feet from the exterior cleanout or predetermined termination point. The bladder assembly shall extend beyond each end of the liner, so the liner remains open-ended and no cutting shall be required.

3.03 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 steam. The heating equipment shall be capable of delivering a mixture of steam and air throughout the liner bladder assembly to uniformly raise the liner temperature above the temperature required to cure the resin. The curing of the CIPP shall 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 and followed.

B. CIPP Processing - Curing shall be complete 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 falls back to 100 degrees Fahrenheit or less.

3.04 FINISH

A. The Finished CIPP - It shall be a homogenous CIPP liner assembly located at the main/lateral interface and extending into the lateral pipe to the maximum distance of two (2) feet downstream of the outside cleanout or at the designated termination point if no outside cleanout is available. The CIPP shall be smooth with minimal wrinkling and shall increase flow rate. The profile of the hydrophilic molded gaskets should be visible and verifiable during post-video inspection on liners 6mm or thinner thickness. The CIPP shall be free of dry spots, lifts, and delamination. The CIPP shall include a textile taper at each end providing a smooth transition to the host mainline liner for accommodating video equipment and maintaining proper flow in the mainline. After the work is completed, the installer will provide the owner with video footage documenting the repair and the visual markings on the CIPP liner assembly identifying the building address. The finished product shall provide a verifiable non-leaking connection between the mainline liner and the CIP-Lateral liner.

3.05 UNSUITABLE LATERALS

A. Service laterals in which a SLC insert cannot be installed will be identified, documented, video recorded, and the Owner's representative will be informed of the conditions encountered. The Contractor will not attempt to install a insert in these connections unless directed by the Owner's representative.

3.06 POST-CONSTRUCTION INSPECTION

A. After installations are complete, all pipe sections shall be televised. See Section 02015 – Closed Circuit Television Inspection

3.07 ONE YEAR CORRECTION PERIOD

A. All sewer pipe sealing work performed shall be assured against faulty workmanship and/or materials for a period of one year after the completion of the work.

B. Prior to the expiration of the one-year period after substantial completion (but more than 6 months after substantial completion), the sewer pipes containing

the repair work shall be videotaped by the Contractor. The Owner or Owner's Representative shall be present at the time of the video inspection.

C. The Contractor shall videotape the sewer lines containing the repair work and the resulting video will be turned over to the Owner immediately. Payment for videoing the repaired sewer lines shall be included as part of the Bid Item, "Warranty Inspection of Mainline Sewer." No compensation shall be provided for re-repairing work that has failed. Any SLCs which were originally sealed and are observed to be leaking shall be repaired at no cost to the Owner.

END OF SECTION