

**CONTRACT NO. 2018-41  
INFLOW AND INFILTRATION REHABILITATION**

This Nonexclusive Contract ("Contract") for Inflow and Infiltration Rehabilitation is entered into this 22<sup>nd</sup> day of May 2018 ("Effective Date"), by and between the City of North Port, Florida, a municipal corporation of the State of Florida, hereinafter referred to as the "City" and Insituform Technologies, LLC, a Delaware limited liability company, registered with Florida as a foreign corporation with its principal office located at 17988 Edison Avenue, Chesterfield, MO 63005, hereinafter referred to as the "Contractor."

**WITNESSETH**

The parties to this Contract, for and in consideration of their mutual covenants specified below, and for other good and valuable consideration, the sufficiency and receipt of which are hereby acknowledged, bind themselves, their partners, successors, assigns and legal representatives to all covenants, agreements and obligations contained in the agreements and bid documents executed between the parties, and do hereby further agree as follows:

**1. RESPONSIBILITIES OF THE CONTRACTOR:**

- A. Supervision: The Contractor shall supervise and direct the work to the best of its ability, give it all the attention necessary for such proper supervision and direction and not employ for work on the project any person without sufficient skill to perform the job for which the person was employed.

The Contractor assumes full responsibility for acts, negligence, or omissions of all its employees on the project, for those subcontractors and their employees, and for those of all other persons doing work under a contract with it. All contracts between the Contractor and any subcontractor as the Contractor may hire, shall conform to the provisions of this Contract and the bid documents, and shall incorporate in them the relevant portions of this Contract.

- B. Labor and Materials: The Contractor shall provide and pay for all labor, materials, and equipment, including but not limited to tools, construction equipment and machinery, and all transportation and other facilities and services necessary for the proper completion of the work in strict conformity with the provisions herein contained and Request For Bid No. 2018-41 (the "RFB"), including the DEP Agreement No. LP58021, plans and specifications, addendums and the proposal submitted by the Contractor.
- C. The RFB, specifications, and proposal submitted by the Contractor are hereby specifically made a part of this Contract and are incorporated herein.
- D. The Contractor represents and warrants to the City that all equipment and materials used in the work, and made a part of the structures thereon, or placed permanently in connection therewith, will be in conformity with this Contract and new unless otherwise specified in this Contract and the bid documents, shall be of good quality and free of defects. It is understood between the parties that all equipment and materials not in conformity are defective.

E. Incorporation of Bid Documents: The RFB, including the DEP Agreement No. LP58021, plans, specifications, addendums, and Contractor's response to the RFB, are specifically made a part of this Contract and are incorporated herein. In the event of a conflict between or among the documents or any ambiguity or missing specifications or instruction, the following priority is established:

1. This Contract (Contract No. 2018-41) approved by the Commission, and any attachments;
2. The Request for Bid, including any and all attachments and addenda;
3. Contractor's response to the Request for Bid; and then
4. Any change order or amendment to this Contract.

## 2. PUBLIC RECORDS:

In accordance with Florida Statutes, section 119.0701, the Contractor shall comply with all public records laws, and shall specifically:

- A. Keep and maintain public records required by the City to perform the service.
  1. The timeframes and classifications for records retention requirements must be in accordance with the General Records Schedule GS1-SL for State and Local Government Agencies. (See <http://dos.dos.state.fl.us/library-archives/records-management/general-records-schedules/>).
  2. "Public records" means and includes those items specified in Florida Statutes, section 119.011(12), as amended from time to time, and currently defined as: All documents, papers, letters, maps, books, tapes, photographs, films, sound recordings, data processing software, or other material, regardless of the physical form, characteristics, or means of transmission, made or received pursuant to law or ordinance or in connection with the transaction of official business with the City. The Contractor's records under this Contract include but are not limited to, supplier/subcontractor invoices and contracts, project documents, meeting notes, e-mails and all other documentation generated during this Contract.
- B. Upon request from the City's custodian of public records, provide the City, at no cost, with a copy of the requested records or allow the records to be inspected or copied within a reasonable time at a cost that does not exceed the cost provided for by law. All records kept electronically must be provided to the City, upon request from the City's custodian of public records, in a format that is compatible with the information technology systems of the City.
- C. Ensure that project records that are exempt or confidential and exempt from public records disclosure requirements are not disclosed except as authorized by law for the duration of the Contract term and, if the Contractor does not transfer the records to the City following completion of the Contract, for the time period specified in General Records Schedule GS1-SL for State and Local Government Agencies.
- D. Upon completion of the Contract, transfer, at no cost, to the City, all public records in the Contractor's possession or keep and maintain public records required by the City to perform the service. If the Contractor transfers all public records to the City upon completion of the Contract, the Contractor shall destroy any duplicate public records that are exempt or confidential and

exempt from public records disclosure requirements. If the Contractor keeps and maintains public records upon the completion of the Contract, the Contractor shall meet all applicable requirements for retaining public records.

**E. IF THE CONTRACTOR HAS QUESTIONS REGARDING THE APPLICATION OF CHAPTER 119, FLORIDA STATUTES, TO THE CONTRACTOR'S DUTY TO PROVIDE PUBLIC RECORDS RELATING TO THIS CONTRACT, CONTACT THE CUSTODIAN OF PUBLIC RECORDS AT CUSTODIAN OF PUBLIC RECORDS, 4970 CITY HALL BOULEVARD, NORTH PORT, FLORIDA 34286, 941-429-7063 OR HOTLINE 941-429-7270; E-MAIL: padkins@cityofnorthport.com.**

F. Failure of the Contractor to comply with these requirements shall be a material breach of this Contract. Further, the Contractor may be subject to penalties under Florida Statutes, section 119.10.

### **3. CONTRACT AMOUNT AND WORK ASSIGNMENT PRICE:**

- A. Contractor understands that this is a nonexclusive contract and the City may award more than one contract for this project as outlined in the Contract specifications. The cumulative total for all work assignments issued under each contract shall not exceed the Contract amount indicated below as selected for this Contract.
- B. The Contract amount for all Work Assignments shall not exceed the budgeted amount per fiscal year.
- C. In consideration of the work, labor, services and materials to be furnished by the Contractor, and in accordance with the agreed upon plans and specifications, the City agrees to pay Contractor, upon the completion and acceptance thereof by the City. The total Contract amount for all Work Assignments set forth above is an estimate based upon anticipated Work Assignments for all applicable contracts. However, the Contractor understands and acknowledges that no minimum amount of work is guaranteed under this Contract.
- D. The Contract amount set forth herein is an estimate based upon anticipated Work Assignments. However, the Contractor understands and acknowledges that no minimum amount of work is guaranteed under this Contract.

### **4. PAYMENT:**

- A. Upon certification and approval by the City or its duly authorized agent, progress payments may be made to the Contractor upon its application for all services or work completed or materials furnished in accordance with the Contract. Two (2) original requests for payment must be submitted to the City of North Port on the form provided by the City. Each request for payment must be accompanied by an updated work schedule to reflect progress of work. Payment shall be accompanied by either written approval and direction of the surety, or receipt of updated affidavits of payment by subcontractors and/or suppliers, in accordance with Florida

Statutes, section 255.05(11). Price shall be net and all invoices payable according to the Florida Local Government Prompt Payment Act, Florida Statutes, section 218.70, *et seq.*

- B. Prior to fifty percent (50%) completion, the Contractor will be paid monthly the total value of the work completed and accepted during the preceding month, less ten percent (10%) retainage. After fifty percent (50%) completion, and upon request of the Contractor, the City shall reduce the amount of retainage withheld from each subsequent progress payment made to the Contractor to five percent (5%). For purposes of this Contract the term "fifty percent (50%) completion" is the point at which the City has expended fifty percent (50%) of the total cost of the construction services purchased as identified in the Contract together with all costs associated with existing change orders and other additions or modifications to the services provided for in the Contract.
- C. The City shall inform the Contractor's surety of any reduction in retainage. Contractor must update each new pay request in accordance with any changes made to the previous submittal. The City or its duly authorized administrative agent, shall approve final payment for all work, materials or services furnished under this Contract. Retainage may be reduced upon issuance of the Certificate of Substantial Completion by the City if, in the sole opinion of the City, sufficient progress on the work schedule has been accomplished, all required affidavits have been provided, and the City has retained adequate coverage for the project through the achievement of Final Completion.

#### 5. WORK ASSIGNMENTS:

- A. Upon completion and approval by the City of Work Assignments lasting less than 90-days in duration and which cost less than \$100,000.00, monthly payments may be made to the Contractor upon application for all services or work completed or materials furnished in accordance with the Work Assignment.
- B. Upon the City's certification and approval of Work Assignments lasting more than 90-days in duration and which cost less than \$100,000.00, monthly payments may be made to the Contractor upon application for all services or work completed or materials furnished in accordance with the Contract. Prior to completion, monthly payments shall not exceed eighty percent (80%) of the value of the materials furnished or services and work completed up to the time of application for payment. The Contractor must update each new request in accordance with any changes made to the previous submittal. Final payment shall be made after approval by the City, of all work, materials or services required under the Work Assignment.
- C. Upon certification and approval by the City of Work Assignments valued at more than \$100,000.00, monthly payments may be made to the Contractor upon application for all services or work completed or materials furnished in accordance with the Contract. The Contractor shall submit the application for payment shallas further described by the Work Assignment, and in a form satisfactory with the City of North Port. Prior to substantial completion, monthly payments shall be made on the value of materials furnished or services and work completed up to the time of application for payment. Retainage shall be in accordance with Florida Statutes, section 255.078, and may be reduced upon the City's issuance of the Certificate of Substantial Completion if, in the sole opinion of the City, sufficient progress on the schedule has been accomplished, all Notices of Lien have been resolved, and the County has retained adequate

retainage for the final completion of the project and all estimated liquidated damages. The City shall inform the Contractor's surety of any reduction in retainage. Contractor must update each new application for payment in accordance with any changes made to the previous application.

- D. Final payment shall be made after the City's approval of all work, materials or services required under this Contract.
  - 1. Applications for payment shall be submitted monthly and shall be due on the anniversary date of the Notice to Proceed.
  - 2. Except in the case of an application for final payment, applications for payment of less than \$200.00 shall not be accepted or processed.

#### 6. CONTRACT TERM:

- A. Time is of the essence in the performance of this Contract. The term of this Contract is one (1) year from the Effective Date. This Contract may be renewed for up to two (2) additional one-year terms upon mutual written agreement of the Parties, entered into by the Parties not more than one-hundred and twenty (120) days and not less than thirty (30) days from the expiration of the term. The time of completion set for a Work Assignment will be determined at the time the Work Assignment is executed.
- B. The Contractor agrees that no work shall begin prior to the start of the term provide by the Work Assignment. All work shall be performed to the specification provided in the Work Assignment and shall continue until reaching Substantial Completion.
- C. Substantial Completion shall be defined within the time frame specified in each individual Work Assignment, and shall include an additional 30 calendar days for the Contractor to reach Final Acceptance. The only acceptable delays are those caused through no fault of the Contractor or by unforeseeable acts of nature.

#### 7. BOND REQUIREMENTS:

- A. **Bond Requirements:** The successful bidder shall provide the required performance and payment bond or other acceptable security to the City within **ten (10) business days of being awarded the work assignment. Failure by the successful bidder to provide the bond within ten (10) business days shall be considered a default under Sec. 2-404 of the Code of the City of North Port.** Upon such default the City may immediately award the bid to the next lowest responsive and responsible bidder, and recover from the original successful bidder the difference in cost between the original winning bid and the next lowest responsive and responsible bidder. Such default shall only be curable at the option of the City.

In addition, the Contractor shall be responsible and bear all costs associated to record the Performance and Payment Bond with Sarasota County Clerk's Office. The Contractor shall furnish the receipt of said recording and certified copy of the bond to the Purchasing Department at the time of the pre-construction meeting for the work assignment. Such default shall only be curable at the option of the City.

**B. Performance and Payment Bond:** A Performance and Payment Bond will be required on all Work Assignments. The Contractor shall provide a Performance and Payment Bond, in the form prescribed in Florida Statutes, Section 255.05, in the amount of one hundred percent (100%) of the Contract amount, the costs of which are to be paid by the Contractor. The bond will be acceptable to the City only if the Surety Company:

1. Is licensed to do business in the State of Florida; and
2. Holds a certificate of authority authorizing it to write surety bonds in the State of Florida; and
3. Has twice the minimum surplus and capital required by the Florida Insurance Code at the time the invitation to bid is issued; and
4. Is otherwise in compliance with the provisions of the Florida Insurance Code; and
5. Holds a currently valid certificate of authority issued by the United States Department of Treasury under 31 U.S.C. §§ 9304-9308; and
6. Has a current rating of at least Excellent (A or A-) as reported in the most current Best Key Rating Guide, published by A.M. Best Company, Inc., of 75 Fulton Street, New York, New York 10038; and
7. Has an underwriting limitation of at least two times the dollar amount of the contract.

If the Surety Company for any bond furnished by the Contractor files for bankruptcy, has a receiver appointed, is declared bankrupt, becomes insolvent, has an assignment made for the benefit of creditors, has its right to do business in the State of Florida terminated, or ceases to meet the requirements imposed by the Contract or the documents incorporated therein, the Contractor shall, within five (5) calendar days thereafter, substitute another Bond and Surety Company, both of which shall be subject to the City's approval.

By execution of this bond, the Surety Company acknowledges that it has read the surety qualifications and surety obligations imposed by the Contract and the documents incorporated therein and satisfies all conditions.

## **8. INSURANCE:**

Before performing any work under the Contract or Work Assignment, the Contractor shall procure and maintain, during the term of this Contract or the Work Assignment, the following types of insurance coverage and shall furnish certificates representing such insurance to the City. The policies of insurance shall be primary and written on forms acceptable to the City and placed with insurance carriers approved and licensed by the Insurance Department in the State of Florida and shall meet a minimum financial AM Best and Company rating of no less than "A- Excellent: FSC VII." No changes are to be made to these specifications without prior written approval by the City Manager or designee. The City Manager or designee may alter the amounts or types of insurance policies required by this Contract upon agreement with Contractor.

- A. WORKERS' COMPENSATION AND EMPLOYERS' LIABILITY INSURANCE (PER CHAPTER 440, FLORIDA STATUTES):** The Contractor shall procure and maintain during the term of this Contract, and the Work Assignment, Worker's Compensation insurance for all of its employees to be engaged in work on the project under this Contract or Work Assignment and, in case any such work is sublet, the Contractor shall require the subcontractor similarly to provide Worker's Compensation insurance for all of the latter's employees engaged in such work unless such employees are covered by protection afforded by the Contractor's Workers Compensation insurance. For additional information contact the Department of Financial Services, Workers' Compensation Division, at 850-413-1601 or on the web at [www.fldfs.com](http://www.fldfs.com). In case any class of employees engaged in hazardous work on the project under this Contract or a Work Assignment is not protected under the Worker's Compensation Statute, the Contractor shall provide, and shall cause each subcontractor to provide, Employer's Liability Insurance for the protection of its employees not otherwise protected under such provisions. The minimum liability limits of such insurance shall not be less than herein specified or in that amount specified by law for that type of damage claim.

Proof of such insurance shall be filed by the Contractor with the City within ten (10) days after the execution of a Work Assignment. Coverage is to apply for all employees in the statutory limits in compliance with the applicable state and federal laws. The policy must include Employers' Liability with a limit of \$1,000,000 for each accident; \$1,000,000 each employee; and \$1,000,000 policy limit for disease.

- B. COMPREHENSIVE GENERAL LIABILITY:** The Contractor shall procure and maintain, and require all subcontractors to procure and maintain, during the term of this Contract and any Work Assignment, a comprehensive general liability policy, including, but not limited to: 1) Independent Contractor's liability; 2) products and completed operations liability; 3) contractual liability; 4) broad form property damage liability; and 5) personal injury liability. The minimum shall be no less than \$1,000,000 each occurrence; \$1,000,000 general aggregate; \$1,000,000 products and completed ops; and \$100,000 damage to rented premises. The City of North Port, Florida, shall be named as an additional insured.
- C. BUSINESS AUTOMOBILE LIABILITY:** The Contractor shall procure and maintain, and require all subcontractors to procure and maintain, during the term of this Contract, and any Work Assignment, automobile liability insurance including all owned, hired, and non-owned vehicles. The minimum combined single limit per occurrence shall be no less than \$1,000,000 for bodily injury and property damage liability. This shall include owned vehicles, hired, and non-owned vehicles, as well as employee's non-ownership. The City of North Port, Florida, shall be named as additional insured.
- D. ENVIRONMENTAL / POLLUTION LIABILITY:** Required when dealing with any substance as defined and regulated per Florida Statutes, Chapter 487. Pollution Liability is generally excluded from most General Liability policies. A separate Pollution Liability policy is required with minimum limits of \$100,000 each occurrence and \$300,000 general aggregate. Occurrence form required.

**9. SPECIAL REQUIREMENTS:**

Additional Insured: All policies required by this Contract, with the exception of Workers' Compensation, or unless specific approval is given by Risk Management through the City's Purchasing Office, shall name the City of North Port, Florida, its Commissioners, officers, agents, employees and volunteers, as well as the State of Florida, the Department of Environmental Protection, and the State of Florida Board of Trustees of the Internal Improvement Trust Fund as additional insureds as their interests may appear under this Contract. This must be written in the description of operations section of the insurance certificate, even if there is check-off-box on the insurance certificate. Any costs for adding the City as "additional insured" shall be at the Contractor's expense.

Any and all deductibles to the above referenced policies are to be the responsibility of the Contractor. The Contractor's insurance is considered primary for any loss regardless of any insurance maintained by the City. The Contractor is responsible for all insurance policy premiums, deductibles, SIR (self-insured retentions) or any loss or portion of any loss that is not covered by any available insurance policy.

All insurance policies must be issued by companies of recognized responsibility licensed to do business in Florida and must contain a provision that prohibits cancellation unless the City is provided notice as stated within the policy. It is the Contractor's responsibility to provide notice to the City.

#### **10. WAIVER OF SUBROGATION:**

All required insurance policies, with the exception of Workers Compensation, are to be endorsed with a Waiver of Subrogation. The insurance companies, by proper endorsement or thru other means, agree to waive all rights of subrogation against the City, its Commissioners, officers, officials, employees and volunteers, and the City's insurance carriers, for losses paid under the terms of these policies that arises from the contractual relationship or work performed by the Contractor for the City. It is the Contractor's responsibility to notify their insurance company of the Waiver of Subrogation and request written authorization or the proper endorsement. Additionally, the Contractor, its officers, officials, agents, employees, volunteers, and any subcontractors, agree to waive all rights of subrogation against the City and its insurance carriers for any losses paid, sustained or incurred, but not covered by insurance, that arise from the contractual relationship or work performed. This waiver also applies to any deductibles or self-insured retentions the Contractor or its agents may be responsible for.

#### **11. POLICY FORM:**

- A. All policies required by this Contract, with the exception of Workers Compensation, or unless specific approval is given by Risk Management through the City's Purchasing Office, are to be written on an occurrence basis, shall name the City of North Port, Florida, its Commissioners, officers, agents, employees and volunteers as additional insured as their interest may appear under this Contract. Insurer(s), with the exception of Professional Liability and Workers Compensation, shall agree to waive all rights of subrogation against the City of North Port, Florida, its Commissioners, officers, agents, employees, or volunteers.
- B. Insurance requirements itemized in this Contract, and required of the Contractor, shall be provided by or on behalf of all subcontractors to cover their operations performed under this Contract. The

Contractor shall be held responsible for any modifications, deviations, or omissions in these insurance requirements as they apply to subcontractors.

- C. Each insurance policy required by this Contract shall:
  - 1. Apply separately to each insured against whom claim is made and suit is brought, except with respect to limits of the insurer's liability.
  - 2. Be endorsed to state that coverage shall not be suspended, voided or cancelled by either party except after notice is delivered in accordance with the policy provisions. The Contractor is to notify the City Purchasing Office by written notice via certified mail, return receipt requested.
- D. The City shall retain the right to review, at any time, coverage, form, and amount of insurance.
- E. The procuring of required policies of insurance shall not be construed to limit Contractor's liability nor to fulfill the indemnification provisions and requirements of this Contract. The extent of Contractor's liability for indemnity of the City shall not be limited by insurance coverage or lack thereof, or unreasonably delayed for any reason, including but not limited to, insurance coverage disputes between the Contractor and its carrier.
- F. The Contractor shall be solely responsible for payment of all premiums for insurance contributing to the satisfaction of this Contract and shall be solely responsible for the payment of all deductibles and retention to which such policies are subject, whether or not the City is an insured under the policy.
- G. Claims-made policies will be accepted for professional and hazardous materials and such other risks as are authorized by the City's Purchasing Office. All Claims Made Policies contributing to the satisfaction of the insurance requirements herein shall have an extended reporting period option or automatic coverage of not less than two (2) years. If provided as an option, the Contractor agrees to purchase the extended reporting period on cancellation or termination unless a new policy is affected with a retroactive date, including at least the last policy year.
- H. Certificates of insurance evidencing claims-made or occurrences form coverage and conditions to this Contract, as well as the contract number and description of work, are to be furnished to the City's Purchasing Office (4970 City Hall Boulevard, Suite 337, North Port, FL 34286) prior to commencement of work and a minimum of thirty (30) calendar days prior to expiration of the insurance contract when applicable. All insurance certificates shall be received by the City's Purchasing Office before the Contractor will be allowed to commence or continue work. The Certificate of Insurance issued by the underwriting department of the insurance carrier shall certify compliance with the insurance requirements provided herein.

## **12. INDEMNITY:**

- A. TO THE EXTENT PERMITTED BY FLORIDA LAW, THE CONTRACTOR SHALL INDEMNIFY, DEFEND, AND HOLD HARMLESS THE CITY, ITS COMMISSIONERS, OFFICERS, AGENTS AND EMPLOYEES, FROM ALL LIABILITIES, FINES, CLAIMS, ASSESSMENTS, SUITS, JUDGMENTS, DAMAGES, LOSSES AND COSTS, INCLUDING CONSEQUENTIAL, SPECIAL, INDIRECT, AND PUNITIVE DAMAGES,

(INCLUDING, BUT NOT LIMITED TO, REASONABLE ATTORNEYS' FEES AND COURT COSTS, WHETHER SUCH FEES AND COSTS ARE INCURRED IN NEGOTIATIONS, AT THE TRIAL LEVEL OR ON APPEAL, OR IN THE COLLECTION OF ATTORNEYS' FEES), ARISING OUT OF ANY ACTS, ACTIONS, BREACHES, NEGLIGENCE OR OMISSIONS OF THE CONTRACTOR, OR CONTRACTOR'S OFFICERS, EMPLOYEES, AGENTS, SUBCONTRACTORS, SUB-CONSULTANTS, AND OTHER PERSONS EMPLOYED OR UTILIZED BY THE CONTRACTOR IN THE PERFORMANCE OF, OR THE FAILURE TO PERFORM, THE CONTRACT. THE CONTRACT DOES NOT CONSTITUTE A WAIVER OF SOVEREIGN IMMUNITY OR CONSENT BY THE CITY OR ITS SUBDIVISIONS TO SUIT BY THIRD PARTIES.

- B. IN THE EVENT OF A CLAIM, THE CITY SHALL PROMPTLY NOTIFY THE CONTRACTOR IN WRITING BY PREPAID CERTIFIED MAIL (RETURN RECEIPT REQUESTED) OR BY DELIVERY THROUGH ANY NATIONALLY RECOGNIZED COURIER SERVICE (SUCH AS FEDERAL EXPRESS OR UPS) WHICH PROVIDES EVIDENCE OF DELIVERY, AT THE ADDRESS PROVIDED FOR RECEIPT OF NOTICES IN THIS AGREEMENT.
- C. THE CITY SHALL PROVIDE ALL AVAILABLE INFORMATION AND ASSISTANCE THAT THE CONTRACTOR MAY REASONABLY REQUIRE REGARDING ANY CLAIM. THIS AGREEMENT FOR INDEMNIFICATION SHALL SURVIVE TERMINATION OR COMPLETION OF THE CONTRACT. THE INSURANCE COVERAGE AND LIMITS REQUIRED IN THIS CONTRACT MAY OR MAY NOT BE ADEQUATE TO PROTECT THE CITY AND SUCH INSURANCE COVERAGE SHALL NOT BE DEEMED A LIMITATION ON THE CONTRACTOR'S LIABILITY UNDER THE INDEMNITY PROVIDED IN THIS SECTION. IN ANY PROCEEDINGS BETWEEN THE PARTIES ARISING OUT OF OR RELATED TO THIS INDEMNITY PROVISION, THE PREVAILING PARTY SHALL BE REIMBURSED ALL COSTS, EXPENSES AND REASONABLE ATTORNEY FEES THROUGH ALL PROCEEDINGS (AT BOTH TRIAL AND APPELLATE LEVELS).
- E. NOTHING IN THIS CONTRACT SHALL BE DEEMED TO AFFECT THE RIGHTS, PRIVILEGES AND IMMUNITIES OF THE CITY AS SET FORTH IN FLORIDA STATUTES, SECTION 768.28.
- F. THE TERMS OF THIS SECTION SHALL SURVIVE THE TERMINATION OF THIS CONTRACT.
- G. FURTHER, THE CONTRACTOR SHALL FULLY INDEMNIFY, DEFEND, AND HOLD HARMLESS THE CITY OF NORTH PORT, FLORIDA, FROM ANY SUITS, ACTIONS, DAMAGES, AND COSTS OF EVERY NAME AND DESCRIPTION, INCLUDING ATTORNEYS' FEES, ARISING FROM OR RELATING TO VIOLATION OR INFRINGEMENT OF A TRADEMARK, COPYRIGHT, PATENT, TRADE SECRET OR INTELLECTUAL PROPERTY RIGHT.

**13. CONTRACTOR'S AFFIDAVIT:**

When all work contemplated by this Contract has been completed, and has been inspected and approved by the City, the Contractor shall furnish the City a Contractor's Affidavit in a form acceptable to the City. Signed affidavits of payment will also be required by the City from any and all subcontractors hired by the Contractor, unless payment is approved by the surety in accordance with Florida Statutes, section 255.05(11). The affidavits shall state whether the subcontractor(s) has been paid in full or whether there are payments remaining. A list of all subcontractors shall be furnished to the City prior to any payments against the Contract.

**14. TERMINATION AND DEFAULT:**

The City Manager or designee shall have the right at any time upon thirty (30) calendar days written notice to the Contractor to terminate the services of the Contractor and, in that event, the Contractor shall cease all work and shall deliver to the City all documents (including but not limited to reports, designs, specifications, and all other data) prepared or obtained by the Contractor in connection with its services. Upon delivery of the documents, the City shall pay the Contractor in full settlement of all claims by it hereunder as the work actually completed bears to the entire work under the Contract, as determined by the City, less payments already made to the Contractor, and any amounts withheld by the City to settle claims against or to pay indebtedness of the Contractor in accordance with the provisions of the Contract.

- A. **Non-Appropriation:** The parties acknowledge and agree that the obligations of City to fulfill financial obligations of any kind pursuant to any and all provisions of this Contract, or any subsequent contract entered into pursuant to this Contract or referenced herein to which City is a party, are and shall remain subject to the provisions of Florida Statutes, Section 166.241, regardless of whether a particular obligation has been expressly so conditioned. City agrees to exercise all lawful and available authority to satisfy any financial obligations of City that may arise under this Contract; however, since funds are appropriated annually by the City Commission on a fiscal year basis, and since funds have not yet been appropriated for the undertakings contemplated herein, City's legal liability for the payment of any costs shall not arise unless and until appropriations for such costs are approved for the applicable fiscal year by the City Commission (nor shall such liability arise if, a request for such appropriations is excluded from the budget approved by the City Commission). Notwithstanding the foregoing, no officer, employee, director, member or other natural person or agent of City shall have any personal liability in connection with the breach of the provisions of this Section or in the event of a default by City under this Section. This Contract shall not constitute an indebtedness of City nor shall it constitute an obligation for which City is obligated to levy or pledge any form of taxation or for which City has levied or pledged any form of taxation.
- B. In the event that the Contractor has abandoned performance under this Contract, then the City Manager or designee may terminate this Contract upon three (3) calendar days' written notice to the Contractor indicating its intention to do so. The written notice shall state the evidence indicating the Contractor's abandonment.
- C. The Contractor shall have the right to terminate the Contract only in the event of the City failing to pay the Contractor's properly documented and submitted invoice within ninety (90) calendar days of the approval by the City's Administrative Agent, or if the project is suspended by the City for a period greater than ninety (90) calendar days.
- D. The City Manager or designee reserves the right to terminate and cancel this Contract in the event the Contractor shall be placed in either voluntary or involuntary bankruptcy, a receiver is appointed for the Contractor or an assignment is made for the benefit of creditors.
- E. In the event Contractor breaches this Contract, the City shall provide written notice of the breach and Contractor shall have ten (10) days from the date the notice is received to cure. If Contractor fails to cure within the ten (10) days, the City Manager or designee shall have the right to immediately terminate the Contract and/or refuse to make any additional payment, in whole or in part, and, if necessary, may demand the return of a portion or the entire amount previously paid to Contractor due to:

1. The quality of a portion or all of the Contractor's work not being in accordance with the requirements of this Contract;
  2. The quantity of the Contractor's work not being as represented in the Contractor's Payment Request, or otherwise;
  3. The Contractor's rate of progress being such that, in the City's opinion, substantial or final completion, or both, may be inexcusably delayed;
  4. The Contractor's failure to use Contract funds, previously paid the Contractor by the City, to pay Contractor's project related obligations including, but not limited to, subcontractors, laborers and material and equipment suppliers;
  5. Claims made, or likely to be made, against the City or its property;
  6. Loss caused by the Contractor;
  7. The Contractor's failure or refusal to perform any of the obligations to the City, after written notice and a reasonable opportunity to cure as set forth above; and
  8. Violation of any local, state or federal law in the performance of this Contract shall constitute a material breach of this Contract.
- F. In the event the City makes written demand upon the Contractor for amounts previously paid by the City as contemplated in the clause, the Contractor shall promptly comply with such demand. The City's rights hereunder survive the term of this Contract, and are not waived by final payment and/or acceptance.

**15. INDEPENDENT CONTRACTOR:**

The Contractor is, and shall be, in the performance of all work, services and activities under this Contract, an independent contractor, and not an employee, agent or servant of the City. All persons engaged in any of the work or services performed pursuant to this Contract shall at all times, and in all places, be subject to the Contractor's sole direction, supervision, and control. The Contractor shall exercise control over the means and manner in which it and its employees perform the work, and in all respects the Contractor's relationship and the relationship of its employees to the City shall be that of an independent contractor and not as employees or agents of the City. The Contractor does not have the power or authority to bind the City in any promise, agreement or representation other than as specifically provided for in this Contract. The Contractor shall not pledge the City's credit or make it a guarantor of payment of surety for any contract, debt, obligation, judgment, lien or any form of indebtedness. The Contractor further warrants and represents that it has no obligation or indebtedness that would impair its ability to fulfill the terms of this Contract.

**16. SUBCONTRACTORS:**

Contractor shall furnish the City with a list of all subcontractors prior to any payments against the Contract. All subcontractors are subject to City approval.

**17. LICENSES AND PERMITS/LAWS AND REGULATIONS:**

The Contractor shall pay all taxes required by law in connection with the activity in accordance with this Contract including sales, use, and similar taxes, and unless mutually agreed to in writing to the contrary, shall secure all licenses and permits necessary for proper completion of the work, paying any fees therefore. Violation of any local, state or federal law in the performance of this

Contract shall constitute a material breach of this Contract. The Contractor shall comply with all laws and ordinances, and the rules, regulations, and orders of all public authorities relating to the performance of the work herein. If any of the Contract documents are at variance therewith, the Contractor shall notify the City promptly on the discovery of such variance.

**18. AMENDMENT:**

This Contract constitutes the sole and complete understanding between the parties and supersedes all agreements between them, whether oral or written with respect to the subject matter. No amendment, change or addendum to this Contract is enforceable unless agreed to in writing by both parties and incorporated into this Contract. The City Manager or designee may agree to amendments that do not increase compensation to Contractor. The City Commission shall approve all increases in compensation under this Contract.

**19. EQUAL EMPLOYMENT OPPORTUNITY:**

The City of North Port, Florida, in accordance with the provisions of Title VII of the Civil Rights Act of 1964 (78 Stat. 252) and the Regulations of the Department of Commerce (15 CFR, Part 8) issued pursuant to such Act, hereby notifies all bidders that it will ensure that in any Contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit replies in response to this advertisement and will not be discriminated against on the ground of race, color or national origin in consideration for an award.

**20. NON-DISCRIMINATION:**

The City of North Port, Florida, does not discriminate on the basis of race, color, national origin, sex, age, disability, family or religious status in administration of its programs, activities or services. Pursuant to Florida Statutes, section 287.134(2)(a), an entity or affiliate who has been placed on the discriminatory vendor list may not submit a bid, proposal, or reply on a contract to provide any goods or services to a public entity; may not submit a bid, proposal, or reply on a contract with a public entity for the construction or repair of a public building or public work; may not submit bids, proposals, or replies on leases of real property to a public entity; may not be awarded or perform work as a Contractor, supplier, subcontractor, or consultant under a contract with any public entity; and may not transact business with any public entity.

**21. ASSIGNMENT:**

The Contractor shall not assign any interest in this Contract and shall not transfer any interest in same (whether by assignment or novation) without prior written consent of the City Manager or designee, except that claims for the money due or to become due the Contractor from the City under this Contract may be assigned to a financial institution or to a trustee in bankruptcy. Notice shall be promptly given to the City.

**22. NOTICES:**

Any notice, demand, communication, or request required or permitted hereunder shall be sent by certified mail, return receipt requested, and shall be mailed to:

**As to the City:** Utilities Engineering Manager  
City of North Port, Florida  
Utilities Department  
6644 W Price Blvd.  
North Port, Florida 34291  
Tel: 941.240. 8013  
E-Mail: macosta@cityofnorthport.com

**With a copy to:** City of North Port, Florida  
City Attorney's Office  
4970 City Hall Boulevard  
North Port, Florida 34286

**As to Contractor:** Name/Title: Diane Partridge, Contracting and Attesting Officer  
Address: 17988 Edison Avenue  
Chesterfield, MO 63005  
\_\_\_\_\_  
Telephone: (636) 530-8000  
E-Mail: dpartridge@aegion.com

Notices shall be effective when received at the addresses specified above. Changes in the respective addresses which such notice is to be directed may be made from time to time by either party by written notice to the other party. Nothing in this Section shall be construed to restrict the transmission of routine communications between representatives of Contractor and City.

**23. WAIVER:**

No delay or failure to enforce any breach of this Contract by either the City or the Contractor shall be binding upon the waiving party unless such waiver is in writing. In the event of a written waiver, such a waiver shall not affect the waiving party's rights with respect to any other or further breach. The making or acceptance of a payment by either party with knowledge of the existence of a default or breach shall not operate or be construed to operate as a waiver of any subsequent default or breach.

**24. ATTORNEY'S FEES:**

In any proceedings between the parties arising out of or related to this Contract, the prevailing party shall be reimbursed all costs, expenses and reasonable attorney fees through all proceedings, at both trial and appellate levels.

**25. GOVERNING LAW, VENUE AND SEVERABILITY:**

The rights, obligations and remedies of the parties under this Contract shall be governed by the laws of the State of Florida and the exclusive venue for any legal or judicial proceedings in connection with the enforcement or interpretation of this Contract shall be in Sarasota County, Florida. The invalidity, illegality, or unenforceability of any provision of this Contract shall in no way affect the

validity or enforceability of any other portion or provision of the Contract. Any void provision shall be deemed severed from the Contract and the balance of the Contract shall be construed and enforced as if the Contract did not contain the particular portion or provision held to be void.

**26. PARAGRAPH HEADINGS:**

Paragraph headings are for the convenience of the parties and for the reference purposes only and shall be given no legal effect.

**27. ENTIRE AGREEMENT:**

This Contract (with all referenced plans, attachments, addenda and provisions incorporated by reference) embodies the entire agreement of both parties, superseding all oral or written previous and contemporary agreements between the parties relating to matters set forth in this Contract. In the event of any conflict between the provisions of this Contract and the RFB or Contractor's bid, this signed Contract (excluding the RFB and Contractor's bid) shall take precedence, followed by the provisions of the RFB, and then by the terms of the Contractor's bid.

*(This space intentionally left blank; signature page to follow)*

IN WITNESS WHEREOF, the parties have hereto caused the execution of these documents, the year and date first above written.

Attest:

CITY OF NORTH PORT, FLORIDA

Patsy C. Adkins  
Patsy C. Adkins, City Clerk, MMC

Peter D. Lear  
Peter D. Lear, CPA, CGMA, City Manager

Approved as to Form and Correctness:

Amber L. Slayton  
Amber L. Slayton, City Attorney

For Contractor: Insituform Technologies, LLC

Signature: Diane Partridge

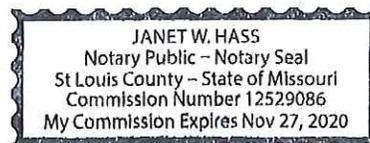
Print Name: Diane Partridge

Title: Contracting and Attesting Officer

MISSOURI  
STATE OF ~~FLORIDA~~  
COUNTY OF ST. LOUIS

The foregoing instrument was acknowledged before me this 4th day of May, 2018, by Diane Partridge, who is personally known to me or who produced Personally Known as identification.

Janet W. Hass  
Notary Public, State of ~~Florida~~  
Missouri



### SECTION III. SPECIAL PROVISIONS

#### SP-01 INTENT:

The purpose of this project is to obtain a competent, experienced and responsible Contractor to construct the project in accordance with the plans and specifications, in an expeditious manner that reasonably protects the public and adjacent property from the construction of the project.

The Contract Documents comprise the entire agreement between City and Contractor concerning the work. The Contract Documents are complementary; what is called for by one is as binding as if called for by all. The Contract Documents will be construed in accordance with the law of the State of Florida, City of North Port. The work specified herein shall consist of furnishing all supervision, labor, equipment, material and any incidentals required for the successful completion of all work as specified herein. All work shall conform within the limits as specified and shown and be in conformance with the appropriate Technical Specifications contained herein.

The plans, technical specifications, and other documents provided are intended to provide the Contractor with known conditions of the existing site and proposed work area. The Contractor is responsible to conduct any and all investigation, survey, or other activities required to fully understand the existing site and conditions that will be encountered during the project, and on which their bid will be based. Additional investigations may be necessary for the purposes of carrying out the construction project. The City of North Port, Florida, will not consider or approve any claim for additional time or monetary compensation submitted by the Contractor caused by unknown site conditions or a failure by the Contractor to fully investigate and understand the full extent and nature of the work. This includes, but is not limited to, existing utilities as well as subsurface conditions.

#### SP-02 EQUIPMENT:

The Contractor shall only use equipment, machines, or combination of machines that are in good and safe working condition. The equipment shall produce results that meet or exceed the Technical Specifications stated herein.

Equipment incapable of providing this will not be acceptable for use on this Project. The Contractor shall not use equipment which is unsafe or in need of repair. Work completed with equipment, which is not properly functioning, shall be deemed unacceptable.

#### SP-03 CONSTRUCTION SCHEDULE:

This is a unit price contract. It is a one (1) year contract with a maximum of two (2), one (1) year renewals. All work will be issued through Work Assignments. This Contract is anticipated to start May 2018.

The Contractor shall furnish copies of the Construction Schedule to the City when requested to perform as needed work as outlined in the Bid Form. The City will notify the Contractor of such as needed work

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and the Contractor will provide a Construction Schedule to the City within thirty (30) days of the City's notification. A project update meeting will be held weekly during the Work Assignments under this Contract.

**SP-04 PRE-CONSTRUCTION CONFERENCE:**

A Pre-Construction Conference will be held, at which time the Contractor shall submit the following for the City's approval and acceptance:

A telephone list specifying the name, address, office phone number and cell phone numbers of all subcontractors or suppliers to be used on this project. If the Contractor proposes to subcontract any survey work that may be required, the Contractor shall include the registration number of the surveyor. The telephone list shall also include emergency telephone numbers. The Contractor shall include a 24-hour emergency telephone for the City's use, which the Contractor shall update as necessary throughout the project. The Contractor shall request, in writing, any changes in subcontractors or suppliers.

- No change in subcontractors or suppliers shall be made without written consent from the City.
- In addition to the telephone and facsimile numbers, the Contractor shall provide an e-mail address where e-mails can be sent. The e-mail address must be monitored at least daily and capable of transferring electronic files.
- The Contractor shall submit to the City a list of equipment the Contractor proposes to utilize on this project.
- The Contractor shall submit for City approval a paper copy and electronic copy of a Construction Schedule prepared using City approved software, and a Schedule of Progress Payment Requests.
- The Contractor shall also submit all other materials or mix designs, which will be used by the Contractor for this Contract.

**Mobilization may not start** until all submittals have been accepted by the City. Once approved, no changes will be allowed without the written approval of the City.

The Contractor shall also provide, on a monthly basis, an update to the Construction Schedule reflecting changes made and their cause; such as due to weather, breakdowns, and unanticipated delays, as a means of better monitoring the project.

**SP-05 PROGRESS MEETING:**

For this project, progress meetings shall be weekly during a Work Assignment. The Contractor shall designate a representative to attend Progress Meetings held at the North Port Utilities Field Office, 6644 West Price Boulevard, North Port, Florida. At each meeting the Contractor shall submit up-to-date schedule information, a written projected schedule for the next two weeks, written claims for additional compensation, written claims for weather days to extend the Contract, results of all testing and Value Engineering Proposals. The City will use the updated schedule information to monitor the Contractor's production rate. Upon written notice from the City, the Contractor shall dedicate additional resources to increase the production rate such that the Contractor will be back on schedule. Failure to comply with the approved Construction Schedule shall result in the Contractor being considered in default and subject to suspension of this Contract. Contractor may request progress meetings be on a different schedule than

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weekly provided the City can confirm work is proceeding expeditiously. City may require a return to weekly progress meetings at any time.

**SP-06 COOPERATION WITH UTILITIES:**

The Contractor shall notify all utility owner(s) affected by the project prior to beginning work. Any expense of utility repair or other damage due to Contractor's operations shall be borne by the Contractor. Protection of utilities shall be the responsibility of the Contractor, who shall provide adequate protection to maintain proper service.

**NOTE: The Contractor is to include within his bid prices, the costs to protect, and/or support, all above ground, overhead and underground utilities, which may be in conflict with the construction of this proposed project.**

Attention is called to the Florida Underground Facility Damage Prevention and Safety Act defined in Florida Statute. This act provides for a "One Call Toll Free" telephone number to be used by all parties doing excavation, demolition or other underground construction.

**SP-07 CONTRACT TIME:**

Contract time will be negotiated at the time of the Work Assignment is entered into between the City's Project Manager and the Contractor.

**SP-08 PROJECT COMPLETION:**

Project final completion shall be defined as "the stage in the progress of the Work where the Work is complete in accordance with the Work Assignment so that the City can begin to utilize the Work for its intended use, all punch list items are complete, and the Contractor has completely demobilized from the project area."

**SP-09 LIQUIDATED DAMAGES:** The amount of liquidated damages to be assessed for each calendar day that Substantial Completion for each individual Work Assignment is delayed beyond the required date of Substantial Completions shall be negotiated at the time the Work Assignment between the City's Project Manager and the Contractor is entered into.

For all contracts, regardless of whether the contract time is stipulated in calendar days or working days, the City will count default days in calendar days. If the Contractor, or in case of default the surety, fails to complete the work within the time stipulated in the Work Assignment, or within such extra time that the City may have granted the Contractor, or in case of default the surety, shall pay liquidated damages to the City.

The City has the right to apply, as payment on such liquidated damages, any money the City owes the Contractor.

The City does not waive its right to liquidated damages due under the Contract by allowing the Contractor to continue and finish the work, or any part of it, after the expiration of the Contract Time including granted time extensions.

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In the case of default of the Contract and the completion of the work by the City, the Contractor and its surety are liable for the liquidated damages under the Contract, but the City will not charge liquidated damages for any delay in the final completion of the City's performance of the work due to any unreasonable action or delay on the part of the City.

The City considers the Contract complete when the Contractor has completed all work and the City has accepted the work. The City will then release the Contractor from further obligation except as set forth in its bond.

**SP-10 DAMAGES:**

Areas adjacent to the project that are damaged shall be repaired at the Contractor's expense. Restoration of adjoining areas shall be equal to or better than original condition and to the satisfaction of the City. Protection of personal property, utilities, structures, access drives, conduits, pavement, curbs, sidewalks, trees, and shrubs shall be the responsibility of the Contractor, who shall provide adequate protection to maintain proper service.

**SP-11 CONTINUOUS PROSECUTION OF WORK:**

The Contractor shall continuously prosecute the work in accordance with the Contract Documents and Work Assignment. Upon written direction from the City, the Contractor shall remove any personnel for the duration of the Contract who fails to comply with the Contract Documents.

Once commencing the Work Assignment, the project must be continuously prosecuted during normal hours to its completion. At no time shall the Contractor suspend work for any reason for more than seven (7) calendar days, excluding delays granted for inclement weather. Should the Contractor fail to perform any work on the project for three (3) or more work days, the Contractor shall submit a written request to the City no less than twenty-four (24) hours in advance of the restart of work to allow the City to schedule the required inspection personnel. No work may restart prior to the expiration of the twenty-four (24) hour notice without the City's approval.

Correction of safety concerns will be given priority and shall be corrected as soon as practicable, but not later than twenty-four (24) hours after discovery by the City and notification of the Contractor. Failure to comply with these provisions and/or Technical Specifications shall result in the Contractor being considered in default and subject to suspension of this Contract.

**SP-12 SAFETY AND PROTECTION:**

A. Contractor shall be responsible for initiating, maintaining, and supervising all safety precautions and programs in connection with the work. Contractor shall take all necessary precautions for the safety of and shall provide the necessary protection to prevent damage, injury or loss to:

- i. All employees working on the project and other persons or organizations who may be affected thereby.
- ii. All the work and materials and equipment to be incorporated therein, whether in storage on or off the site.

B. Other property at the site or adjacent thereto, including but not limited to trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and underground facilities not designated for removal, relocation or replacement in the course of construction. Contractor shall comply with all applicable Laws

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and Regulations of any public body having jurisdiction for the safety of person or property or to protect them from damage, injury or loss; and shall erect and maintain all necessary safeguards for such safety and protection.

C. All personnel working within the City's right-of-way shall at all times wear City approved safety vests, including personnel who may only briefly be out of their vehicle (i.e., supervisors, truck drivers).

D. No open excavations are allowed on the project. Any pipe installation shall be backfilled properly the same day of work on such pipe area to allow safe passing of pedestrians and vehicles. The Contractor shall immediately remove any personnel who fail to conform to this requirement.

E. Contractor shall designate a responsible representative at the site whose duty shall be the prevention of accidents. This person shall be the Contractor's superintendent unless otherwise designated in writing by Contractor to City.

**SP-13 CHANGES IN THE WORK:**

The City, without invalidating the Contract, may order extra work or make changes by altering, adding to or deducting from the Work Assignment, the Work Assignment sum being adjusted accordingly. Such work will be an **Amendment to the Work Assignment** and shall require approval by the City Manager prior to prosecution of the additional work. The change and amount of compensation must be agreed upon in writing in a document of equal dignity herewith prior to any deviation from the terms of this Contract. In giving instructions, the City shall have authority to make minor changes in the work, not involving extra cost, and not inconsistent with the purposes of the work. Except in an emergency endangering life or property, no extra work or change shall be made unless in pursuance of a written order by the City; and no claim for an addition to the Contract sum shall be valid, unless ordered.

**Contingency:** This term refers to an amount added to an estimate to allow for items, conditions, or events for which the state, occurrence, or effect is uncertain and that experience shows will likely result, in aggregate, in additional costs. All contingency items will require approval from the Purchasing Manager or designee, the Finance Director and City Manager or designee prior to any work being performed.

Value of any such extra work or change shall be determined in one or more of the following ways:

1. By estimate and acceptance in a lump sum.
2. By unit prices named in the contract or subsequently agreed upon.
3. By cost and percentage or by cost and a fixed fee.
4. By Change order executed by the City Manager.
5. By Contingency Authorization (executed by the City Manager).

If none of the previous methods are agreed upon, the Contractor, provided it receives an order as above, shall proceed with the work. In such a case, Contractor shall keep amendment in such form as the City may direct, a correct amount of the net cost of labor and materials, together with vouchers. The City shall certify to the amount, including reasonable allowance for overhead and profit, due to the Contractor. Pending final determination of value, no payment on changes shall be made.

**SP-14 SUBCONTRACTING, SUBLETTING AND/OR ASSIGNMENT:**

Contractor shall not, sell, transfer, assign or otherwise dispose of the Contract or Work Assignment or any portion thereof, or of the right, title, or interest therein, without written consent of the City. If the

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Contractor chooses to sublet any portion of the Contract or Work Assignment, the Contractor must provide a written request to the City for approval. With the City's acceptance and approval of the request, the Contractor may sublet a portion of the work, but shall perform with its own organization work amounting to not less than 40% of the total Contract amount. The City shall notify the Contractor within five (5) business days of receipt of the request whether the City approves the requested subletting.

Contractor shall include in the total cost its cost of materials and manufactured component products, and their transportation to the project site. For the purpose of meeting this requirement, the City will not consider off-site commercial production of materials and manufactured component products that the Contractor purchases, or their transportation to the project, as subcontracted work.

If the Contractor sublets a part of a Work Assignment, the City will use only the sublet proportional cost in determining the percentage of subcontracted normal work. Contractor shall execute all agreements to sublet work in writing and include all pertinent provisions and requirements of the Contract and Work Assignment. All other agreements must be in writing and reference all applicable Contract and Work Assignment provisions. Upon request, Contractor shall furnish the City with a copy of the subcontract and agreement. The subletting of work does not relieve the Contractor or the surety of their respective liabilities under the Contract.

The City recognizes a subcontractor only in the capacity of an employee or agent of the Contractor and the City may require the Contractor to remove the subcontractor as in the case of an employee.

All sublets must be in continued compliance with all Contract and Work Assignment provisions and the Contractor will continue to perform the minimum percentage of Contract work with its own organization, as required by said Contract or Work Assignment. It is recognized and agreed that the prime contractor remains responsible for the proper performance of all requirements of said contract and use of sublet does not relieve or release the Contractor and his surety or either of them of any liability under the contract bond. A false statement or omission made in connection with subletting is sufficient cause for suspension, revocation, or denial of qualification to bid, and a determination of non-responsibility, and may subject the person and/or entity making the false statement to any and all civil and criminal penalties available pursuant to applicable Federal and State Law.

**SP-15 AVAILABILITY OF LANDS:**

Work is planned to occur within rights of way or existing utility easements. The Contractor will be held responsible to obtain right-of-way use permit(s) from the City of North Port. North Port Utilities will pay the permit fee directly to the Neighborhood Development Services Department. Any additional or repeat inspection or testing charges shall be paid by the Contractor. See Provision SP-17.

**SP-16 COORDINATION OF THE SPECIFICATIONS:**

Where conflicts between the City of North Port General Provisions, Special Provisions, Technical Specifications and Construction Plans exist, it is the responsibility of the bidding Contractor to bring those conflicts to the attention of the Purchasing Agent prior to the bid date. After bids, have been received, the Contractor will be held to the most stringent requirement.

The Contractor shall take no advantage of any apparent error or omission in the plans or specifications. If the Contractor discovers such an error or omission, he shall immediately notify the City. The City will then

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make such corrections and interpretations as may be deemed necessary for fulfilling the intent of the plans and specifications.

**SP-17 CONSTRUCTION PERMITS:**

Construction permits from the Florida Department of Environmental Protection are not required for this project.

The City will pay for all permit fees determined necessary by the Building Department and the City of North Port Public Works Department. For this project, Right-of-Way (ROW) permit(s) will be required. The City will make payment directly to the Neighborhood Development Services Department for any miscellaneous fees assessed for the necessary permits and related inspections. Additional or re-inspection fees shall be paid for by the Contractor. Pressure testing the system shall be paid for by the Contractor. Permits and licenses necessary for the prosecution of the work shall be secured by the Contractor.

**SP-18 NOTICE-OF-INTENT (NOI):**

If necessary, the Contractor shall submit a Notice of Intent to Use Generic Permit for Stormwater Discharge from Large and Small Construction Activities, along with the permit fee, to the Florida Department of Environmental Protection.

**SP-19 SPECIFICATIONS AND PLANS:**

Information regarding this project may be viewed and downloaded from DemandStar's website at [www.demandstar.com](http://www.demandstar.com). Links to DemandStar are also available from the city website at [www.cityofnorthport.com](http://www.cityofnorthport.com). Bid documents are posted on the City FTP site at <http://apps.cityofnorthport.com/ftpinfo/>; however, all addendums are posted on [www.demandstar.com](http://www.demandstar.com). Bid documents (Specifications and Plans are available on disk) may be obtained by contacting the City of North Port Purchasing Department at (941)743-7172 or E-mail your request to [purchasing@cityofnorthport.com](mailto:purchasing@cityofnorthport.com).

**SP-20 CONTRACTOR'S UNDERSTANDING:**

It is understood and agreed that the Contractor has, by careful examination, satisfied itself as to the nature and locations of the work, the conformation of the ground, the character, quality, and quantity of materials to be encountered, the character of equipment and facilities needed prior to and during prosecution of the work under this Contract. No verbal agreement or conversation with any officer, agent, or employee of the City, either before or after execution of this Contract or Work Assignment, shall affect or modify the terms or obligations herein contained.

**SP-21 ERRORS OR OMISSIONS IN PERMITS, PLANS OR SPECIFICATIONS:**

The Bidder shall take no advantage of any apparent error or omission, which may be discovered in the Permits, Plans or Specifications but shall forthwith notify the City Representative of such discovery, who will then make such correction and interpretations as deemed necessary for reflecting the actual spirit and intent of the Permits and Specifications.

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**SP-22 ROAD/LANE CLOSURE:**

No road closures are allowed without prior City approval. A lane closure request must be submitted in writing no less than five (5) business days in advance of the requested lane closure. The time and length of closure(s) shall be reviewed by the City of North Port and must be approved prior to any closure taking place. The Contractor shall provide a Maintenance of Traffic (MOT) Plan for the requested lane closure(s) to the City.

**SP-23 MAINTENANCE OF TRAFFIC:**

The Contractor shall be responsible for all maintenance of traffic and obtaining approval of a Maintenance of Traffic (MOT) Plan from the City for work within the Right-of-Way of any City Road. The Contractor shall maintain traffic at all times during the project.

**SP-24 DEWATERING:**

The Contractor shall request approval from the Project Manager before applying for a permit from the Southwest Florida Water Management District.

**SP-25 PRIVATE PROPERTY:**

The Contractor shall not occupy private land outside of any easements or rights-of-way unless a written authorization has been signed by the property owner. It shall be the Contractor's responsibility to obtain these authorizations prior to beginning work on the project. Prior to the use of private lands, the Contractor shall submit a copy of the authorization(s) to the City. In the event that the Contractor uses private property for any purpose without first having obtained the necessary authorization from the property owner or provided the necessary authorization to the City, the City will direct the Contractor in writing to immediately cease using such property. If the Contractor does not comply with the City's request to stop the unauthorized use of private property, the Contractor may be considered to be in breach of this Contract. A Contractor may also be required to repair any damage to the private property, with the funds for such repairs being paid directly by the Contractor or coming from any money owed Contractor under this Contract or a Work Assignment.

Prior to application for final payment, the Contractor shall provide documentation from the owner of each piece of private property for which an authorization for use was provided, or for which the City has issued written notification to the Contractor, that each owner is satisfied with the manner in which the Contractor has restored the property. Final payment or reduction in retainage shall not be paid until such documentation is received by the City.

Any areas, outside of the rights-of-way or easements that are impacted or damaged by the Contractor's activities shall be repaired at the Contractor's expense and to the property owner's satisfaction. Restoration of impacted areas shall be equal to or better than original condition and to the satisfaction of the property owner. The Contractor shall be responsible to secure written approval of the restoration of the property from the property owner and shall submit a copy to the City prior to requesting Substantial Completion. The City shall not release retainage to the Contractor until such time as the approvals are submitted by the Contractor.

**SP-26 RESIDENTS CONCERNS:**

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During the term of this Contract, residents may contact the City to question the progress of the work or express concerns regarding the work. These concerns are responded to by the City's Utilities Department, but normally the Contractor will have more detailed information on the actual scheduling of the work or corrective measures required. Therefore, the Contractor will provide a fax number and e-mail address where the City's Utilities Department can fax or e-mail inquiries. The Contractor shall respond to these inquiries within two (2) business days detailing how the inquiry will be addressed and the time frame the Contractor will take in addressing the inquiry. The City's Utilities Department will maintain a log of inquiries that will be reviewed at each progress meeting.

**SP-27 TESTING:**

Any and all testing requirements related to the installation of utility piping, including but not limited to pressure testing, must be included in the Contractor's bid price. Testing must be arranged with an independent testing firm (also included in the bid price) for the testing of concrete and compaction in advance of any work being conducted. The City shall be notified three (3) business days in advance of any test in order to have ant required personnel present for testing. Where less time for notice is specified in the specifications or plans, this special provision shall prevail.

**SP-28 MISCELLANEOUS ITEMS:**

Miscellaneous items and accessories which are not specifically mentioned, but which are essential to the project, shall be furnished and installed without change in the price of the Work Assignment. Such miscellaneous items and accessories shall be of the same quality standards, including material, style, finish, strength, class, weight and other applicable characteristics, as specified for the major components of which the miscellaneous items or accessory is an essential part, and shall be approved by the City before installation. This requirement is not intended to include major components not covered by or inferable from the Drawings and Specifications.

**SP-29 SOURCES OF WATER FOR TESTING, CLEANING, AND OTHER CONSTRUCTION PURPOSES:**

Piping pressure and flow testing and flushing may be done with reclaimed water. Contractor's connection(s) to the City's reclaimed water supply shall allow the City to meter the amount of reclaimed water used in testing, flushing, and other miscellaneous purposes. The Contractor is responsible for obtaining meter(s) and associated appurtenances, and paying all appropriate fees/deposits. Contractor shall not use any water until or unless a meter is installed. The actual reclaimed water used will be provided at no cost to the Contactor. Any fees or deposits due back to the Contractor will be returned after the project is completed and the meter is removed.

If potable water is required for the project, a Contractor's connection(s) to the City's potable water supply shall allow the City to meter the amount of water used. All potable water connections shall include a reduced pressure zone backflow preventer. The Contractor is responsible for obtaining meter(s), backflow preventers, and associated appurtenances, and paying all appropriate fees and deposits. Contractor shall not use any potable water until a meter and backflow preventer are installed. The Contractor will set up an account with the City and will be billed at the City's normal rates for actual potable water used. Any fees or deposits due back to the Contractor will be returned after the project is completed and the meter is removed.

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**SP-30 PRE-INSTALLATION VIDEO:**

No work shall take place prior to the City's acceptance and approval of the Contractor's Pre-Installation Video. The video shall thoroughly capture the intended work area as outlined in the Contract Documents and Work Assignment.

**SP-31 PERIODIC CLEAN UP AND RESTORATION:**

During the work on the project the Contractor shall regularly remove from the work site, and properly dispose of, all accumulated debris and surplus material of any kind that result from their operations. The Contractor shall remove unsightly mounds of earth, large stones, boulders, and debris so the site presents a neat appearance. Burial of construction debris is not permitted. Unused tools and equipment shall be stored at the Contractor's property or base of operations for the project. When the work involves Rights-of-Way, private property, roadways, private driveways or access roads, easements and sidewalks, or any work that may impede pedestrian or vehicular traffic while the work is in progress, the Contractor shall backfill, grade, compact, and otherwise restore the area to the basic condition which existed prior to work in order to allow vehicular and pedestrian use. All areas must be restored to their original design grade to facilitate drainage.

**SP-32 MAINTENANCE OF FLOW:**

Contractor shall maintain the flow of the existing potable water, wastewater force mains, sanitary sewers with bypass pumping as needed, and lift stations during any work on the project. Maintenance of flow is considered incidental to the work and shall be done at no additional cost to the City.

**SP-33 CITY RIGHT-OF-WAY RESTORATION:**

The Right-of-Way restoration includes all procedures to restore them to a condition equal to or better than their original condition and to the satisfaction of the City. The Contractor shall be responsible for restoration of items including but not limited to existing structures, stabilized roads, and ground areas damaged during the project.

During installation of new utilities, the Contractor shall maintain an undisturbed existing buffer strip of ground cover measuring a minimum of one (1) foot in width from the edge-of-pavement (EOP) in order to minimize potential erosion along the pavement edge. The Contractor shall be responsible for all costs to restore this buffer strip if disturbed during work on the project.

**SP-34 LABOR, MATERIALS AND EQUIPMENT:**

The Contractor will provide competent, suitably qualified personnel to survey and lay out the Work and perform construction as required by the Contract Documents and Work Assignment. Contractor shall, at all times, maintain good discipline and order at the project location.

The Contractor shall furnish all materials, equipment, labor, transportation, construction equipment and machinery, tools, appliances, fuel, power, light, heat, local telephone, water and sanitary facilities and all other facilities and incidentals necessary for the execution, testing, initial operation and completion of the project.

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All materials and equipment will be new, except as otherwise provided in the Contract Documents and Work Assignment. When special makes or grades of material which are normally packaged by the supplier or manufacturer are specified or approved, such materials shall be delivered to the project site in their original packages or container with seals unbroken and labels intact.

All materials and equipment shall be applied, installed, connected, erected, used, cleaned and conditioned in accordance with the instructions of the applicable manufacturer, fabricator or processors, except as otherwise provided in the Contract Documents and Work Assignment.

**SP-35 MATERIALS, EQUIPMENT, PRODUCTS, AND SUBSTITUTIONS:**

Materials, equipment and products incorporated in the Work must be approved for use before being purchased by the Contractor. The Contractor shall submit to the City a list of proposed materials, equipment or products, together with such samples as may be necessary to determine their acceptability and obtain approval. No request for payment for "or equal" equipment will be approved until this list has been received and approved by the City.

Whenever a material, article or piece of equipment is identified on the Drawings or Specifications by reference to brand name or catalog number, it shall be understood that this is referenced for the purpose of defining the performance or other salient requirements and that other products of equal capacities, quality and function shall be considered per 40 CFR 33.255(c) as referenced in Chapter 62-552, FAC. The Contractor may recommend the substitution of a material, article, or piece of equipment of equal substance and function for those referred to in the Contract Documents by reference to brand name or catalog number, and if, in the opinion of the City, such material, article, or piece of equipment is of equal substance and function to that specified, the City may approve its substitution and use by the Contractor. Incidental changes or extra component parts required to accommodate the substitute will be made by the Contractor without a change in the Contract Price or Contract Time.

No substitute shall be ordered or installed without the written approval of the City who shall be the judge of equality. Delay caused by obtaining approvals for substitute materials will not be considered justifiable grounds for an extension of Contract Time.

Should any work or materials, equipment or products not conform with requirements of the Drawings and Specifications or become damaged during the progress of the Work, such Work or materials shall be removed and replaced, together with any work disarranged by such alteration, at any time before completion and acceptance of the Project. All such work shall be done at the expense of the Contractor.

No materials or supplies for the Work shall be purchased by the Contractor or by any Subcontractor subject to any chattel mortgage or under a conditional sale or other agreement by which an interest is retained by the Seller. The Contractor warrants that he has good title to all materials and supplies used in the Work.

**SP-36 USE OF PREMISES:**

The Contractor shall confine all apparatus, storage of materials, and operations of its employees to the limits indicated by law, ordinances, permits, and directions of the City, and shall not unnecessarily encumber any part of the site. Contractor shall not overload or permit any part of any structure to be loaded with such weight as will endanger its safety, nor shall it subject any part of the Work to stresses or

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pressures that will endanger the project. Contractor shall enforce City's instructions in connection with signs, advertisements, fires and smoking. Contractor shall arrange and cooperate with the City in routing and parking of automobiles of Contractor's employees, Subcontractors and other personnel, and in routing material delivery trucks and other vehicles to the Project site.

**SP-37 SURVEY:**

All survey monuments and benchmarks that may be disturbed during construction shall be referenced and replaced by the Contractor. All monuments and benchmarks disturbed or destroyed by the Contractor through accident or negligence shall be replaced by a Florida Licensed Professional Land Surveyor at the Contractor's expense.

**SP-38 MANUFACTURER'S LITERATURE:**

Manufacturer's literature, when referenced, shall be dated and numbered and is intended to establish the minimum requirements acceptable. Whenever reference is given to codes, or standard specifications or other data published by regulating agencies or accepted organizations, including but not limited to the National Electrical Code, applicable State Building Code, Federal Specifications, ASTM Specifications, various institute specifications, and the like, it shall be understood that such reference is to the latest edition including addenda in effect on the date of Bid.

**SP-39 BRAND NAMES:**

Brand names where used in the technical specifications, are intended to denote the standard of quality and performance required of the particular material or product. The term "equal" or "equivalent," when used in connection with brand names, shall be interpreted to mean a material or product that is similar and equal in type, quality, size, capacity, composition, finish, color and other applicable characteristics to the material or product specified by trade name, and that is suitable for the same use and capable of performing the same function, in the opinion of the City's Engineer of Record, as the material or product so specified. The City's Engineer of Record must approve proposed equal items before they are purchased or incorporated in the Work.

**SP-40 RECORD DRAWINGS:**

The Contractor shall keep one record copy of all Specifications, Drawings, Addenda, Modifications, and Shop Drawings at the project location and in good order and annotated to show all changes made during the construction process. Record Drawings shall list all equipment removed from existing facilities. These shall be available to the City, City's Representative, City's Engineer of Record, and to the State of Florida Department of Environmental Protection (FDEP), and shall be delivered by Contractor to the City upon completion of the Project. Final payment will not be made until receipt and approval by the City of Record Drawings.

**SP-41 RECORD DRAWINGS CERTIFICATION:**

The certification statement shall be as follows:

"I hereby certify that the as-built location information of the water and/or wastewater facilities shown on these drawings conforms to the Minimum Technical Standards for Land Surveying in the State of Florida, chapter 5J-17.052 (Florida Administrative Code), as adopted by the Department of Agriculture and

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Consumer Services, Division of Consumer Services, Board of Professional Surveyors and Mappers in 2010, and that said as-built are true and correct to the best of my knowledge and belief as surveyed under my direction."

**SP-42 COMPLETION OF THE PROJECT:**

The Completion of the project shall be accomplished and finalized prior to submittal of the application for final payment by the Contractor. The City shall determine the date of completion for the project when, at the minimum, the following are met as well as all other conditions defined in the Contract Documents and Word Assignment:

- All punch list items have been addressed to the satisfaction of the City.
- All testing has been completed and results are satisfactory (including but not limited to Pipe Pressure Test, Concrete, and Compaction Tests).
- Record Drawing requirements have been accepted and approved by the City and all other governmental agencies, if applicable.
- All associated equipment and facilities necessary for the reliable operation of the project are complete in accordance with contract requirements.
- All release of liens have been submitted and are satisfactory to the City, certifying that all payrolls, material bills, and other indebtedness incurred by the Contractor in connection with this project have been paid in full.

**SP-43 STORED MATERIALS:**

Payment for stored materials will be made in accordance with Section 3.2 of the Solicitation's General Provisions.

**SP-44 PAYMENT ADJUSTMENT:**

This Contract will not provide for fuel or other payment adjustments due to any increase in material costs during the life of the Contract.

**SP-45 WORK HOURS:**

The Contractor shall conduct all work on the project between 7 A.M. and 4 P.M. Monday through Friday, which is defined as regular work hours. The Contractor shall not conduct work on Saturdays, Sundays, legal holidays or holidays observed by the City. Work conducted outside of the regular work hours and days shall be permitted only with written permission from the City. Any additional cost incurred by North Port Utilities and/or the Engineer of Record for work outside these hours will be paid by the Contractor.

**SP-46 NOTIFICATIONS OF 48 HOURS:**

Wherever the technical specifications or plans indicate a minimum of 48 hours' notice to Owner/City or Engineer, this special provision shall prevail dictating a minimum of three (3) business days' notice to Owner/City or Engineer.

**SP-47 QUALIFICATIONS/REFERENCES:**

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Contractor shall submit a minimum of four (4) references of projects worked on within the previous five (5) years that were of similar size and scope involving cleaning and CCTV, cured-in-place liners, cured-in-place liner spot repair, manhole rehabilitations (or alternatives) and grouting or any combination of services being offered to the City. Each reference shall include a project description, project location, name and phone number of a contact person, total project amount, and completion date. The City reserves the right to contact references. Bidder is referred to MINIMUM QUALIFICATIONS AND REFERENCE FORM included later herein.

The Contractor/Subcontractor qualification requirements include, but are not limited to, the successful completion of utility relocations during roadway construction or similar project.

**SP-48 CITY'S STATUS:**

The City shall examine and inspect the work to assure compliance with the requirements of these Contract Documents and Work Assignment. The City shall determine the quality and acceptability of materials and workmanship relative to the requirements of the Plans and Technical Specifications. The City has the following authority:

1. To stop the work whenever such stoppage may be necessary to insure the proper execution of the Contract or Work Assignment.
2. To reject all work which does not conform to the Contract or Work Assignment.
3. To resolve questions which arise in the execution of the work.
4. To stop work whenever materials or shop drawings have not been approved prior to placement.

No additional time or compensation will be added to the Contract when stopping the work for the above listed reasons.

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SECTION [01 11 00] [01010]  
SUMMARY OF WORK

PART 1 GENERAL

1.01 LOCATION OF WORK

- A. The work of this Contract is located at throughout the City of North Port's wastewater collection system.

1.02 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to construct, install, and perform inflow and infiltration rehabilitation services within the wastewater collection system of the City of North Port in its entirety as shown on the Drawings and as specified herein. The types of rehabilitation work anticipated include sewer line cleaning and CCTV inspection, gravity sewer smoke testing, manhole rehabilitation, manhole lining systems, cured-in-place pipe lining and spot repairs, and grouting lateral connections.
- B. [The Work includes, but is not limited to, the following:
  - 1. Gravity sewer cleaning and closed-circuit television inspection
  - 2. Cured in place lining including spot repairs
  - 3. Manhole rehabilitation
  - 4. Smoke testing

1.03 WORK BY OTHERS

- A. None

1.04 CONTRACTOR'S USE OF PREMISES

- A. Coordinate use of premises with the Owner.
- B. Contractor shall assume full responsibility for security of all his/her and his/her subcontractor's materials and equipment stored on the site.
- C. If directed by the Owner, move any stored items which interfere with operations of Owner or other contractors.
- D. Obtain and pay for use of additional storage or work areas if needed to perform the Work.

1.05 OWNER OCCUPANCY

- A. Owner will occupy premises during performance of the work for the conduct of his/her

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normal operations. Coordinate all construction operations with Owner to minimize conflict and to facilitate Owner usage.

END OF SECTION

SECTION [01 20 00] [01025]  
MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SCOPE

- A. This Section includes specification for the measurement and payment of the various elements of the Work; with provisions applicable to lump sum prices, unit prices, and allowances, if applicable.
- B. In the case of conflict between this Section and the measurement methods specified in the individual technical Sections, the measurement methods in the technical specifications shall govern.
- C. The Contractor shall receive no payment for any portion of the work until it is installed. The only exception to this is payment for stored materials on site if the Contract provides for the payment of stored materials. Partial payment may be requested for items partially installed.

1.02 RELATED WORK

- A. General Provisions
- B. Special Provisions

1.03 LUMP SUM ITEMS

- A. Lump Sum measurement will be for the entire item, unit of work, structure, or combination thereof, as specified and as indicated in the Bid Form. Measurement and payment for all bid items indicated as Lump Sums shall include the cost of all labor, materials and equipment necessary to furnish, install, clean, test, and place each bid item into operation; including permitting, general conditions, overhead and profit.
- B. Progress payments will be based on the Schedule of Values prepared by the Contractor and approved by the Engineer and/or Owner before acceptance of the first Application for Payment.
- C. In order for the Contractor to request progress payments against Lump Sum items, Contractor shall provide a disaggregation or breakdown in sufficient measurable detail that is acceptable to the Engineer.
- D. Measurement

- 1. Measurement shall be based on the estimated percent complete of each item of

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the Schedule of Values, as determined by the Engineer and/or Owner.

E. Payment

1. Payment will be made at the lump sum price proportional to the completion percentages approved by the Engineer and/or Owner.

1.04 UNIT PRICE ITEMS

- A. Quantity and measurement estimates stated in the Bid Form are estimates for bidding purposes only. Actual payments shall be based on actual quantities installed, in-place, as measured and/or verified by the Engineer and/or Owner.
- B. Unless otherwise provided in the General or Special Provisions, the bid unit prices shall be in effect throughout the contract duration, regardless of variances between the estimated quantities and the actual installed quantities.
- C. The Contractor shall make no claim, nor receive any compensation, for anticipated profits, loss of profit, damages, or any extra payment due to any difference between the amounts of work actually completed, or materials or equipment furnished, and the estimated quantities.
- D. Unless otherwise approved by the Owner, any unit quantities exceeded may not be invoiced until the estimated quantity is increased by contract change order.
- E. Contractor shall assist Engineer by providing necessary equipment, workers, and survey personnel as required to measure quantities.
- F. Measured quantities shall be rounded to the nearest whole integer.
  1. Measurement for progress payment shall be made or approved by the Engineer and/or Owner based on the estimated effective quantity installed. The effective quantity installed represents the actual units or quantities installed, adjusted for incomplete elements or components.
  2. Unless otherwise provided for in the Bid Form unit price items are all-inclusive of all related work, direct and indirect, to provide a complete and functional item. For example, underground pipe installation would include trenching, shoring, dewatering, bedding, installation, backfill, testing, flushing, disinfection, and commissioning; including all labor, materials and equipment necessary to furnish, install, clean, test, and place into operation; including permitting, general conditions, overhead and profit.
  3. The final measurement shall be based on actual quantities, jointly measured by Contractor, Engineer and/or Owner, complete, fully, tested and placed into service.

G. Payment

1. Progress payments shall be in accordance with the contract documents based on estimated effective quantities installed, paid at the bid unit price.
2. The final payment shall be based on actual quantities, fully installed, tested and placed

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into service, paid at the bid unit price.

PART 2 PRODUCTS – NOT USED PART 3

EXECUTION

3.01 UNIT PRICE ITEMS

A. GRAVITY SEWER CLEANING AND CLOSED-CIRCUIT TELEVISION INSPECTION

1. Measurement

- a. Gravity sewer cleaning and closed-circuit television inspection of the size specified on the Bid Form will be measured in place on a linear foot basis. Measurement for length will be along the horizontal centerline of the pipe, with no deductions for manholes. Measurement will be to the nearest foot as achieved by tape measure survey over the surface of the alignment.

2. Payment

- a. Payment for gravity sewer cleaning and closed-circuit television inspection shall be by size will be made for the respective quantities as above determined, at the price per linear foot entered for the respective item on the Bid Form. Such price and payment shall be full compensation for all related and incidental work, including, but not limited to:
- 1) utility locates, maintenance of traffic provisions, cutting existing pavement;
  - 2) temporary provisions necessary to maintain service;
  - 3) dewatering and drainage; furnishing and installing any geotextile filter fabric;
  - 4) disposal of debris from cleaning operations;

B. CURED-IN-PLACE LINER

1. Measurement

- a. Cured-in-place liner will be measured in place on a linear foot basis. Measurement for length will be along the horizontal centerline of the pipe. Measurement will be to the nearest foot as achieved by tape measure survey over the surface of the alignment.

2. Payment

- a. Payment for cured-in-place liner shall be by size and will be made for the respective quantities as above determined, at the price per linear foot entered for the respective item on the Bid Form. Such price and payment shall be full compensation for all related and incidental work, including, but not limited to:
- 1) re-establishment of sewer service connections covered by the liner
  - 2) utility locates, maintenance of traffic provisions, cutting existing pavement;
  - 3) temporary provisions necessary to maintain service;
  - 4) dewatering and drainage; furnishing and installing any geotextile filter fabric;
  - 5) disposal of debris from cleaning operations;

C. MANHOLE REHABILITATION, CEMENTITIOUS MONOLITHIC MANHOLE LINING SYSTEM, EPOXY MONOLITHIC MANHOLE LINING SYSTEM, AND CURED-IN-PLACE MONOLITHIC MANHOLE LINING SYSTEM

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1. Measurement
  - a. Manhole rehabilitations shall be counted as the number of completed structures of each depth completed.
2. Payment
  - a. Payment for manhole rehabilitations shall include furnishing and installing all materials necessary for a complete item. Price and payment will be full compensation for utility locates, maintenance of traffic, cutting existing pavement, cleaning, debris removal, as specified and all work required for or incidental to the satisfactory completion of the items for which separate payment is not provided under other items in the Bid Form.

D. CURED-IN-PLACE SPOT REPAIRS

1. Measurement
  - a. Cured-in-place spot repairs will be measured as the actual number of each size of repair completed.
2. Payment
  - a. Payment for cured-in-place spot repairs shall be by size and will be made for the respective quantities as above determined, at the unit price entered for the respective item on the Bid Form. Such price and payment shall be full compensation for all related and incidental work, including, but not limited to:
    - 1) re-establishment of sewer service connections covered by the spot repair;
    - 2) utility locates, maintenance of traffic provisions, cutting existing pavement;
    - 3) temporary provisions necessary to maintain service;
    - 4) dewatering and drainage; furnishing and installing any geotextile filter fabric;
    - 5) disposal of debris from cleaning operations;

E. GROUTING SERVICE LATERAL CONNECTION

1. Measurement
  - a. Grouting of sewer service connections shall be measured as the actual number of connections completed.
2. Payment
  - a. Payment for grouting service connections shall include furnishing and installing all materials necessary for a complete repair including testing of the repair. Price and payment will be full compensation for utility locates, maintenance of traffic, cutting existing pavement, cleaning, debris removal, as specified and all work required for or incidental to the satisfactory completion of the items for which separate payment is not provided under other items in the Bid Form.

F. MOBILIZATION/DEMOBILIZATION

1. Measurement
  - a. Mobilization/demobilization will be measured as a noted in the Bid Form not to exceed five (5%) percent of the total value of the sum of all the other items dollar value.

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2. Payment
  - a. Mobilization/demobilization will be paid one time on a lump sum basis not to exceed five (5%) percent of the value of the total contract.

END OF SECTION

SECTION [01 35 43] [01110]  
ENVIRONMENTAL PROTECTION PROCEDURES

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of inspection, rehabilitation and/or construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species; or degrade the utility of the environment for aesthetic and/or recreational purposes.
- B. The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.
- C. Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to construction activity in that area.
- D. This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.
- E. All phases of sedimentation and erosion control shall comply with and be subject to the approval of the Southwest Florida Water Management District, the Florida Department of Environmental Protection and the City of North Port. Prepare sedimentation and erosion control drawings meeting the requirements for approval by these agencies. Upon approval, furnish two copies of the approved Drawing to the Engineer and/or Owner.

1.02 APPLICABLE REGULATIONS

- A. Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

1.03 NOTIFICATIONS

- A. The Engineer and/or Owner will notify the Contractor in writing of any non-compliance with

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the foregoing provisions or of any environmentally objectionable acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer or Owner, of any non-compliance with State or local requirements. After receipt of such notice from the Engineer, Owner or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If

the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or damages by the Contractor unless it is later determined that the Contractor was in compliance.

## 1.04 IMPLEMENTATION

- A. Prior to commencement of the work, meet with the Engineer and/or Owner to develop mutual understandings relative to compliance with these provisions and administration of the environmental pollution control program.
- B. Remove temporary environmental control features, when approved by the Engineer and/or Owner and incorporate permanent control features into the project at the earliest practicable time.

## PART 2 PRODUCTS (NOT USED) PART 3

## EXECUTION

## 3.01 EROSION CONTROL

- A. Provide positive means of erosion control such as shallow ditches around construction to carry off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. Flow of surface water into excavated areas shall be prevented. Ditches around construction area shall also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to original condition.

## 3.02 PROTECTION OF STREAMS AND SURFACE WATERS

- A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream or surface water from pollution by debris, sediment or other material, or from the manipulation of equipment and/or materials in or near such streams. Water that has been used for washing or processing, that contains oils or sediments that will reduce the quality of the water in the stream, shall not be directly returned to the stream. Divert such waters through a settling basin or filter before being directed into streams or surface waters.
- B. Do not discharge water from dewatering operations directly into any live or intermittent stream, channel, wetlands, surface water or any storm sewer. Water from dewatering operations shall

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be treated by filtration, settling basins, or other approved method to reduce the amount of sediment contained in the water to allowable levels.

- C. Take all preventative measures to avoid spillage of petroleum products and other pollutants. In the event of any spillage, prompt remedial action shall be taken in accordance with a contingency action approved by the Florida Department of Environmental Protection.

3.03 PROTECTION OF LAND RESOURCES

- A. Restore land resources within the project boundaries and outside the limits of permanent work to a condition, after completion of construction that will appear to be natural and not detract from the appearance of the project. Confine all construction activities to areas shown on the Drawings.
- B. Outside of areas requiring earthwork for the construction of the new facilities, do not deface, injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No ropes, cables, or guys shall be fastened to or attached to any existing nearby trees for anchorage unless specifically authorized by the Engineer and/or Owner. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.
- C. Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.
- D. Trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer and/or Owner will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.
  - 1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than one (1") inch in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.
  - 2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer and/or Owner, shall be immediately removed and replaced.
- E. The locations of the Contractor's storage and other construction buildings required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings

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showing storage facilities shall be submitted for approval of the Engineer and/or Owner.

- F. If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, they shall submit the following for approval at least ten days prior to scheduled start of such temporary work.
1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.
  2. Details of temporary road construction.
  3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.
  4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final condition of the area. Modification of the Contractor's approved drawings shall be made only with the written approval of the Engineer. No unauthorized road construction, excavation or embankment construction including disposal areas will be permitted.
- G. Remove all signs of temporary construction facilities such as haul roads, work areas, structures, foundations of temporary structures, stockpiles of excess of waste materials, or any other vestiges of construction as directed by the Engineer and/or Owner. It is anticipated that excavation, filling and plowing of roadways will be required to restore the area to near natural conditions which will permit the growth of vegetation thereon. The disturbed areas shall be prepared and seeded as described in Section [32 92 19] [02930], or as approved by the Engineer and/or Owner.
- H. All debris and excess material will be disposed of outside wetland or floodplain areas in an environmentally sound manner.

### 3.04 PROTECTION OF AIR QUALITY

- A. Burning - The use of burning at the project site for the disposal of refuse and debris will not be permitted.
- B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant sites, waste areas, borrow areas and all other work areas within or without the project boundaries free from dust which could cause the standards for air pollution to be exceeded and which would cause a hazard or nuisance to others.
- C. An approved method of stabilization consisting of sprinkling or other similar methods will be permitted to control dust. The use of petroleum products is prohibited.
- D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of the disturbed area at least damp at all times, and the Contractor shall have sufficient competent equipment on the job to accomplish this. Dust control shall be performed as the work

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proceeds and whenever a dust nuisance or hazard occurs, as determined by the Engineer and/or Owner.

## 3.05 NOISE CONTROL

- A. Make every effort to minimize noises caused by the construction operations. Equipment shall be equipped with silencers or mufflers designed to operate with the least possible noise in compliance with Federal and State regulations.

## 3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRUCTION

- A. Maintain all facilities constructed for pollution control as long as the operations creating the particular pollutant are being carried out or until the material concerned has become stabilized to the extent that pollution is no longer being created.

END OF SECTION

SECTION [01 30 00] [01300]  
SUBMITTALS

## PART 1 GENERAL

## 1.01 SCOPE OF WORK

- A. This Section includes the requirements for compiling, processing and transmitting submittals required for execution of the project.
- B. Submittals are categorized into two types: Action Submittals and Informational Submittals, as follows:
  - 1. Action Submittal: Written and graphic information submitted by the Contractor that requires the Engineer's and/or Owner's approval. The following are examples of action submittals:
    - a. Shop drawings (including working drawings, valve schedule in accordance with Section [01 13 10] [01170], and product data)
    - b. Samples
    - c. Operation & maintenance manuals
    - d. Site Usage Plan (Contractor's staging - including trailer siting and material laydown area)
    - e. Schedule of values
    - f. Payment application format
  - 2. Informational Submittal: Information submitted by the Contractor that does not require the Engineer's and/or Owner's approval. The following are examples of informational submittals:
    - a. Shop Drawing Schedule
    - b. Construction Schedule
    - c. Statements of Qualifications
    - d. Health and Safety Plans
    - e. Construction Photography and Videography

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- f. Work Plans
- g. Maintenance of Traffic Plans
- h. Outage Requests
- i. Proposed Testing Procedures
- j. Test Records and Reports
- k. Vendor Training Outlines/Plans
- l. Test and Start-Up Reports
- m. Certifications
- n. Record Drawings
- o. Record Shop Drawings
- p. Submittals required by laws, regulations and governing agencies
- q. Submittals required by funding agencies
- r. Other requirements found within the technical specifications
- s. Warranties and Bonds
- t. As-Built Surveys
- u. Contract Close-out Documents

1.02 RELATED WORK

- A. Additional requirements may be specified in the General and Special Provisions for the Contract.
- B. Additional submittal requirements may be specified in the respective technical Specification Sections.
- C. Operation and Maintenance manuals are included in Section [01 78 23] [01730].
- D. Contract closeout submittals are included in Section [01 77 10] [01700].
- E. Warranties and Bonds are included in Section [01 78 36] [01740].
- F. Construction Photos are included in Section [01 32 33] [01380].
- G. Applications for Payment are included in Section [01 29 76] [01152].
- H. Construction Schedules are included in Section [01 32 16] [01310].
- I. Project Controls (Surveying) [01 71 20] [01050].
- J. Project Record Documents are included in Section [01 78 39] [01720].
- K. Requests for Information are included in Section [01 26 13] [01038].

1.03 CONTRACTOR'S RESPONSIBILITIES

- A. All submittals shall be clearly identified as follows:
  - 1. Date of Submission.
  - 2. Project Number.

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3. Project Name.
  4. Contractor Identification.
    - a. Contractor.
    - b. Supplier.
    - c. Manufacturer.
    - d. Manufacturer or supplier representative.
  5. Identification of the Product.
  6. Reference to Contract Drawing.
  7. Reference to specification section number, page and paragraph(s).
  8. Reference to applicable standards, such as ASTM or Federal Standards numbers.
  9. Indication of Contractor's approval.
  10. Contractor's Certification statement.
  11. Identification of deviations from the Contract Documents, if any.
  12. Reference to previous submittal (for resubmittals).
  13. Made in America (when required by the Contract).
- B. Submittals shall be clear and legible, and of sufficient size for legibility and clarity of the presented data.
- C. Submittal Log. Maintain a log of all submittals. The submittal log shall be kept accurate and up to date. This log should include the following items (as applicable):
1. Description.
  2. Submittal Number.
  3. Date transmitted to the Engineer.
  4. Date returned to Contractor (from Engineer).
  5. Status of Submittal (Approved/Not Approved/etc.).
  6. Date of Resubmittal to Engineer and Return from Engineer (if applicable and repeat as necessary).
  7. Date material released for fabrication.
  8. Projected (or actual) delivery date.
- D. Numbering System. Utilize the following submittal identification numbering system:
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1. The first character shall be a D, S, M or I which represents Shop Drawing (including working drawings and product data), Sample, Manual (Operating & Maintenance) or Informational, respectively.
  2. The next five digits shall be the applicable Section Number.
  3. The next three digits shall be the sequential number of each separate item or drawing submitted under each Specification Section, in the chronological order submitted, starting at 001.
  4. The last character shall be a letter, A to Z, indicating the submission (or resubmission) of the same submittal, i.e., "A" = 1st submission, "B" = 2nd submission, "C" = 3rd submission, etc. A typical submittal number would be as follows:
    - a. D-03300-008-B.
    - b. D = Shop Drawing03300 = Section for Concrete.
    - c. 008 = the eighth different submittal under this Section.
    - d. B = the second submission (first resubmission) of that particular shop drawing.
- E. Variances
1. Notify the Engineer and/or Owner in writing, at the time of submittal, of any deviations in the submittals from the requirements of the Contract Documents.
  2. Notify the Engineer and/or Owner in writing, at the time of re-submittal (resubmission), of all deviations from previous submissions of that particular shop drawing, except those deviations which are the specific result of prior comments from the Engineer.
- F. Action Submittals
1. Shop Drawings, Working Drawings, Product Data and Samples.
    - a. Shop Drawings.
      - 1) Shop drawings as defined in the General Conditions, and as specified in individual Sections may include, but are not necessarily limited to, custom prepared data such as fabrication and erection/installation (working) drawings, scheduled information, setting diagrams, actual shop work manufacturing instructions, custom templates, valve schedules, wiring diagrams, coordination drawings, equipment inspection and test reports, and performance curves and certifications, as applicable to the work.
      - 2) Contractor shall verify all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data, and coordinate each item with other related shop drawings and the Contract requirements.
      - 3) All details on shop drawings shall clearly show the relation of the various parts to the main members and lines of the structure and where correct fabrication of the work depends upon field measurements, such measurements shall be made and noted on the drawings before being submitted.
      - 4) All shop drawings submitted by subcontractors and vendors shall be reviewed by the Contractor. Contractor shall confirm, materials, dimensions, catalog numbers, technical data and performance criteria; and shall coordinate with other related shop drawings and the Contract requirements. In addition,

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Contractor shall confirm existing field conditions and dimensions and assure that the submittal is coordinated and compatible with existing conditions. Submittals directly from subcontractors or vendors will not be accepted by the Engineer.

- 5) The Contractor shall be responsible the accuracy of the subcontractor's or vendor's submittal; and, for their submission in a timely manner to support the requirements of the Contractor's construction schedule. Shop drawings found to be inaccurate or otherwise in error shall be returned to the subcontractor or vendor to correct, before submission to the Engineer. All shop Drawings shall be approved by the Contractor.
  - 6) Delays to construction due to the untimely submission of submittals will constitute inexcusable delays, for which Contractor shall not be eligible for additional cost nor additional contract time. Inexcusable delays consist of any delay within the Contractor's control.
  - 7) Submittals for equipment specified under Divisions [11, 13, 14, 15 and 16] [11, 13, 14, 21, 22, 23, 31, 33, 35, 40 through 46] shall include a listing of installations where identical or similar equipment manufactured by that manufacturer has been installed and in operation for a period of at least five years.
- b. Working Drawings
- 1) Detailed installation drawings (sewers, equipment, piping, electrical conduits and controls, HVAC work, and plumbing, etc.) shall be prepared and submitted for review and approval by the Engineer prior to installing such work. Installation drawings shall be to-scale and shall be fully dimensioned.
  - 2) Piping working drawings shall show the laying dimensions of all pipes, fittings, valves, as well as the equipment to which it is being connected. In addition, all pipe supports shall be shown.
  - 3) Equipment working drawings shall show all equipment dimensions, anchor bolts, support pads, piping connections and electrical connections. In addition, show clearances required around such equipment for maintenance of the equipment.
  - 4) Electrical working drawings shall show conduits, junction boxes, disconnects, control devices, lighting fixtures, support details, control panels, lighting and power panels, and Motor Control Centers. Coordinate all locations with the Contract Documents and the Contractor's other working drawings.
- c. Product Data
- 1) Product data, as specified in individual Specification Sections, include, but are not limited to, the manufacturer's standard prepared data for manufactured products (catalog data), such as the product specifications, installation instructions, availability of colors and patterns, rough-in diagrams and templates, product photographs (or diagrams), wiring diagrams, performance curves, quality control inspection and reports, certifications of compliance (as specified or otherwise required), mill reports, product operating and maintenance instructions, recommended spare parts and product warranties, as applicable.
- d. Samples
- 1) Furnish, samples required by the Contract Documents for the Engineer's approval. Samples shall be delivered to the Engineer as specified or directed. Unless specified otherwise, provide at least two samples of each required

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- item. Materials or equipment for which samples are required shall not be used in the work unless and until approved by the Engineer.
- 2) Samples specified in individual Specification Sections, include, but are not limited to: physical examples of the work (such as sections of manufactured or fabricated work), small cuts or containers of materials, complete units of repetitively-used products, color/texture/pattern swatches and range sets, specimens for coordination of visual effect, graphic symbols, and other specified units of work.
  - 3) Approval of a sample shall be only for the characteristics or use named in such approval and shall not be construed to change or modify and Contract Requirements.
  - 4) Approved samples not destroyed in testing shall be sent to the Engineer or stored at the site of the work. Approved samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in work shall match the approved samples. Samples which fail testing or are not approved will be returned to the Contractor at his expense, if so requested at time of submission.
- e. Professional Engineer (P.E.) Certification Form
- 1) If specifically required in any of the technical Specification Sections, submit a Professional Engineer (P.E.) Certification for each item required, using the form appended to this Section.
2. Contractor's Certification
- a. Each shop drawing, working drawings, product data, and sample shall have affixed to it the following Certification Statement:
    - 1) "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements."
  - b. Shop drawings, working drawings, and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The transmittal cover sheet for each identified shop drawing shall fully describe the packaged data and include a listing of all items within the package.
3. The review and approval of shop drawings, working drawings, product data, or samples by the Engineer shall not relieve the Contractor from the responsibility for the fulfillment of the terms of the Contract. All risks of error and omission are assumed by the Contractor and the Engineer will have no responsibility therefor.
4. Project work, materials, fabrication, and installation shall conform to approved shop drawings (including working drawings and product data) and applicable samples.
5. No portion of the work requiring a shop drawing (including working drawings and product data) or sample shall be started, nor shall any materials be fabricated or installed before approval of such item. Procurement, fabrication, delivery or installation of products or materials that do not conform to approved shop drawings shall be at the Contractor's

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risk. Furthermore, such products or materials delivered or installed without approved shop drawings, or in non-conformance with the approved shop drawings will not be eligible for progress payment until such time as the product or material is approved or brought into compliance with approved shop drawings. Neither the Owner nor Engineer will be liable for any expense or delay due to corrections or remedies required to accomplish conformity.

6. Operation and Maintenance Data
  - a. Operation and maintenance data shall be submitted in assembled manuals as specified. Such manuals shall include detailed instructions for Owner personnel on safe operation procedures, controls, start-up, shut-down, emergency procedures, storage, protection, lubrication, testing, trouble-shooting, adjustments, repair procedures, and other maintenance requirements.
7. Schedule of Values
  - 1) On projects consisting of lump sums (in whole or in part) submit a proposed schedule of values providing a breakdown of lump sum items in to reasonably small components – generally disaggregated by building, area, and/or discipline. The purpose of the schedule of values is for processing partial payment applications. If requested by the Engineer, provide sufficient substantiation for all or some items as necessary to determine the proposed schedule of values is a reasonable representation of the true cost breakdown of the Work. The schedule of values shall not be unbalanced to achieve early payment or over-payment in excess of the value of work or any other mis-distribution of the costs. If, in the opinion of the Engineer, the schedule of values is unbalanced, Contractor shall reallocate components to achieve a balanced schedule acceptable to Engineer.
8. Payment Application Format
  - 1) If an application form is included in the Contract Documents, use that form unless otherwise approved by the Engineer and Owner. If an application form is not included in the Contract Documents, Contractor may propose a form for approval.
9. Site Usage
  - a. Submit a proposed site staging plan, including but not limited to the location of office trailers, storage trailers and material laydown. Such plan shall be a graphic presentation (drawing) of the proposed locations; and, shall include on-site traffic modifications, and temporary utilities, as may be applicable.

## G. Informational Submittals

1. Shop Drawing Schedule
  - a. Prepare and submit a schedule indicating when shop drawings are required to be submitted to support the as-planned construction schedule. The submittal schedule shall allow sufficient time for preparation and submittal, review and approval, and fabrication and delivery to support the construction schedule.
2. Construction Schedule

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- a. Prepare and submit construction schedules and monthly status reports as specified.
3. Statements of Qualifications
  - a. Provide evidence of qualification, certification, or registration, as required in the Contract Documents, to verify qualifications of licensed land surveyor, professional engineer, materials testing laboratory, specialty subcontractor, technical specialist, consultant, specialty installer, and other professionals.
  - b. Health and Safety Plans
    - 1) When specified, prepare and submit a general company Health and Safety Plan (HSP), modified or supplemented to include job-specific considerations.
4. Construction Photography and Videography
  - a. Provide periodic construction photographs and videography as specified – including but not limited to preconstruction photographs and/or video, monthly progress photos and/or video and post-construction photographs and/or video.
5. Work Plans
  - a. Prepare and submit copies of all work plans needed to demonstrate to the Owner that Contractor has adequately thought-out the means and methods of construction and their interface with existing facilities.
6. Maintenance of Traffic Plans
  - a. Prepare maintenance of traffic plans where and when required by the Contract Documents and by local ordinances or regulations. If Contractor is not already knowledgeable about local ordinances and regulations regarding maintenance of traffic requirements, become familiar with such requirements and include all costs for preparation and submittal of traffic management plans and all associated costs for permits and fees to implement the traffic management plan, in the bid amount. In addition, unless a supplemental payment provision is provided in the bid form, include the cost of police attendance, when required.
7. Outage Requests
  - a. Provide sufficient notification of any outages required (electrical, flow processes, etc.) as may be required to tie-in new work into existing facilities. Unless specified otherwise elsewhere, a minimum of seven calendar days' notice shall be provided.
8. Proposed Testing Procedures
  - a. Prepare and submit testing procedures it proposes to use to perform testing required by the various technical specifications.
9. Test Records and Reports
  - a. Provide copies of all test records and reports as specified in the various technical specifications.
10. Vendor Training Outlines/Plans
  - a. At least two weeks before scheduled training of Owner's personnel, provide lesson plans for vendor training in accordance with the specification for O&M manuals.
11. Test and Start-up Reports

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- a. Manufacture shall perform all pre-start-up installation inspection, calibrations, alignments, and performance testing as specified in the respective Specification Section. Provide copies of all such test and start-up reports.
12. Certifications
    - a. Provide various certifications as required by the technical specifications. Such certifications shall be signed by an officer (of the firm) or other individual authorized to sign documents on behalf of that entity.
    - b. Certifications may include, but are not limited to:
      - 1) Welding certifications and welders' qualifications
      - 2) Certifications of Installation, Testing and Training for all equipment
      - 3) Material Testing reports furnished by an independent testing firm
      - 4) Certifications from manufacturer(s) for specified factory testing
      - 5) Certifications required to indicate compliance with any sustainability or LEEDS accreditation requirements indicated in the Contract Documents
  13. Record Drawings
    - a. No later than Substantial Completion, submit a record of all changes during construction not already incorporated into drawings – in accordance with specification on Project Record Documents.
  14. Record Shop Drawings
    - a. Before final payment is made, furnish one set of record shop drawings to the Engineer. These record shop drawings shall be in conformance with the approved documents and should show any field conditions which may affect their accuracy.
    - b. Submittals required by laws, regulations and governing agencies
      - 1) Prepare and submit all documentation required by state or local law, regulation or government agency directly to the applicable agency. This includes, but is not limited to, notifications, reports, certifications, certified payroll (for projects subject to wage requirements) and other documentation required to satisfy all requirements. Provide to Engineer one copy of each submittal made in accordance with this paragraph.
    - c. Submittals required by funding agencies
      - 1) Prepare and submit all documentation required by funding agencies. This includes, but is not limited to segregated pay applications and change orders when required to properly allocate funds to different funding sources; and certified payrolls for projects subject to wage requirements. Provide one copy of each submittal made in accordance with this paragraph to the Engineer.
  15. Other requirements of the technical Specification Sections
    - a. Comply with all other requirements of the technical specifications.
  16. Warranties and Bonds
    - a. Assemble a booklet or binder of all warranties and bonds as specified in the various technical specifications and in accordance with the specification on Warranties and Bonds; and provide two originals to the Engineer.

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17. As-Built Surveys
  - a. Engage the services of a licensed land surveyor in accordance with the Project Controls (Surveying) specification. Prior to Final Completion, provide an as-built survey of the constructed facility, as specified.
  
18. Contract Close-Out Documents
  - a. Submit Contract documentation as indicated in the specification for Contract Close-out.

PART 2 PRODUCTS (NOT USED) PART 3

EXECUTION

3.01 SUBMITTAL SCHEDULE

- A. Provide an initial submittal schedule at the pre-construction meeting for review by Owner and Engineer. Incorporate comments from Owner or Engineer into a revised submittal schedule.
  
- B. Maintain the submittal schedule and provide sufficient copies for review by Owner and Engineer. An up-to-date submittal schedule shall be provided at each project progress meeting.

3.02 TRANSMITTALS

- A. Prepare separate transmittal sheets for each submittal. Each transmittal sheet shall include at least the following: Contractor's name and address, Owner's name, project name, project number, submittal number, description of submittal and number of copies submitted.
  
- B. Submittals shall be transmitted or delivered directly to the office of the Engineer, as indicated in the Contract Documents or as otherwise directed by the Engineer.
  
- C. Provide copies of transmittals forms or cover letters (without attachments) directly to the Resident Project Representative.

3.03 PROCEDURES

- A. Action Submittals

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1. Contractor's Responsibilities
  - a. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in advance of performing the related work or other applicable activities, or within the time specified in the individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required). Coordinate with other submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. Extensions to the Contract Time will not be approved for the Contractor's failure to transmit submittals sufficiently in advance of the Work.
  - b. The submittals of all shop drawings (including working drawings and product data) shall be sufficiently in advance of construction requirements to allow for possible need of re-submittals, including the specified review time for the Engineer.
  - c. No less than twenty (20) calendar days will be required for Engineer's review time for shop drawings and O&M manuals involving only one engineering discipline. No less than thirty (30) calendar days will be required for Engineer's review time for shop drawings and O&M manuals that require review by more than one engineering discipline. Resubmittals will be subject to the same review time.
  - d. Submittals of operation and maintenance data shall be provided within 30 days of approval of the related shop drawing(s).
  - e. Before submission to the Engineer, review shop drawings as follows:
    - 1) make corrections and add field measurements, as required
    - 2) use any color for its notations except red (reserved for the Engineer's notations) and black (to be able to distinguish notations on black and white documents)
    - 3) identify and describe each and every deviation or variation from Contract documents or from previous submissions, except those specifically resulting from a comment from the Engineer on a previous submission
    - 4) include the required Contractor's Certification statement
    - 5) provide field measurements (as needed)
    - 6) coordinate with other submittals
    - 7) indicate relationships to other features of the Work
    - 8) highlight information applicable to the Work and/or delete information not applicable to the Work
  - f. Submit the following number of copies:
    - 1) Shop drawings (including working drawings and product data) – electronically
    - 2) Samples – electronically
    - 3) Site Usage Plan – electronically
    - 4) Schedule of values – electronically
    - 5) Payment application format – electronically
  - g. If Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, provide written notice thereof to the Engineer immediately; and do not release for manufacture before such notice has been received by the Engineer.
  - h. When the shop drawings have been completed to the satisfaction of the Engineer, carry out the construction in accordance therewith; and make no further changes therein except upon written instructions from the Engineer.
2. Engineer's Responsibilities
  - a. Engineer will not review shop drawings (including working drawings and product

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data) that do not include the Contractor's approval stamp and required certification statement. Such submittals will be returned to the Contractor, without action, for correction.

- b. Partial shop drawings (including working drawings and product data) will not be reviewed. If, in the opinion of the Engineer, a submittal is incomplete, that submittal will be returned to the Contractor for completion. Such submittals may be returned with comments from Engineer indicating the deficiencies requiring correction.
  - c. If shop drawings (including working drawings and product data) meet the submittal requirements, Engineer will forward copies to appropriate reviewer(s). Otherwise, noncompliant submittals will be returned to the Contractor without action - with the Engineer retaining one copy.
  - d. Submittals which are transmitted in accordance with the specified requirements will be reviewed by the Engineer within the time specified herein. The time for review will commence upon receipt of submittal by Engineer.
3. Review of Shop Drawings (Including Working Drawings and Product Data) and Samples
- a. The review of shop drawings, working drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:
    - 1) as permitting any departure from the Contract requirements
    - 2) as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials
    - 3) as approving departures from details furnished by the Engineer, except as otherwise provided herein
  - b. The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.
  - c. If the shop drawings (including working drawings and product data) or samples as submitted describe variations and indicate a deviation from the Contract requirements that, in the opinion of the Engineer are in the interest of the Owner and are so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed drawings without noting an exception.
  - d. Only the Engineer will utilize the color "RED" in marking submittals.
  - e. Shop drawings will be returned to the Contractor with one of the following codes.
    - 1) "APPROVED" - This code is assigned when there are no notations or comments on the submittal. When returned under this code the Contractor may release the equipment and/or material for manufacture.
    - 2) "APPROVED AS NOTED" - This code is assigned when a confirmation of the notations and comments IS NOT required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product.
    - 3) "APPROVED AS NOTED/CONFIRM" - This combination of codes is assigned when a confirmation of the notations and comments is required by the Contractor. The Contractor may release the equipment or material for manufacture; however, all notations and comments must be incorporated into the final product. This confirmation shall specifically address each omission and nonconforming item that was noted. Confirmation is to be received by the

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Engineer within fifteen (15) calendar days of the date of the Engineer's transmittal requiring the confirmation.

- 4) "APPROVED AS NOTED/RESUBMIT" - This combination of codes is assigned when notations and comments are extensive enough to require a resubmittal of the entire package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by the Engineer within thirty (30) calendar days of the date of the Engineer's transmittal requiring the resubmittal.
  - 5) "NOT APPROVED" - This code is assigned when the submittal does not meet the intent of the contract documents. The Contractor must resubmit the entire package revised to bring the submittal into conformance. It may be necessary to resubmit using a different manufacturer/vendor to meet the requirements of the contract documents.
  - 6) "COMMENTS ATTACHED" - This code is assigned where there are comments attached to the returned submittal, which provide additional data to aid the Contractor.
  - 7) "RECEIPT ACKNOWLEDGED (Not subject to Engineer's Review or Approval)" - This code is assigned to acknowledge receipt of a submittal that is not subject to the Engineer's review and approval, and is being filed for informational purposes only. This code is generally used in acknowledging receipt of means and methods of construction work plans, field conformance test reports, and health and safety plans.
- f. Repetitive Reviews: Shop drawings, O&M manuals and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at the Contractor's expense. Reimburse the Owner for all costs invoiced by Engineer for the third and subsequent reviews.
4. Electronic Transmission
- a. Action Submittals may be transmitted by electronic means provided the following conditions are met:
    - 1) The above-specified transmittal form is included.
    - 2) All other requirements specified above have been met including, but not limited to, coordination by the Contractor, review and approval by the Contractor, and the Contractor's Certification.
    - 3) The submittal contains no pages or sheets large than 11 x 17 inches.
    - 4) With the exception of the transmittal sheet, the entire submittal is included in a single file.
    - 5) The electronic files are PDF format (with printing enabled).
    - 6) In addition, transmit three hard-copy (paper) originals to the Engineer.
    - 7) The Engineer's review time will commence upon receipt of the hard copies of the submittal.
    - 8) For Submittals that require certification, corporate seal, or professional embossment (i.e., P.E.s, Surveyors, etc.) transmit at least two hard-copy originals to the Engineer. In addition, provide additional photocopied or scanned copies, as specified above, showing the required certification, corporate seal, or professional seal.

## B. Informational Submittals

### 1. Contractor's Responsibilities

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Inflow and Infiltration Rehabilitation

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- a. Number of copies: Submit three copies, unless otherwise indicated in individual Specification sections
  - b. Refer to individual technical Specification Sections for specific submittal requirements.
2. Engineer's Responsibilities
- a. The Engineer will review each informational submittal within fifteen (15) days. If the informational submittal complies with the Contract requirements, Engineer will file for the project record and transmit a copy to the Owner. Engineer may elect not to respond to Contractor regarding informational submittals meeting the Contract requirements.
  - b. If an informational submittal does not comply with the Contract requirements, Engineer will respond accordingly to the Contractor within fifteen (15) days. Thereafter, the Contractor shall perform the required corrective action, including retesting, if needed, until the submittal, in the opinion of the Engineer, is in conformance with the Contract Documents.
3. Electronic Transmission
- a. Informational submittals may be transmitted by electronic means providing all of the following conditions are met:
    - 1) The above-specified transmittal form is included.
    - 2) The submittal contains no pages or sheets large than 11 x 17 inches.
    - 3) With the exception of the transmittal sheet, the entire submittal is included in a single file.
    - 4) The electronic files are PDF format (with printing enabled).
    - 5) For Submittals that require certification, corporate seal, or professional embossment (i.e., P.E.s, Surveyors, etc.)) transmit two hard-copy originals to the Engineer.

END OF SECTION

EXHIBIT B  
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P.E. CERTIFICATION FORM

**NOTE: Edit according to the location of the project.**

The undersigned hereby certifies that he/she is a professional engineer registered in the [State] [Commonwealth] of \_\_\_\_\_ and that he/she has been employed by

\_\_\_\_\_ to  
design (Company Name)

\_\_\_\_\_ (Insert P.E. Responsibilities)

In accordance with Specification Section \_\_\_\_\_ for the

\_\_\_\_\_ (Name of Project)

The undersigned further certifies that he/she has performed the said design in conformance with all applicable local, state and federal codes, rules and regulations; and, that his/her signature and P.E. stamp have been affixed to all calculations and drawings used in, and resulting from, the design.

The undersigned hereby agrees to make all original design drawings and calculations available to the

\_\_\_\_\_ (Insert Name of Owner)

or Owner's representative within seven days following written request therefor by the Owner.

\_\_\_\_\_  
P.E. Name

\_\_\_\_\_  
Company Name

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Signature

\_\_\_\_\_  
P.E. Registration Number

\_\_\_\_\_  
Title

\_\_\_\_\_  
Address

\_\_\_\_\_  
Address

EXHIBIT B  
TECHNICAL SPECIFICATIONS

Contract No. 2018-41.001

SECTION [02221] [31 23 33] TRENCHING,  
BACKFILLING AND COMPACTION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and perform all trenching for pipelines and appurtenances, including drainage, filling, backfilling, disposal of surplus material and restoration of trench surfaces and easements.
- B. Excavation shall extend to the width and depth shown on the Drawings or as specified herein and shall provide suitable room for installing pipe, structures and appurtenances.
- C. Furnish and place all sheeting, bracing and supports and shall remove from the excavation all materials which the Engineer may deem unsuitable for backfilling. The bottom of the excavation shall be firm, dry and in all respects, acceptable. If conditions warrant, deposit gravel for pipe bedding, or gravel refill for excavation below grade, directly on the bottom of the trench immediately after excavation has reached the proper depth and before the bottom of the trench has become softened or disturbed by any cause whatever. The length of open trench shall be related closely to the rate of pipe laying. All excavation shall be made in open trenches.
- D. All excavation, trenching and related sheeting, bracing, etc., shall conform to the requirements of the Florida "State Safety Act" (CS/SB 2626) which incorporates, by reference, OSHA's excavation safety standards, 29 CFR 1926 Subpart P.
- E. Wherever the requirement for 92 percent compaction is referred to herein it shall mean "at least 92 percent of maximum density as determined by ASTM D1557, Method D".
- F. Prior to the start of work submit the proposed method of backfilling and compaction to the Engineer for review.

1.02 RELATED WORK

- A. Dewatering is included in Section [02140] [31 23 18].
- B. Earthwork is included in Section [02200] [31 23 00].
- C. Granular Fill Material is included in Section [02230] [31 23 25].
- D. Rock and Boulder Excavation is included in Section [02213] [31 23 16].
- E. Pavement Repair and Resurfacing is included in Section [02575] [32 01 16].
- F. Loaming and Seeding is included in Section [02930] [32 92 19].

1.03 SUBMITTALS

## TECHNICAL SPECIFICATIONS

- A. Submit, in accordance with Section [01300] [01 30 00], complete product data for materials specified in this Section.

## 1.04 REFERENCED STANDARDS

- A. American Association of State Highway and Transportation Officials:
1. AASHTO M 288 - Geotextiles.
- B. ASTM International:
1. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)).
  2. ASTM D 4355 / D 4355M - Standard Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus.
  3. ASTM D 4533/ D 4533M - Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
  4. ASTM D 4632/ D 4632M - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.
  5. ASTM D 6241 - Standard Test Method for Static Puncture Strength of Geotextiles and Geotextile-Related Products Using a 50-mm Probe.
  6. ASTM D 4751 - Standard Test Methods for Determining Apparent Opening Size of a Geotextile.
- C. Code of Massachusetts Regulations:
1. 454 CMR 10.00 et. seq. – Construction Industry Rules and Regulations.
- D. Florida "State Safety Act" (CS/SB 2626).
- E. Occupational Safety and Health Administration (OSHA):
1. 29 CFR Part 1926 Subpart P.
- F. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## PART 2 PRODUCTS

## 2.01 GEOTEXTILES

- A. Subsurface Drainage Geotextile: Nonwoven needle-punched geotextile, manufactured for subsurface drainage applications, made from polyolefins or polyesters; with elongation greater than 50 percent; complying with AASHTO M 288 and the following, measured per test methods referenced:

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1. Survivability: Class 3; AASHTO M 288.
2. Survivability: As follows:
  - a. Grab Tensile Strength: 120 lbf (534 N); ASTM D 4632/ D 4632M.
  - b. Tear Strength: 50 lbf (223 N); ASTM D 4533/D 4533 M.
  - c. Puncture Strength: 310 lbf 1 N); ASTM D 6241.
3. Apparent Opening Size: No. 70 (0.212-mm) sieve, maximum; ASTM D 4751.
4. Permittivity: 0.1 per second, minimum; ASTM D 4751.
5. UV Stability: 70 percent after 500 hours' exposure; ASTM D 4355/D 4355M.
6. Product: Provide "Mirafi 140N," by TenCate Geosynthetics – Nicolon Corporation, or equal.

PART 3 EXECUTION

3.01 TRENCH EXCAVATION

- A. Trench excavation shall include material of every description and of whatever substance encountered, except rock and boulders. Pavement shall be cut with a saw, wheel or pneumatic chisel along straight lines before excavating.
- B. Strip and stockpile topsoil from grassed areas crossed by trenches. At the Contractor's option, topsoil may be otherwise disposed of and replaced, when required, with approved topsoil of equal quality.
- C. While excavating and backfilling is in progress, traffic shall be maintained, and all utilities and other property protected as provided in the General Conditions and General Requirements.
- D. Trenches shall be excavated to the depth indicated on the Drawings and in widths sufficient for laying the pipe, bracing and for pumping and drainage facilities. The bottom of the excavations shall be firm and dry and in all respects acceptable to the Engineer. Trench width shall be practical minimum.
- E. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of subgrade soils. The trench may be excavated by machinery to, or just below the designated subgrade, provided that material remaining in the bottom of the trench is no more than slightly disturbed. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory as a result of inadequate excavation, dewatering or other construction methods shall be removed and replaced by screened gravel fill as required by the Engineer at the Contractor's expense.
- F. Clay and organic silt soils are particularly susceptible to disturbance due to construction operations. When excavation is to end in such soils, use a smooth-edge bucket to excavate the last 1-ft of depth.

## TECHNICAL SPECIFICATIONS

- G. Where pipe is to be laid in screened gravel bedding, the trench may be excavated by machinery to the normal depth of the pipe provided that the material remaining in the bottom of the trench is no more than slightly disturbed.
- H. Where pipe is to be laid directly on the trench bottom, final excavation at the bottom of the trench shall be performed manually, providing a flat-bottom true to grade upon undisturbed material. Bell holes shall be made as required.

## 3.02 DISPOSAL OF MATERIALS

- A. Excavated material shall be stacked without excessive surcharge on the trench bank or obstructing free access to hydrants and gate valves. Inconvenience to traffic and abutters shall be avoided as much as possible. Excavated material shall be segregated for use in backfilling as specified below.
- B. It is expressly understood that no excavated material shall be removed from the site of the work or disposed of, except as directed by the Engineer. When removal of surplus materials has been approved by the Engineer, dispose of such surplus material in approved designated areas.
- C. Should conditions make it impracticable or unsafe to stack material adjacent to the trench, the material shall be hauled and stored at a location provided. When required, it shall be re-handled and used in backfilling the trench.

## 3.03 SHEETING AND BRACING

- A. Furnish, put in place and maintain sheeting and bracing required by Federal, State or local safety requirements to support the sides of the excavation and prevent loss of ground which could endanger personnel, damage or delay the work or endanger adjacent structures. If the Engineer is of the opinion that at any point sufficient or proper supports have not been provided, he/she may order additional supports placed at the expense of the Contractor. Compliance with such order shall not relieve the Contractor from his/her responsibility for the sufficiency of such supports. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed.
- B. Where sheeting and bracing is required to support the sides of trenches, engage a professional engineer, registered in the State of Florida, to design the sheeting and bracing. The sheeting and bracing installed shall be in conformity with the design and certification of this shall be provided by the professional engineer. [Submit P.E. Certification Form contained in Section [01300] [01 30 00] to show compliance with this requirement].
- C. When moveable trench bracing such as trench boxes, moveable sheeting, shoring or plates are used to support the sides of the trench, care shall be taken in placing and moving the boxes or supporting bracing to prevent movement of the pipe, or disturbance of the pipe bedding and the screened gravel backfill.
  - 1. When installing rigid pipe (R.C., V.C., A.C., etc.), any portion of the box extending below mid diameter shall be raised above this point prior to moving the box ahead to install the next pipe. This is to prevent the separation of installed pipe joints due to movement of the box.

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2. When installing flexible pipe (PVC, etc.), trench boxes, moveable sheeting, shoring or plates shall not be allowed to extend below mid-diameter of the pipe. As trench boxes, moveable sheeting, shoring or plates are moved, screened gravel shall be placed to fill any voids created and the screened gravel and backfill shall be re-compacted to provide uniform side support for the pipe.
  - D. Permission will be given to use steel sheeting in lieu of wood sheeting for the entire job wherever the use of sheeting is necessary. The cost for use of sheeting will be included in the  
  
bid items for pipe and shall include full compensation for driving, bracing and later removal of sheeting.
  - E. All sheeting and bracing shall be carefully removed in such manner as not to endanger the construction of other structures, utilities, or property, whether public or private. All voids left after withdrawal of sheeting shall be immediately refilled with sand by ramming with tools especially adapted to that purpose, by watering or otherwise as directed.
  - F. No payment will be given for sheeting, bracing, etc, during the progress of the work. No payment will be given for sheeting which has actually been left in the trench for the convenience of the Contractor.
  - G. Sheeting driven below mid-diameter of any pipe shall remain in place from the driven elevation to at least [1-ft] [305 mm] above the top of the pipe.
- 3.04 TEST PITS
- A. Excavation of test pits may be required for the purpose of locating underground utilities or structures as an aid in establishing the precise location of new work.
  - B. Test pits shall be backfilled as soon as the desired information has been obtained. The backfilled surface shall be maintained in a satisfactory condition for travel until resurfaced as specified.
- 3.05 EXCAVATION BELOW GRADE AND REFILL
- A. Whatever the nature of unstable material encountered or the groundwater conditions, trench drainage shall be complete and effective.
  - B. If the Contractor excavates below grade through error or for the Contractor's own convenience, or through failure to properly dewater the trench, or disturbs the subgrade before dewatering is sufficiently complete, he may be directed by the Engineer to excavate below grade as set forth in the following paragraph, in which case the work of excavating below grade and furnishing and placing the refill shall be performed at his own expense.
  - C. If the material at the level of trench bottom consists of fine sand, sand and silt or soft earth which may work into the screened gravel notwithstanding effective drainage, the subgrade material shall be removed to the extent directed and the excavation refilled with a 6-in layer of coarse sand, or a mixture graded from coarse sand to the fine pea stone, as approved by

## TECHNICAL SPECIFICATIONS

the Engineer, to form a filter layer preserving the voids in the gravel bed of the pipe. The composition and gradation of gravel shall be approved by the Engineer prior to placement. Screened gravel shall then be placed in 6-in layers thoroughly compacted up to the normal grade of the pipe. If directed by the Engineer, bank-run gravel shall be used for refill of excavation below grade.

- D. Geotextile non-woven filter fabric may be substituted for filter layer if approved by the Engineer.

## 3.06 BACKFILLING

- A. As soon as practicable after the pipe has been laid and jointed, backfilling shall begin and thereafter be prosecuted expeditiously. Bedding gravel, as specified for the type of pipe installed, shall be placed up to one (1') foot over the pipe.
- B. An impervious dam or bulkhead cutoff of clay or other impervious material shall be constructed in the trench as directed, to interrupt the unnatural flow of groundwater after construction is completed. The dam shall be effectively keyed into the trench bottom and sidewalls. Provide at least one clay or other impervious material dam in the pipe bedding between each manhole where directed or every three hundred (300') feet, whichever is less.
- C. Where the pipes are laid cross-country, the remainder of the trench shall be filled with common fill material in layers not to exceed three (3') feet and mounded six (6") inches above the existing grade or as directed. Where a loam or gravel surface exists prior to cross-country excavations, it shall be removed, conserved and replaced to the full original depth as part of the work under the pipe items. In some areas it may be necessary to remove excess material during the clean-up process, so that the ground may be restored to its original level and condition.
- D. Where the pipes are laid in streets, the remainder of the trench up to a depth of twelve (12") inches below the bottom of the specified permanent paving shall be backfilled with common fill material in layers not to exceed one (1') foot and thoroughly compacted. The subbase layer for paving shall be of bank-run gravel thoroughly compacted in six (6") inch layers.
- E. To prevent longitudinal movement of the pipe, dumping backfill material into the trench and then spreading will not be permitted until selected material or screened gravel has been placed and compacted to a level one (1') foot over the pipe.
- F. Backfill shall be brought up evenly on all sides. Each layer of backfill material shall be thoroughly compacted by rolling, tamping, or vibrating with mechanical compacting equipment or hand tamping, to 92 percent compaction. If rolling is employed, it shall be by use of a suitable roller or tractor, being careful to compact the fill throughout the full width of the trench.
- G. Compaction by puddling or water jetting shall not be permitted.
- H. Compaction in confined areas shall be by use of hand or pneumatic ramming with tools weighing at least [20 lbs]. The material shall be spread and compacted in layers not exceeding six (6") inches thick, uncompacted loose measure thickness.

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- I. Backfill around structures shall be granular fill material as specified and as shown on the Drawings. All backfill shall be spread and compacted as specified, especially under and over pipes connected to the structures.
- J. Bituminous paving shall not be placed in backfilling unless specifically permitted, in which case it shall be broken up as directed. Frozen material shall not be used under any circumstances.
- K. All road surfaces shall be broomed and hose-cleaned immediately after backfilling. Dust control measures shall be employed at all times.

## 3.07 RESTORING TRENCH SURFACE

- A. Where the trench occurs adjacent to paved streets, in shoulders, sidewalks, or in cross-country areas, thoroughly consolidate the backfill and shall maintain the surface as the work progresses. If settlement takes place, immediately deposit additional fill to restore the level of the ground.
- B. In and to adjacent to streets, the twelve (12) inches of trench backfill below the specified initial pavement shall consist of compacted bank-run gravel. Should the Contractor wish to use material excavated from the trench as gravel subbase for pavement replacement, the Contractor, at his/her own expense, have samples of the material tested by an independent testing laboratory at intervals not to exceed five hundred (500') feet, in order to establish its compliance with the specifications. Only material which has been tested and approved by the Engineer shall be allowed to be incorporated into the work.
- C. The surface of any driveway or any other area which is disturbed by the trench excavation and which is not a part of the paved road shall be restored to a condition at least equal to that existing before work began.
- D. In sections where the pipeline passes through grassed areas, and at the Contractor's own expense, remove and replace the sod, or loam and seed the surface to the satisfaction of the Engineer.

## END OF SECTION

## SECTION [32 01 16] [02576]

ASPHALTIC CONCRETE PAVEMENT PARTIAL REMOVAL, REPAIR AND  
RESURFACING

## PART 1 GENERAL

## 1.01 SCOPE OF WORK

- A. Furnish all labor, material, equipment and incidentals required and replace all pavement removed over trenches or otherwise disturbed by the Contractor's operations.
- B. New pavement in streets shall consist of initial pavement over trenches and final bituminous concrete pavement placed either over trenches or over the entire paved traveled way as directed by the Owner.

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- C. Streets, driveways, parking areas or sidewalk pavements damaged or disturbed by the Contractor's operations shall be repaired, replaced or restored in accordance with the requirements specified herein and as directed for the respective type of pavement replacement and in a manner satisfactory to the Owner.

1.02 RELATED WORK

- A. Saw cut of existing pavement is included in Section [02221] [31 23 33].

1.03 [SUBMITTALS]

1.04 REFERENCE STANDARDS

- A. Except as otherwise specified herein, the current Standard Specifications for Highways and Bridges, including all addenda, issued by the State of Florida Department of Transportation, shall apply to materials and workmanship required for the work of this Section.
- B. American Association of State Highways and Transportation Officials (AASHTO)
  - 1. AASHTO M144 - Standard Specification for Calcium Chloride.
- C. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 MAINTENANCE

- A. All pavement placed shall be maintained for a period of one (1) year. During this period all areas which have settled or are unsatisfactory for traffic shall be refilled and replaced.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Calcium chloride shall conform to AASHTO M144, Type I or Type II.
- B. Initial pavement shall be [Binder Course, conforming to the referenced standard, Section M3.11, Class I, Type I-1 bituminous concrete].
- C. Final trench pavement shall consist of [Binder Course and Top Course, conforming to the referenced standard, Section M3.11, Class I, bituminous concrete].
- D. Final full width pavement shall be [Top Course conforming to the referenced standard, Section M3.11, Class I, Type I-1, bituminous concrete].

PART 3 EXECUTION

3.01 GENERAL

- A. Materials for pavement shall be mixed, delivered, placed and compacted in accordance with

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the [referenced standard, Sections M3.11 and 460] and as specified herein.

- B. Whenever the subbase becomes dry enough to cause dust problems, spread calcium chloride uniformly over the gravel surface in sufficient quantity to eliminate the dust.
- C. When the air temperature falls below 50 degrees F, extra precautions shall be taken in drying the aggregates, controlling the temperatures of the materials and placing and compacting the mixtures.
- D. No mixtures shall be placed when the air temperature is below 40 degrees F, nor when the material on which the mixtures are to be placed contains frost or has a surface temperature not suitable to the Engineer.
- E. No vehicular traffic or loads shall be permitted on the newly completed pavement until adequate stability has been attained and the material has cooled sufficiently to prevent distortion or loss of fines. If the climatic or other conditions warrant it, the period of time before opening to traffic may be extended at the discretion of the Engineer.
- F. Paving of streets and sidewalks shall be between the continuous limits of damage to the existing pavement. Final pavement shall be restored across the entire width of street or sidewalk between the limits of damage. New pavement shall match existing limits of pavement at straight seams cut perpendicular to the curb line.

3.02 EXISTING PAVEMENT REMOVAL

- A. Saw Joints as follows;
  - 1. Saw joints true to the lines shown on the Plans or as directed by the Engineer.
  - 2. Saw joints the full depth of the existing concrete unless otherwise shown on the Plans or directed by the Engineer.
  - 3. Leave a neat, vertical face for the full depth of the retained portion.
- B. Remove Pavement
  - 1. After sawing the joints, begin removing the isolated pavement.
  - 2. Use removal methods that will not damage the pavement edges that will remain in place or impede the proposed construction.
- C. Protect Remaining Edges
  - 1. After removing the pavement, protect the pavement edges that will remain in place.
  - 2. Do not allow traffic or equipment to cross the remaining edges.
  - 3. Repair or restore the damaged edges to the Engineer's satisfaction at no additional cost to Owner.

3.03 INSTALLATION

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- A. Initial pavement shall be placed wherever existing pavement has been removed or disturbed as soon as practical, but in no case more than 1 week after backfilling is completed.
1. The bank run gravel subbase shall be excavated to a depth of two (2") inches below the existing pavement, shaped and compacted.
  2. The two (2") inch initial pavement shall be placed and compacted by steel-wheeled rollers of sufficient weight to thoroughly compact the bituminous concrete without damaging the existing pavement. The new pavement shall be rolled smooth and even with the existing pavement.
  3. Hose clean all road surfaces adjacent to the trench area to be paved. No paving is to be placed until subsurface is dry.
  4. Initial pavement shall be maintained in a condition suitable for traffic until replaced or overlaid by final pavement. Defects shall be repaired within 3 days of notification of such defects.
- B. Final pavement shall not be placed over trenches in less than 90 days after completion of the backfilling unless otherwise directed in writing by the Engineer.
- C. Final pavement over trenches shall be constructed as follows:
1. Remove and dispose of initial pavement and subbase to twelve (12") inches below existing pavement. Twelve (12") inches of processed gravel for roadway subbase shall be spread and compacted to 95 percent of maximum dry density as determined by ASTM D1557, Method D. Processed gravel for roadway subbase is specified in Section [31 23 24] [02230].
  2. Trim loose edges of existing pavement. Broom and tack coat all edges with emulsified or cutback asphalt.
  3. Place Binder Course and compact to 1-1/2-in thickness by steel-wheeled roller.
  4. Broom and tack coat edges of existing pavement and Binder Course with emulsified or cutback asphalt.
  5. Place Top Course and compact to 1-1/2-in thickness, finish smooth, dense and flush with surface of existing pavement.
  6. Apply prime coat to existing and initial pavement as specified in [subsection 460.62 of the referenced standard].
  7. Spread and compact Top Course to 1-1/2-in thickness over existing pavement to the entire width of the pavement. Bituminous concrete shall be placed by mechanical spreader except in areas inaccessible to the spreader.
  8. Wherever the edge of the new pavement passes over existing paved driveways or side streets, or the new pavement ends on existing pavement, the existing pavement shall be grooved 1-in deep in the surface such that the surface of the new pavement will slope to

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the surface of the existing pavement in not less than 18-in and the new pavement will not be less than 1-in thick.

9. Clean all pavement penetrations and remove all loose aggregate from the site.]
  10. In areas directed by the Engineer, remove up to two (2") inches of bituminous concrete using a cold planer. The planing machine shall be specifically designed and built for planing flexible pavements and have the ability to plane concrete patches when encountered in bituminous pavement.
  11. The planing machine shall be self-propelled and have the means for planing without tearing or gouging the underlying surface and blading the cutting into a window. The machine shall be capable of being operated at speeds from 10 to 40 fpm and designed such that the operator can at all times observe the planing operation without leaving the control area. A cut to predetermined grade or any specified lesser depth up to the thickness specified in Paragraph 3.02E1 above may be required. The machine shall be adjustable as to crown and depth.
  12. All manhole/catch basin covers and grates and other items at the roadway surfaces shall be lowered to a sufficient depth prior to cold planing. All damaged covers, grates and utility boxes shall be replaced with new covers, grates or utility boxes by the Contractor, at his/her expense.
  13. The equipment furnished shall be maintained so as to produce a clean cut in the pavement at all times.
  14. The planed surface shall conform generally to the grade and cross slope required and be free from being torn, gouged, shaved, broken or excessively grooved.
  15. Surface texture shall be as specified by the Engineer and in any case be acceptable to traffic in the event resurfacing is delayed. The planing shall be squared off for the full width of the traveled way at the end of each work day.
  16. No cutting shall remain on the project at the end of each work day. Dispose of all waste materials as specified in Section [01046] [01 32 13] at no additional compensation.
  17. The planed surface shall be free of imperfections of workmanship that will prevent the surface from being resurfaced with new pavement following this operation.]
- 3.04 PAVEMENT MARKINGS
- A. Reline all streets with pavement markings equal in type and location where existing prior to paving.

END OF SECTION

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SECTION [33 05 14] [02605]  
PRECAST CONCRETE MANHOLES (AND STRUCTURES) PART 1

GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install precast concrete manholes, structures, frames and covers, access hatches, and appurtenances all as shown on the Drawings and as specified herein.

1.02 RELATED WORK

- A. Excavation and backfill is included in Section [[31 23 00] [02200]] [[31 23 34] [02221]].
- B. Screened gravel bedding is included in Section [[31 23 00] [02200]] [[31 23 25] [02230]].
- C. Cast-in-place concrete is included in Section [03 30 00] [03300].

1.03 SUBMITTALS

- A. Submit, in accordance with Section [01 30 00] [01300], shop drawings showing details of construction, reinforcing, joints, pipe connection to manhole, manhole rungs, manhole platforms (if applicable), manhole frames and covers, [access hatches] [and] [ladders].

1.04 REFERENCE STANDARDS

- A. ASTM International
  - 1. ASTM A48 - Standard Specification for Gray Iron Castings
  - 2. ASTM A615 - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  - 3. ASTM C32 - Standard Specification for Sewer and Manhole Brick (Made from Clay or Shale).
  - 4. ASTM C62 - Standard Specification for Building Brick (Solid Masonry Units Made from Clay or Shale).
  - 5. ASTM C150 - Standard Specification for Portland Cement.
  - 6. ASTM C207 - Standard Specification for Hydrated Lime for Masonry Purposes.
  - 7. ASTM C443 - Standard Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets.
  - 8. ASTM C478 - Standard Specification for Precast Reinforced Concrete Manhole Sections.

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9. ASTM D4101 - Standard Specification for Propylene Plastic Injection and Extrusion Materials.
- B. American Concrete Institute (ACI)
  1. ACI 318 - Building Code Requirement for Structural Concrete.
- C. American Association of State Highway and Transportation Officials (AASHTO)
- D. Occupational Safety and Health Administration (OSHA)
- E. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

## 1.05 QUALITY ASSURANCE

- A. The quality of all materials, the process of manufacture, and the finished sections shall be subject to inspection and approval by the Engineer, or other representative of the Owner. Such inspection may be made at the place of manufacture, or on the work after delivery, or at both places and the materials shall be subject to rejection at any time on account of failure to meet any of the requirements specified herein; even though samples may have been accepted as satisfactory at the place of manufacture. Material rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All materials which have been damaged after delivery will be rejected, and if already installed, shall be acceptably repaired, if permitted, or removed and replaced, entirely at the Contractor's expense.
- B. At the time of inspection, the materials will be carefully examined for compliance with the ASTM standard specified below and this Section and with the approved manufacturer's drawings. All manhole sections shall be inspected for general appearance, dimension, "scratch- strength", blisters, cracks, roughness, soundness, etc. The surface shall be dense and close- textured.
- C. Imperfections in manhole sections may be repaired, subject to the approval of the Engineer, after demonstration by the manufacturer that strong and permanent repairs result. Repairs shall be carefully inspected before final approval. Cement mortar used for repairs shall have a minimum compressive strength of 4,000 psi at 7 days and 5,000 psi at 28 days, when tested in 3-in by 6-in cylinders stored in the standard manner. Epoxy mortar may be utilized for repairs subject to the approval of the Engineer.

## PART 2 PRODUCTS

## 2.01 PRECAST CONCRETE MANHOLE SECTIONS

- A. Precast concrete barrel sections and transition top sections, shall conform to ASTM C478 and meet the following requirements: \*\*\*02605011\*\*\*
  1. The wall thickness shall not be less than five (5") inches for 48-inch diameter reinforced barrel sections], six (6") inches for 60-in diameter reinforced barrel sections and seven (7") inches for 72-in diameter reinforced barrel sections.

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2. Top sections shall be eccentric except that barrel sections shall be used where shallow pipe cover requires a top section less than four (4') feet as shown on the Drawings.
  3. Barrel sections shall have tongue and groove joints.
  4. All sections shall be cured by an approved method and shall not be shipped nor subjected to loading until the concrete compressive strength has attained 3,000 psi and not before five (5) days after fabrication and/or repair, whichever is longer.
  5. Precast concrete barrel sections with precast top slabs and precast concrete transition sections shall be designed for a minimum of H-20 (300 psf) loading plus the weight of the soil above at 120 pcf.
  6. The date of manufacture and the name and trademark of the manufacturer shall be clearly marked on the inside of each precast section.
  7. Precast concrete bases shall be constructed and installed as shown on the Drawings. The thickness of the bottom slab of the precast bases shall not be less than the manhole barrel sections or top slab whichever is greater. \*\*02605002\*\*
  8. Knock out panels shall be provided in precast manhole sections at the locations shown on the Drawings. They shall be integrally cast with the section, 2-1/2-in thick and shall be sized as shown on the Drawings. There shall be no steel reinforcing in knock out panels.
- B. All precast concrete shall have a minimum compressive strength of 5000 psi at 28 days. Water shall be kept to a minimum to obtain concrete which is as dense and watertight as possible. The maximum water-to-cement ratio shall be 0.40 by weight and the minimum cement content shall be 600 lbs of cement per cubic yard of concrete. The above ratios shall be revised for sacks of cement weighing different from 94 pounds per sack.
- C. Design Criteria
1. All precast concrete members shall conform to ACI 318.
  2. When the design yield strength "fy" for tension reinforcement exceeds 40,000 psi, the "z" values referred to in ACI 318 shall not exceed 95 kips/in. The flexural stress in reinforcement under service loads "fs" shall be calculated and shall not be greater than 50 percent of the specified yield strength fy.
  3. The precast concrete structure's elements shall be designed to support their own weight, the weight of soil above at 120 pcf and shall be capable of withstanding a live load equal to an (AASHTO HS-20 highway loading) (300 psf) applied to the top slab.
  4. The base slab and walls shall be cast together to form a monolithic base section.
  5. All exterior walls shall be designed for an equivalent fluid pressure of 90 lbs/sq ft. The top of the pressure diagram shall be assumed to originate at finished ground level. Additional lateral pressure from approaching truck wheels shall be considered in

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accordance with AASHTO.

6. The structural design shall take into account discontinuities in the structure produced by openings and joints in the structure.
  7. The structures shall be designed to prevent flotation without the benefit of skin friction when the ground water level is at finished ground surface. Flotation forces shall be resisted by the dead load of the structure and soil directly above the structure. Weight of equipment and piping within the structure and soil frictional forces shall not be considered as being effective in resisting flotation forces.
  8. If the design of the box structure requires a concrete pad to prevent flotation, the cost of designing, furnishing and installing a reinforced concrete pad shall be included in the price for the structure. Details of the design of the concrete pad (if required) shall be submitted to the Engineer for review.
  9. All walls and slabs shall be analyzed by accepted engineering principles. Openings shall be completely framed as required to carry the full design loads to support walls. All slabs and walls shall be fully reinforced on both faces and the minimum reinforcing shall be No. 5 at 12-in E.F.E.W. Additional reinforcing shall be provided around all openings.
  10. The horizontal wall joints shall not be located within 18-in of the horizontal centerline of wall penetrations.
- D. The structure shall be built by the manufacturer in no more than four major sections including the top slab if required.
  - E. Where top slabs are used or required, lifting hooks shall be provided.
  - F. As required, access openings and pipe penetrations shall be formed openings and located as shown on the Drawings.
  - G. Wall sleeves as shown on the Drawings, shall be provided to the precast concrete manufacturer for inclusion in the manufacture of the structure.

2.02 BRICK MASONRY

- A. The bricks shall be good, sound, hard and uniformly burned, regular and uniform in shape and size, of compact texture and satisfactory to the Engineer. Underburned or salmon brick will not be acceptable and only whole brick shall be used unless otherwise permitted. In case bricks are rejected by the Engineer, they shall be immediately removed from the site of the work and satisfactory bricks substituted therefor.
  1. Bricks for the channels and shelves shall comply with ASTM C32 for Sewer Brick, Grade SS (from clay or shale) except that the mean of five tests for absorption shall not exceed 8 percent and no individual brick exceed 11 percent.
  2. Bricks for building up and leveling manhole frames shall conform to ASTM C62.
- B. Mortar used in the brickwork shall be composed of 1 part Type II Portland cement conforming

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to ASTM C150 to 2 parts sand to which a small amount of hydrated lime not to exceed 10 lbs to each bag of cement shall be added.

- C. The sand used shall be washed, cleaned, screened, sharp and well graded as to different sizes and with no grain larger than will pass a No. 4 sieve. It shall be free from vegetable matter, loam, organic or other materials of such nature or of such quantity as to render it unsatisfactory.
- D. The hydrated lime shall also conform to ASTM C207.

2.03 MANHOLE FRAME AND COVER

- A. Manhole frames and covers shall be of good quality, strong, tough, even grained cast iron smooth, free from scale, lumps, blisters, sand holes and defects of any kind which render them unfit for the service for which they are intended. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A48, Class 30.
- B. Manhole covers shall have a diamond pattern, pickholes and the word \*City of North Port\* cast in three (3") inch letters. Manhole frame and covers shall be US Foundry, East Jordan Foundry; Mechanics Iron Foundry; Neenah Foundry or equal.

2.04 JOINTING PRECAST MANHOLE SECTIONS [AND STRUCTURES]

- A. Tongue and groove joints of precast manhole [and structure] sections shall be sealed with either a round rubber O-ring gasket or a preformed flexible joint sealant. The O-ring shall conform to ASTM C443. The preformed flexible joint sealant shall be Kent Seal No. 2 by Hamilton-Kent; Ram-Nek by K.T. Snyder Company or equal.
- B. Joints shall be designed and manufactured so that the completed joint will withstand an internal water pressure of 15 psi without leakage or displacement of the gasket or sealant.

2.05 PIPE CONNECTIONS TO MANHOLE

- A. Manhole pipe connections may be accomplished in the following ways:
  - 1. A tapered hole filled with non-shrink waterproof grout, Hallemite; Waterplug; Embeco or equal, after the pipe is inserted is acceptable, providing the grout is placed carefully to completely fill around the pipe. If this method is used, place concrete encasement to assure a total 12-in of concrete including manhole thickness around the pipe stub. [For PVC pipe, a waterstop gasket and stainless-steel clamp shall be attached to the pipe prior to grouting.]  
\*\*\*02605012\*\*\*
  - 2. The "Lock Joint Flexible Manhole Sleeve" shall be cast in the precast manhole base. The stainless-steel strap shall be protected from corrosion with bitumastic or asphaltic dampproofing materials. \*\*\*02605008\*\*\*
  - 3. "A-Lok" shall be a rubber like gasket cast in the precast manhole base. The rubber gasket shall be cast into a formed opening in the manhole. \*\*\*02605012\*\*\*

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4. "KOR-N-SEAL" joint shall be installed as recommended by the manufacturer. The stainless-steel clamp shall be protected from corrosion with bitumastic or asphaltic dampproofing materials. \*\*\*02605008\*\*\*

2.06 · DAMPPROOFING

- A. Brushed dampproofing shall be an asphalt emulsion reinforced with fibers conforming to ASTM D1227, Type II, Class 1. The dampproofing shall be Hydrocide 700B by Sonneborn Building Products, Division of ChemRex Inc., Minneapolis, MN; Karnak 220 Asphalt Emulsion by Karnak Corporation, Clark, NJ or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Manhole Installation

1. Manhole shall be constructed to the dimensions shown on the Drawings and as specified herein. All work shall be protected against flooding and flotation.
2. The bases of manholes shall be placed on a bed of 12-in screened gravel as shown on the Drawings. The bases shall be set at a grade to assure that a maximum of 8-in thickness of brickwork will bring the manhole frame and cover to final grade. Cast-in-place bases shall be constructed in accordance with the requirements of Division [03] [3] and the details shown on the Drawings.
3. Precast concrete barrel sections [and structures] shall be set plumb and with sections in true alignment with a 1/4-in maximum tolerance to be allowed. The joints of precast barrel sections shall be sealed with either a rubber O-ring set in a recess or the preformed flexible joint sealant used in sufficient quantity to fill 75 percent of the joint cavity. The outside and inside joint shall be filled with non-shrink mortar and finished flush with the adjoining surfaces. Allow joints to set for 24-hours before backfilling. Backfilling shall be done in a careful manner, bringing the fill up evenly on all sides. If any leaks appear in the manholes, the inside joints shall be caulked with lead wool to the satisfaction of the Engineer. Install the precast sections in a manner that will result in a watertight joint.
4. Holes in the concrete barrel sections required for handling or other purposes shall be plugged with a non-shrinking grout or non-shrinking grout in combination with concrete plugs and finished flush on the inside.

B. Manhole Pipe Connections

1. Manhole pipe connections shall be accomplished in the ways specified herein. Pipe stubs for future extensions shall also be connected and the stub end closed by a suitable watertight plug.

C. Brickwork

1. Mortar shall be mixed only in such quantity as may be required for immediate use and

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shall be used before the initial set has taken place. Mortar shall not be retained for more than 1-1/2 hours and shall be constantly worked over with hoe or shovel until used. Anti-freeze mixtures will not be allowed in the mortar. No masonry shall be laid when the outside temperature is below 40 degrees F unless provisions are made to protect the mortar, bricks and finished work from frost by heating and enclosing the work with tarpaulins or other suitable material. The Engineer's decision as to the adequacy of protection against freezing shall be final.

2. Channels and shelves shall be constructed of brick and concrete as shown on the Drawings. The brick lined channels shall correspond in shape with the lower half of the pipe. The top of the shelf shall be set at the elevation of the crown of the highest pipe and shall be sloped 1-in per foot to drain toward the flow through channel. Brick surfaces exposed to sewage flow shall be constructed with the nominal 2-in by 8-in face exposed (i.e., bricks on edge).
3. Manhole covers and frames shall be set in a full mortar bed and bricks, a maximum of 8-in thick, shall be utilized to assure frame and cover are set to the existing grade. If full width paving is the permanent paving, the manhole frame and cover shall be reset to final grade prior to placement of permanent paving.

## D. Dampproofing

1. Outer surfaces of precast and cast-in-place manholes [and structures] shall dampproofed at the rate of 30 to 35 sq ft per gallon as directed by the Engineer and in accordance with manufacturer's instructions.

## 3.02 LEAKAGE TESTS

- A. Leakage tests shall be made and observed by the Engineer on each manhole. The test shall be the exfiltration test made as described below:
- B. After the manhole has been assembled in place, all lifting holes and those exterior joints within 6-ft of the ground surface shall be filled and pointed with an approved non-shrinking mortar. The test shall be made prior to placing the shelf and invert and before filling and pointing the horizontal joints below the 6-ft depth line. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitably plugged and the plugs braced to prevent blow out.
- C. The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage, that is, no water visibly moving down the surface of the manhole, the manhole may be considered to be satisfactorily water-tight. If the test, as described above is unsatisfactory as determined by the Engineer, or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted if the Contractor so wishes, to allow for absorption. At the end of this period, the manhole shall be refilled to the top of the cone, if necessary and the measuring time of at least 8 hours begun. At the end of the test period, the manhole shall be refilled to the top of the cone, measuring the volume of water added. This amount shall be extrapolated to a 24-hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed 1 gallon per vertical foot for a 24-hour period. If the manhole fails

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this requirement, but the leakage does not exceed 3 gallons per vertical foot per day, repairs by approved methods may be made as directed by the Engineer to bring the leakage within the allowable rate of 1 gallon per foot per day. Leakage due to a defective section or joint or exceeding the 3 gallon per vertical foot per day shall be the cause for the rejection of the manhole. It shall be the Contractor's responsibility to uncover the manhole as necessary and to disassemble, reconstruct or replace it as directed by the Engineer. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed.

- D. No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc., i.e., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, take any steps necessary to assure the Engineer that the water table is below the bottom of the manhole throughout the test.
- E. If the groundwater table is above the highest joint in the manhole, and if there is no leakage into the manhole as determined by the Engineer, such a test can be used to evaluate the water-tightness of the manhole. However, if the Engineer is not satisfied, lower the water table and carry out the test as described hereinbefore.
- F. Leakage Tests for Structures
  - 1. The Engineer will visually inspect structure(s) for possible leaks before backfilling of structures is allowed. All joints shall be sealed to the satisfaction of the Engineer.
  - 2. The Engineer may require an exfiltration test as described for manholes on any structure for which he/she deems the test appropriate.

## 3.03 CLEANING

- A. All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

## END OF SECTION

SECTION [02659] [33 12 10]  
TEMPORARY BY-PASS PUMPING SYSTEMS

## PART 1 GENERAL

## 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and install, field test, and operate temporary by-pass pumping systems as proposed by the Contractor for the purpose of diverting flow around work areas as required.
- B. The design, installation and operation of temporary by-pass pumping systems shall be the Contractor's responsibility. The Contractor shall provide the services of a professional bypass company who can demonstrate to the Owner and Engineer that the company specializes in the design and operation of temporary by-pass pumping systems. The by-pass system shall

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meet the requirements of all codes and regulatory agencies having jurisdiction.

- C. Maintain temporary by-pass pumping systems so that they are completely functional throughout the required period of service.
- D. Following the required period of service, remove temporary by-pass pumping systems from site.
- E. Provide all maintenance including manufacturer recommended preventive maintenance and on-call repair services. Contractor shall provide repair services and/or replacement equipment 24 hours per day, seven days per week within 4 hours of being called.
- F. Should the Contractor elect to use diesel fuel for temporary by-pass pumping, the total storage quantity of fuel allowable at the plant site to operate the temporary pumps shall not exceed the sum of the individual fuel tank capacities furnished with each pump's diesel engine drive. Provide a refueling service to maintain continuous 24-hours per day, 7 days per week pumping system operation.

## 1.02 RELATED WORK

- A. Permits and Regulatory Requirements are specified in Section [01 41 27] [01060].
- B. Federal and State Requirements are specified in Section [01 41 17] [01068].
- C. Environmental Protection Procedures are specified in Section [01 35 43] [01110].
- D. Maintenance of Plant Operations and Sequence of Work is included in Section [01 89 30] [01810].
- E. Connections to and work on the Existing System is included in Section [01 18 20] [02658].

## 1.03 SUBMITTALS

- A. Submit, in accordance with Section [01 30 00] [01300], the following:
  - 1. A detailed description of each proposed temporary by-pass pumping system including pumps, pump drives, piping, hoses, valves, fittings, controls, wiring and any other related accessories required to provide a complete operating system in conformance with the requirements of this Section.
  - 2. Detailed plans and sections showing the proposed pumping system layout including dimensions and elevations. Plan shall include but not be limited to the following:
    - a. Staging area and access requirements for all pumps.
    - b. Number, size, material, location and method of installation of suction piping.
    - c. Number, size, material, location and method of installation of discharge piping.
    - d. Pump size, capacity, number of units, diesel engine specifications, fuel tank capacity, fuel consumption requirements, and method of refueling.
    - e. Calculations of static lift, pipe size selection, friction losses, flow velocity and pump selection.
    - f. Pump curves showing pump operating range.

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- g. Proposed method of freeze protection.
  - h. Proposed method of noise control for each pump.
  - i. Temporary pipe supports, anchorage, cover material and other accessories as required to stabilize the piping system.
  - j. Installation schedule and maintenance schedule.
  - k. Vendor phone number and pager number for 24-hour service.
  - l. A minimum of five reference installations of projects with similar size in wastewater pumping applications. Include contact names and phone numbers.
  - m. List of recommended spare parts to be stored on-site for emergency maintenance.
3. Provide information on the vendor's service staff capabilities and replacement parts inventory to show that the vendor has sufficient resources to provide emergency service and replacement equipment and/or parts to the Bucklin Point site within 4 hours of a service call.
  4. A description of system operation and controls. Include a list of all alarm conditions and procedures for correcting problems including equipment replacement.
  5. A description and schedule for the proposed procedures for startup and testing of the facilities to demonstrate compliance with specified automatic operation and maintenance of a constant discharge pressure.
  6. A plan of operations for inclement weather including snow storms. The plan shall demonstrate the ability to maintain pumping system operations throughout inclement weather events.
  7. A description and schedule for the proposed procedures for dismantling the system, and restoring normal operations at the WWTF.

## 1.04 REFERENCE STANDARDS

- A. Design, manufacturing and assembly of elements of the equipment specified herein shall be in accordance with the following:
  1. American Institute of Steel Construction (AISC)
  2. American Iron and Steel Institute (AISI)
  3. American Society of Mechanical Engineers (ASME)
  4. American National Standards Institute (ANSI)
  5. American Society for Testing Materials (ASTM)
  6. American Welding Society (AWS)
  7. American Bearing Manufacturers Association (ABMA)
  8. Institute of Electrical and Electronics Engineers (IEEE)

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- 9. National Electrical Manufacturers Association (NEMA)
- 10. Occupational Safety and Health Administration (OSHA)
- 11. Underwriters Laboratories (UL)

B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

A. The Contractor shall employ the services of a vendor who can demonstrate 5 years of recent and continuous specialization in the design, installation, operation and removal of temporary by-pass pumping systems in wastewater applications. The complete system shall be furnished from a single vendor who shall be capable of providing service staff, repair parts and replacement of any deficient system component within 4 hours of a service call, twenty-four hours per day, seven days per week.

1.06 SYSTEM DESCRIPTION

- A. Where proposed by the Contractor, temporary by-pass pumping systems shall comply with specified requirements with Design flows shall be as specified in Section [01 89 30] [01810].
- B. Pumping system control panels shall be NEMA 4 and include flow indication, a flow totalizer, indicator lamps showing which pumps are operating, selector switch for auto or manual start and stop for each pump and visual and audible alarms for indication of operation failure and alarm conditions.

1.07 DELIVERY, STORAGE AND HANDLING

A. Delivery, storage and handling of equipment shall be as specified in [01 66 10] [01600].

1.08 MANUFACTURER'S SERVICES

- A. Provide the services of the manufacturer's representative as specified herein.
- B. Provide the services of the manufacturer's representative for physical checkout field testing and operation and maintenance instruction for a minimum of 1 person day per pumping system. See requirements in Part 3.
- C. Provide the services of the manufacturer's representative or designated alternative, who shall be contactable 24-hours per day via telephone or pager and shall be available to be on site within 4 hours of being contacted at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 GENERAL PUMPING EQUIPMENT

A. Furnish pumping units and all accessories from a single vendor. Each temporary by-pass pumping system shall be complete including pumps, drives, piping, piping headers, valves, flow meter, controls and appurtenances as required for a complete system.

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- B. The pumps, drives and controls shall be designed and built for 24-hour continuous service at any and all points within the required range of operation, without overheating, without cavitation, and without excessive vibration or strain. All parts shall be so designed and proportioned as to have the strength, stability and stiffness and be constructed to meet the specified requirements. Methods shall be provided for inspection, repairs, and adjustment.
- C. All necessary foundation bolts, nuts, and washers shall be furnished.
- D. Each piece of equipment shall be furnished with a nameplate (with embossed data) securely mounted to the body of the equipment. As a minimum, the nameplate for the pumps shall include the manufacturer's name and model number, serial number, rated flow capacity, head, speed and all other pertinent data. As a minimum, nameplates for drives shall include the manufacturer's name and model number, serial number, horsepower, speed, input voltage, amps, number of cycles and power and service factors.
- E. Refer to Section [01 13 10] [01170] for noise limitations for the equipment.
- F. All equipment shall be suitable for outdoor operation under adverse weather conditions. Provide protection from freezing as required to maintain system operation.
- G. Pumps shall be manufactured by Goodwin Pumps of America, Bridgeport NJ; Acme Dynamics, Plant City, FL; Thompson Pump and Manufacturing Co., Port Orange FL, or equal.

## 2.02 CONDITIONS OF OPERATION

- A. Pumps shall be identical in every respect with all parts interchangeable.
- B. Each pump shall be designed for the conditions of service specified by the Owner. All pumps shall have a rising head capacity curve for stable pump operation from the minimum head operating point to the shut-off head.
  - 1. Service: Temporary By-Pass Pumping
  - 2. Number of pumps: As required by the Application
  - 3. Liquid: Raw Wastewater
  - 4. Design capacity total peak (gpm): As required by the Application
  - 5. Type of drive: Diesel engine or Electric

## 2.03 PUMPING SYSTEM COMPONENTS

- A. All pumps shall be centrifugal, end suction, fully automatic self-priming units that do not require the use of foot-valves, vacuum pumps, diaphragm pumps, or isolation valves or float apparatus in the priming system.
- B. Pump seals shall be high pressure, mechanical self-adjusting type with solid carbide faces

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capable of withstanding suction pressures to 100 psi without the pump running. The mechanical seal shall be cooled and lubricated in an oil bath reservoir, requiring no maintenance or adjustment. The oil bath reservoir shall not come in contact with or leak into the pumped water. Each pump shall be capable of running dry, with no damage for extended periods of time. All pump seal metal parts shall be stainless steel. All elastomers shall be Viton.

- C. Each pump shall be driven by a diesel engine or electric motor. Diesel engine shall be water cooled. If the Contractor uses electric motor driven pumps, power costs are the responsibility of the Contractor as specified in Section [01 13 10] [01170].
- D. If using diesel driven pumps, each pump and diesel engine shall be skid mounted with integral fuel tank and skid lifting bracket.
- E. Provide automatic start/stop controls for the pumping system to automatically maintain system flow within the flows specified in Section [01 89 30] [01810]]. Controls shall be contained in a local control panel with provision to manually operate each pump, provide indication of pump operation, and indicate the total flow being pumped.
- F. Provide all required suction and discharge pipe and fittings, discharge manifold pipe and fittings, shutoff valves, check valves, flow meter, pressure regulating valves, insulation, freeze protection, and all required accessories. All pipe and fittings shall be steel with flanged or quick connect coupling connections, or high-density polyethylene pipe with fused joints. All joints must be 100 percent restrained. Suction piping shall be rated for 25-in Hg vacuum. Discharge piping, fittings, connections, valves, and other discharge piping accessories shall be rated for a minimum working pressure of 150 psi.

## PART 3 EXECUTION

## 3.01 INSTALLATION AND PHYSICAL CHECKOUT

- A. Installation shall be in accordance with the system supplier's recommendations and approved shop drawing submittals.
- B. Noise shall meet the requirements specified in Section [01170] [01 13 10].
- C. Install pumping units on a firm level surface.
- D. Furnish the services of the pump system supplier's representative for a minimum of one day per temporary by-pass system to assist equipment installation and physical checkout.

## 3.02 FIELD TESTING

- A. Provide field in accordance with the approved shop drawing submittal. Field tests shall demonstrate conformance with system requirements.
- B. The Contractor shall require that field testing be conducted by the pump system supplier's representative in the presence of the Engineer. Furnish the services of the pump system supplier's representative for a minimum of one day per temporary by-pass system to conduct required testing.
- C. Field testing shall demonstrate a minimum of 24 hours of continuous operation. During the

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24 hours of continuous operation, the system shall demonstrate the ability to automatically start and stop pumps in response to changing flow conditions.

- D. Remove and replace any system component that fails to perform in accordance with specified requirements.

## 3.03 SYSTEM OPERATION

- A. Perform all required maintenance on the equipment to maintain the system integrity and capacity as specified.
- B. Provide clean-up and disposal of contaminated material and reporting for all product spills.

## 3.04 EQUIPMENT REMOVAL

- A. At the completion of the period of service, disconnect all temporary piping and remove all system components from the site. Restore the work site to its original condition.

END OF SECTION

## GROUTING LATERAL CONNECTIONS

## PART 1 GENERAL

## 1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to test, grout and retest all sewer services. Service connection cleaning, testing and grouting shall be as described in this Section. All equipment shall enter the service connections from within the main sewer.
- B. The annular space between host pipe and liner as well as the first joint within 18 inches of the service connection point shall be sealed with chemical grout specified in this Section.

## 1.02 QUALITY ASSURANCE

- A. Sealing shall be performed by a crew under the direct supervision of a superintendent who has a minimum of two years documented experience in the sealing procedures as specified herein and as considered standard in the sewer rehabilitation industry. Submit documentation of this experience with references for approval prior to the start of work.

## PART 2 PRODUCTS

## 2.01 DESCRIPTION OF WORK

- A. Clean (including roots, etc.), grout and test each service connection as required. Furnish and use such equipment as is necessary to conduct all of the work specified in this Section (except protruding taps and broken pipe replacement) from inside each service connection. Access to each service connection shall be from within the main sewer from the nearest sewer manhole.

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No access allowed from private properties.

2.02 SEALING MATERIALS

A. General

1. Mixing, handling, and application of chemical sealing materials shall be in strict accordance with the manufacturer's recommendations.
2. While being injected, the chemical sealant must be able to react/perform in the presence of water.
3. The cured sealing material must prevent the passage of water through the pipe joint and the annular space to a distance of 18 inches into the lateral. The sealing material must withstand submergence in water without degradation, remain flexible after curing, and must be able to withstand freeze/thaw and wet/dry cycles without adversely affecting the seal.
4. The cured sealant must be chemically stable and resistant to acids, alkalis and organics normally found in sewage, and must not be biodegradable.
5. Residual sealing materials must be easily removable from the sewer line to prevent reduction or blockage of sewage flow.
6. Handling, formulation and storage of the sealing gel compound shall be in strict conformance with the manufacturers recommendations. The uncured gel shall be delivered to the site in unopened containers, with the date of manufacture clearly indicated, no uncured gel manufactured more than six months prior to the date of application shall be utilized. Any uncured gel compound determined to be more than six months old shall be immediately removed from the site. Once a container of uncured gel has been opened it shall be used as soon as practically possible. If the container of gel is not used within 24 hours of being opened, ensure that the gel has not been contaminated. Any contaminated gel shall be removed from the site and disposed of.

B. Acrylic base gel chemical sealing material shall have the following characteristics:

1. A minimum of 10% acrylic base material by weight in the total sealant mix. A higher concentration (%) of acrylic base material may be used to increase strength of set during injection.
2. The ability to tolerate some dilution and react in moving water during injection.
3. A viscosity of approximately two (2) centipoise, which can be increased with additives.
4. A constant viscosity during the reaction period.
5. A controlled reaction time from five (5) seconds to six (6) hours.
6. The ability to increase mix viscosity, density, and gel strength by the use of additives.

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7. Acrylic base gel chemical sealing material shall be Avanti AV-118 or equal.
- C. Urethane base gel chemical sealing material shall have the following characteristics:
1. One part urethane prepolymer thoroughly mixes with between five (5) and ten (10) parts of water weight. The recommended mix ratio is one part urethane prepolymer to eight (8) parts of water (11% prepolymer).
  2. A liquid prepolymer having a solids content of 77% to 83%, specific gravity of 1.04 (8.65 lbs./gal.) and a flash point of 20 degrees F.
  3. A liquid prepolymer having a viscosity of 600 to 1200 centipoise at 70 degrees F that can be pumped through 500 feet of hose with a 1000 psi head at a flow rate of one (1) ounce per second.
  4. Water used to react the prepolymer shall have a pH between 5 and 9.
  5. A cure time of 80 seconds at 40 degrees F, 55 seconds at 60 degrees F, and 30 seconds at 80 degrees F, when one (1) part prepolymer is reacted with eight (8) parts of water only. Cure time shall be adjustable by the use of additives to the reaction water.
- D. Icoset shall be added to all chemical grout installed under this contract. The application shall be in accordance with the manufacturer's recommendations.
- E. Chemical grouts shall contain no acrylamide.
- F. A representative of the grout manufacturer shall be on site for one day at the start of the project to assure that all requirements are met.

## PART 3 EXECUTION

## 3.01 GENERAL

- A. Prior to sealing the connection, the Contractor shall thoroughly clean the interior of the lateral of debris and foreign matter. Cleaning is to be adequate for seating a lateral packer in the mainline and inserting and seating an inflatable sealing bladder in the lateral. The lateral shall be cleaned of obstructions and roots on the length to be sealed.
- B. The Contractor shall be prepared to bypass pump the sewage flow as part of his operation where the sealing procedures require such diversion. Where the sealing equipment is designed to allow the passage of flow, the flow shall be limited to that as recommended by the equipment manufacturer.
- C. The service lateral testing and grouting shall be accomplished by first testing the service lateral joints followed by grouting of all services laterals. Each service lateral, which has been sealed, shall be retested to ensure the effectiveness of the work. Any service laterals, which fail, shall be resealed and retested until it passes the test before moving on to the next service lateral. Testing of joints which are visibly leaking infiltration will not be required.

## TECHNICAL SPECIFICATIONS

- D. The equipment shall consist of a closed circuit television system and a sealing packer device along with the necessary chemical sealant containers, pumps, controls, regulators, valves, hoses, etc. The sealing packer shall be so constructed that it can straddle four (4") to six (6")-inch diameter service connections in eight (8")-inch to ten (10")-inch main sewer lines. When properly positioned and with the end elements inflated, an inflatable inversion sealing tube shall be extruded up the service lateral thereby isolating a portion of the service lateral containing one or more pipe joints for testing or sealing. The pumping unit, metering equipment, and the packer device shall be designed so that proportions and quantities of materials can be regulated in accordance with the type and size of the leak being sealed. Mainline packer and lateral bladder device shall be manufactured by American logiball, Inc. or equal.
- E. Testing shall be conducted by properly positioning the packer device in the main sewer line with the inversion tube extruded into the service lateral and performing an air test. This test shall be accomplished by applying a positive air pressure equal to one half pound per ft (1/2 lb/ft) of main sewer line depth into the created void area between the packer device and the extended end of the inversion tube, but not to exceed ten (10 psi) pounds per square inch. After the required test pressure has been displayed on the test meter above ground, the application of the air pressure shall be stopped and a 20 second test period shall commence. The test pressure meter shall be observed during the 20-second test period and should the pressure drop exceed 50 percent of the test pressure, the service lateral shall have failed the test and shall be sealed. Should it not be possible to develop the required air test pressure, then the service lateral shall also have failed the test and shall be sealed.
- F. All lateral service lines shall be sealed internally by the use of the packer device. Either immediately following the air test or after the packer device has been properly positioned in the main line with the inversion tube extended into the service lateral, the lateral shall be sealed by the injection of the chemical sealant. The chemical sealant shall be injected through the packer device into the annular space between the inversion tube and the service lateral. The injection of chemical sealant shall continue until the chemical fluid back pressure is sufficient to ensure the complete sealing of all the defects along the length of the inversion tube. However when the effective quantity of grout pumped exceeds one (1) gallon per foot of sealing distance plus three (3) gallons it will be suspected that there is unseen voids outside of the pipe and the applicator shall try to build grout dams by repetitively pumping and curing the grout until the area is dammed off and the refusal pressure is met. The amount of chemical per pump stroke shall be measured from time to time and then the number of pump strokes can be used to measure the amount of chemical delivered to each lateral
- G. Upon completion of the sealing operation, the service lateral shall be retested to ensure the effectiveness of the work. The retesting shall be accomplished using the same procedures previously described. Should the service lateral fail to pass the test, it shall be resealed and retested until the test requirements can be met.
- H. After the service lateral has been successfully sealed and retested the following procedures shall be performed to insure that the sealing operation did not block the service lateral.
- I. The inversion tube shall be removed from the lateral.

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2. The packer and elements shall remain inflated or be reinflated.
  3. Air shall then be introduced into the service lateral line.
- I. If during the injection of the air, no pressure build up is recorded on the pressure gauge the service lateral shall be considered free flowing. However, should air pressure build up indicating a partial or total blockage of the lateral it shall then be cleaned to restore proper flow.
  - J. Residual sealing materials that extend into the pipe, reduce the pipe diameter, or restrict the flow shall be removed from the joint. The sealed joints shall be reasonably flush with the existing pipe surface. It is the responsibility of the contractor to verify that the sealing of laterals did not restrain the flow and to remove any grout which would restrain flow. Lateral flow shall be verified after the sealing of each lateral. With the lateral being viewed with the pan and tilt camera, an attempt is made to obtain a water flush by the occupant. If the flow seems abnormal, it is assumed that the building sewer is blocked with grout and must be cleared
  - K. Extreme caution shall be utilized during the testing and sealing operations in order to avoid damaging the existing sewer. If any damage occurs, it shall be repaired to the satisfaction of the Engineer with no additional cost to the Owner.
  - L. After the work is completed, the Contractor shall perform a CCTV inspection of each lateral connection sealed and provide the Owner with a tape and written log and verification of each sealed connection test, retest and acceptance. The videos shall be provided on a portable hard drive device to be retained by the Owner.

END OF SECTION

SECTION [33 01 43] [02762]  
SEWER LINE JOINT TESTING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. After cleaning and simultaneous with television inspection, joint testing shall be performed on all sewer joints. Joint testing shall be performed before and after sealing except where joints are found to have visible infiltration. Visible infiltration points shall be sealed without pre-testing and shall then be tested to ensure that the joint has been properly sealed.
- B. Sewer line joint testing and sealing shall not be performed on any sewer line until other rehabilitation measures (if any) specified for that particular line have been completed. This requires that any pipe replacement and/or repair of low spots must be completed before the remainder of each line is tested and sealed.
- C. Joint testing shall be accomplished by utilizing a void pressure monitoring system. Generally, this shall be accomplished by applying a positive pressure to each joint, allowing time for the system to stabilize and measuring the amount of pressure decay over a given length of time.

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- D. Use caution at all times so as to prevent potential contamination of the City of North Port's Potable Water System. Cross connections will require a backflow preventer approved by the City of North Port.

PART 2 PRODUCTS

2.01 MATERIALS

- A. The equipment used shall consist of a television camera and a hydrostatic joint testing device that can be pulled through the sewer lines. Testing shall be accomplished by isolating the joint or area to be tested with the testing device or devices and applying a positive hydrostatic pressure into the created, isolated void area. Pressure readings shall be displayed on an above ground gauge with a range of 0 to 10 psi.

PART 3 EXECUTION

3.01 PERFORMANCE

- A. Existing hydrostatic head shall be established by inserting a pipe probe into the backfill material at the crown of the pipe at the downstream manhole and applying pressure until equilibrium is attained. This is the back pressure that all test pressures for that section of line shall be increased by.
- B. A precise pressure of four (4) psi above the existing hydrostatic head shall be applied to each joint. Once the pressure of four (4) psi above hydrostatic head at the joint has been recorded on the gauge above ground, the water flow shall be stopped and the pressure gauge observed for 30 seconds. Should the pressure on the joint drop 0.5 psi or more within 30 seconds, the joint will have failed the test. Joints that fail the test shall be sealed as specified herein and re-tested by the same procedure until the joints pass the pressure test.

END OF SECTION

SECTION 02763 MANHOLE  
REHABILITATION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to rehabilitate manholes as noted on the Drawings and as specified herein.
- B. Where indicated in the Drawings or as directed by the Engineer work may require, patching manhole exterior; stopping infiltration with chemical grout; rebuilding invert and benching; resetting or replacing manhole frame and cover assemblies; installing chimney seals, adjusting elevation of manhole frame and cover.
- C. Remove manhole steps unless otherwise directed by the Owner or Engineer.

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- D. Eliminate active infiltration observed in the frame seal, chimney (corbel for brick manholes), cone, wall, bench, invert, holes, or pipe connections prior to applying the manhole lining system.
- E. Reinstall existing manhole rings and covers removed to allow the completion of the rehabilitation work. Restore the site to its pre-maintenance condition.
- F. Temporary Bypass Pumping Systems as specified in Section 02659.

1.02 RELATED WORK

- A. Contract Drawings show the manholes included in the work and indicate the work required for each manhole.
- B. Cured-in-Place Pipe Liner is included in Section 02769.
- C. Temporary Bypass Pumping Systems is included in Section 02659.
- D. Trenching, Backfilling and Compaction is included in Section 02221.
- E. Pavement Repair and Resurfacing is included in Section 02576.
- F. Monolithic Manhole Lining Systems is included in Section 02767.
- G. Sewer Line and Manhole Cleaning is included in Section 02765.
- H. Environmental Protection Procedures is included in Section 01110.
- I. Precast Concrete Manholes and Structures is included in Section 02605.

1.03 SUBMITTALS

- A. Staging Area Plan: Provide plan at scale of 1" = 50'. Identify the staging area for deployment of manhole repair equipment for each work area.
- B. Submit to the Engineer, in accordance with Section 01300, shop drawings and product data for all manhole rehabilitation materials specified in this Section for each manhole to be rehabilitated.
  - 1. Information on the chemical grout and additives, cementitious compound, waterproofing, and corrosion control materials that will be used, the installation method, and equipment. For the materials that will be used, identify and furnish references for successful use of the materials in similar applications.
  - 2. Method for sealing pipes at manholes.

1.04 REFERENCES

- A. ASTM International (ASTM):

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1. ASTM C 109 - Standard Testing Methods for Compressive Strength of Hydraulic Cement Mortars (Using 2-in Cube Specimens).
  2. ASTM C 150 - Standard Specification for Portland Cement.
  3. ASTM C 267 - Standard Test Methods for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacing and Polymer Concretes.
  4. ASTM C 293 - Test Method for Flexural Strength of Concrete.
  5. ASTM C 309 - Standard Specification for Liquid Membrane Forming Compounds for Curing Concrete.
  6. ASTM C 496 - Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
  7. ASTM C 579B - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts and Monolithic Surfacing.
  8. ASTM C 596 - Test Method for Drying Shrinkage of Mortar Containing Portland Cement.
  9. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
  10. ASTM C 1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
  11. ATSM F 2414 (2009 or current) - Standard Practice for Rehabilitation of Sewers Using Chemical Grouting.
- B. Occupational Safety and Health Administration (OSHA).
- C. The revision of the above standards that is in effect at the time of bid opening will apply.

1.05 QUALITY ASSURANCE

- A. The Contractor to perform the manhole rehabilitation and manhole lining shall be fully qualified, experienced, and equipped to complete the work in a timely and satisfactory manner. Submit the following information to the Engineer for review and approval before any work is performed.
1. Have a minimum of five years' experience in performing this type of specialized work.
  2. Have successfully installed the proposed lining system in a minimum of 500 manholes.
  3. Name of the manufacturer and supplier for this work and previous work performed. The Contractor shall be certified by the manufacturer to install the monolithic lining system.

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4. A list of all municipal installations performed by the manufacturer and Contractor over the past five (5) years along with the contact name, telephone number, and brief description of work performed.
5. Be capable of providing crews as needed to complete this work without undue delay.
6. Owner reserves the right to disapprove the use of the Contractor based on the submitted qualifications.

1.06 DELIVERY, STORAGE AND HANDLING

- A. Care shall be taken in shipping, handling and placing to avoid damaging the chemical grouts, cementitious materials, and other manhole rehabilitation products. Extra care may be necessary during cold weather construction. Any lining product or material damaged in shipment shall be replaced as directed by the Engineer.
- B. Any materials showing deterioration, or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage can be seen, shall be marked as rejected and removed at once from the work.
- C. While stored, the materials shall be adequately packaged and protected. The materials shall be stored in a manner as recommended by the manufacturer.

1.07 WARRANTY

- A. All manhole rehabilitation work shall be warranted by the Contractor for a period of two years from the date of Substantial Completion. During this period, all defects in the lining shall be repaired in a manner satisfactory to the Engineer or the lining shall be re-applied at no cost to the Owner. At 21 months following substantial completion of the manhole rehabilitation work, the Owner/Engineer shall inspect all of this work to ensure proper performance. If any deficiencies are found during these inspections, the Contractor shall repair them at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS TO STOP ACTIVE LEAKS

- A. To stop active leaks in the manhole, use any of the following of the following materials and procedures to stop the active leaks prior to lining.
  1. Premixed Fast-Setting, Volume-Stable Waterproof Cement Plug: Hydraulic cement, graded silica aggregates, special plasticizing and accelerating agents, containing chlorides, gypsums, plasters, iron particles, aluminum powder or gas-forming agents, or promote the corrosion of steel it may come in contact with. The cement plug shall comply with the following minimum requirements:

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Minimum Requirements		
Compressive Strength	ASTM C 109	>1000 psi, 1hr. >2500 psi, 24 hrs.
Sulfate Resistance	ASTM C 267	No weight loss after 15 cycles @ 2000 ppm
Freeze/Thaw	ASTM C 666 "Method A"	100 cycles
Pull Out Strength	ASTM C 234	14,000 lbs.
Set Time		<5.0 minutes

2. Chemical Grout: Repair work shall be in accordance with ASTM F 2414-04, and manufacturers recommended installation methods. Use in accordance with the manufacturer's recommendations for the specific application. Be of a formula that is suitable for application in a manhole that is susceptible to frost, if applicable for the regional climate.
  - a. Drilling and injection method shall use a hydrophilic polyurethane chemical grout manufactured by Avanti or equal unless otherwise approved by the Engineer.
  - b. Exterior chemical curtain grouting method shall use a hydrophobic polyurethane chemical grout manufactured by Avanti or equal unless otherwise approved by the Engineer.
  - c. Expanded Gasket Procedure shall use Oil Free Oakum with hydrophilic polyurethane chemical grout manufactured by Avanti or equal used for sealing larger cracks and manhole joints, unless otherwise approved by the ENGINEER.

2.02 PATCHING, REPOINTING, FILLING AND REPAIRING NON-LEAKING HOLES, CRACKS AND SPALLS IN THE CONCRETE AND MASONRY MANHOLES

- A. Quick-Setting Cementitious Patching material shall comply with the following minimum requirements:

Physical Properties		
Compressive Strength	ASTM C 109	>1800 psi, 1 hr. >2600 psi, 24hr. >3000 psi, 28 days
Bond	ASTM C 882	>1600 psi, 28 days
Applied Density		105 lbs pcf ± 5 lbs
Shrinkage	ASTM C 596	0% at 90% R.H.
Placement Time		5 to 10 minutes
Set Time		15 to 30 minutes

- B. The material used to mix product shall be clean and potable. No material (other than water) shall be used with or added to the patching product without prior approval or recommendation from manufacturer.

2.03 COATINGS FOR ALL INVERTS

- A. A quick-setting material that complies with the following minimum requirements:

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Physical Properties		
Compressive Strength	ASTM C 109	>1800 psi, 1 hr. >2600 psi, 24hr. >3000 psi, 28 days
Bond	ASTM C 882	>1600 psi, 28 days
Applied Density		105 lbs pcf ± 5 lbs
Shrinkage	ASTM C 596	0% at 90% R.H.
Placement Time		5 to 10 minutes
Set Time		15 to 30 minutes

- B. Water used to mix product shall be clean and potable. No material (other than water) shall be used with or added to the patching product without prior approval or recommendation from manufacturer.

2.04 INTERIOR FLEXIBLE CHIMNEY SEALS

- A. Provide a flexible seal to provide corrosion protection and to prevent infiltration through the interior of the manhole frame and chimney area of the manhole.
- B. Provide materials for interior flexible chimney seal 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. The seal shall remain flexible allowing for repeated vertical or horizontal movements of the frame due to frost lift, ground movement, or the thermal movement of pavement. The final liner material shall be made no less than 170 mils of corrosion resistant flexible urethane resin coating to be applied to the inside wall of the entire chimney area as described above. Mil thickness may vary depending on the local climate. The product shall have a minimum elongation of 800% and a Durometer hardness of 75. Final liner shall have a minimum tensile and adhesion strengths of 1150 psi and 175 lb. l/in. respectively. The manhole sealant shall conform to the physical requirements of ASTM D 412 Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension. Sealant shall equal or exceed "Flex-Seal" as manufactured by Sealing Systems, Inc., Loretto, MN.

2.05 MANHOLE FRAME AND COVERS

- A. Manhole frames and covers shall be cast iron, tight-fitting, free from scale, lumps, blisters, sand holes or any noticeable defects of any kind. Manhole covers and frame seats shall be machined to a true surface. Castings shall be thoroughly cleaned and subject to hammer inspection. Cast iron shall conform to ASTM A 48, Class 30. Refer to the Contract Drawings and specification Section 02605 - Precast Concrete Manholes and Structures for additional manhole frame and cover requirements.

PART 3 EXECUTION

3.01 GENERAL

- A. Each manhole to be rehabilitated shall be thoroughly cleaned and then inspected for loose

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or missing bricks, loose mortar, or holes. Remove any protrusions or obstructions into the manhole. Observed leaks shall be eliminated prior to applying the manhole lining system.

- B. Damage incurred to the manhole or pipe segments due to methods and equipment employed by the Contractor is the responsibility of the Contractor. Damage to public and private property from sewer surcharging that results from material or equipment left in the manhole or sewer or from any flow blockage is the responsibility of the Contractor. The cost to repair the manhole or pipe segments and expenses incurred by the Owner as a result of the damage shall be the responsibility of the Contractor.

## 3.02 SURFACE PREPARATION

- A. Pre-Rehabilitation Surface Preparation: Areas to be repaired which requires bonding of new cementitious, epoxy, chemical or waterproofing material to existing cement or masonry shall be prepared as follows.
1. Clean the area with high-velocity water cleaning equipment to remove all foreign matter, oil, grease, wax and dirt, including removal of bitumastic coatings. Pressure shall not exceed that which may cause any permanent damage to the existing manhole walls or other parts of the structure.
  2. Foreign material remaining after high-velocity water blasting shall be removed from the manhole surface using an acid wash. The acid wash shall be muriatic acid (hydrochloric acid) at a ratio of 1 part acid (HCl) to 10 parts of water. The mixing, application and removal of the acid solution shall be in accordance with the manufacturers' recommendations. The acid solution shall remain on the manhole surface until all foreign material have been removed and completely washed off with water.
  3. Chip or chisel away all loose or defective material from the areas to be repaired. Furnish a firm mechanical key by undercutting whenever possible.
  4. Allow interior surfaces of the manhole to dry before applying epoxy manhole lining systems.
  5. Large voids including holes left by the manhole rung removal shall be filled with quick setting patching mix.
  6. Remove protruding rubber gaskets between wall joints.
- B. Existing manhole rungs/steps shall be removed, ground smooth and patched and not replaced. Step removal shall be included in the manhole rehabilitation costs.
- C. Sewer Line Protection: Place covers over the invert to prevent material from entering the sewer lines.
- D. Drop Connections: Remove any interior drop connections anchored to manhole walls prior to installing the lining system. After installation and proper curing of the liner, reinstall interior drop connections to their original condition prior to removal. If the existing drop connection is already damaged and cannot be reused, Contractor shall

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request from the Engineer the best course of action.

- E. Conduct a visual inspection of each manhole after it is cleaned. All active, hydrostatic infiltration leaks shall be plugged or sealed with an appropriate grout compatible with the lining. Remove all loose mortar and rubble of existing chimney (corbelling), cone, walls, benches and inverts. Prepare manhole to receive cementitious lining as necessary by reshaping and repairing benches, inverts, cone, walls, and corbelling where required. All interior surfaces shall be prepared as recommended by the lining manufacturer. Minimum requirements are as listed below:

1. Repair cracks and other voids and fill with suitable non-shrinking cements, sealants or grouts, including all voids between the existing sewer pipes and manhole walls. Patches shall be smooth and even with the manhole wall.
2. Suitably prepare surfaces for required bonding of lining as recommended by the manufacturer.

### 3.03 SEALING OF LEAKS IN INVERTS, BENCHES, WALLS, CONE, AND CORBELLING

- A. Premixed Fast-Setting, Volume-Stable Waterproof Cement Plug: Seal unsealed lifting holes, unsealed step holes, and voids larger than 1/2 inch in thickness with a waterproof, quick setting mortar. Place water proof mortar according to manufacturer's instructions.
- B. Manhole Sealing by Chemical Grout Application: Chemical grouting shall include the following:
1. Transporting, delivering, and storing the chemical grout shall be according to the manufacturers published directions and requirements.
  2. Manhole Preparation: Repair the manhole frame and rings, and complete structural repairs before grouting the manhole. Cut roots and trim roots before grouting the manhole. Remove cracked or deteriorated material from the areas to be grouted.
  3. Chemical Grout Formulation: Mix each batch of chemical grout according to the manufacturer's published directions and requirements.
  4. Sealing Active Leaks: Use the Expanded Gasket Procedure, drilling and injection procedure and/or chemical curtain grouting to stop active leaks.
    - a. Expanded Gasket Procedure (EGP): Perform per ASTM F 2414-04, and the chemical grout manufacturers recommended installation methods. This is performed by soaking dry oil free oakum with hydrophilic polyurethane chemical grout. The resulting oakum/resin plug shall be forced into the opening until it sets. Perform the EGP to:
      - 1) Control flowing water in larger cracks, joints, or pipe to manhole boots.
      - 2) Seal drop or lateral connections, slip line terminal seals and open joints in RCP manholes.
      - 3) Seal between the corbel and manhole rings.
      - 4) Seal between the manhole rings and manhole frame.

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5. Drilling and Injection Procedure: Perform per ASTM F 2414-04 (2009) and the chemical grout manufacturers recommended installation methods to seal the manhole with chemical grout. Drill injection holes through the manhole at locations recommended by the manufacturer. Inject the chemical grout through the holes under pressure. Injection pressure shall not cause damage to the manhole structure or surrounding surface features. Inject chemical grout through the lowest holes first. Repeat the procedure until the manhole is externally sealed. Grout travel shall be verified by observation of grout to defects or adjacent injection holes. Drill additional injection holes as necessary to ensure grout travel. Do not inject grout from the ground surface. After chemical grout injection is complete, clean injection holes with a drill and patch with a waterproof, quick setting mortar for brick and concrete manholes. Perform the drilling and injection procedure to control flowing water in cracks.
6. Curtain Grouting: Perform per ASTM F 2414-04 (2009) and the chemical grout manufacturers recommended installation methods. Perform the curtain grouting procedure when there are multiple active leaks and the drilling and injection procedure does not eliminate the active leaks.

3.04 INVERT CHANNEL COATING

- A. Coat invert channels with a material compatible with the manhole lining system per the manhole lining manufacturers recommendations to prevent infiltration and to build up the invert channel to the invert elevations of the new sewer main or cured-in-place lined sewer and to form a smooth flow channel. The entire channel shall be coated. The coating shall be troweled uniformly onto the invert at a minimum one half (1/2") inch in thickness or as recommended by the manufacturer. The coating shall extend out onto the bench of the manhole sufficiently to tie into the monolithic liner.
- B. The material used for the invert channel shall be suitable for the intended purpose and shall be compatible with the materials used for the manhole lining system. The material for the invert channel shall be as recommended by the cementitious liner manufacturer and installed in accordance with the manufacturers recommended installation instructions and procedures. Coating the invert may be waived when the invert is in excellent condition and upon approval by the Owner or Engineer.

3.05 LOCATING, RAISING, RESETTING, AND/OR REPLACING MANHOLE FRAME AND COVER ASSEMBLIES

- A. Locate and uncover buried manhole frame and covers; remove existing manhole frame and covers; dispose of existing manhole frame and covers, if they are not being reused; and install new or reused manhole frame and covers as directed by the Owner and/or Engineer. Repair any damage to the manhole chimney or corbelling caused by the removal of the existing manhole frame at no additional cost to the Owner.
- B. Existing frames and covers to be reused shall be thoroughly cleaned before re-installation.
- C. If existing frames and covers are not to be reused, properly dispose of these materials in accordance with local laws and Engineer approval.

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- D. When re-setting existing frames and covers, apply preformed flexible joint sealant Kent Seal No. 2 by Hamilton-Kent or Ram-Nek by K.T. Snyder Company or equal.
- E. Install new or reused frames so that the tops of the covers are at the required grade. Utilize bricks or precast concrete grade rings to set the manhole frame and cover to the finished grade. Precast concrete grade rings shall be set in a bed of butyl mastic sealant. Bricks shall be set in a full mortar bed.

3.06 CEMENT EXTERIOR

- A. For raised manholes with damaged exterior, masonry manholes without an exterior cement coating, manholes where frame and cover assemblies are being replaced or reset, where noted on the Drawings, or as directed by Engineer, repair existing or install new cement exterior coating for manholes as follows:
  - 1. Prepare exterior surface of manholes using procedures outlined in Article 3.02, A above.
  - 2. Following surface preparation, spray or hand trowel the exterior from existing/finished grade to above the frame/chimney seal using the product specified in Section 02763 Paragraph 2.01 and in accordance with the manufacturers installation instructions. Apply a minimum finished thickness of two (2") inches.
  - 3. Apply a curing compound in accordance with ASTM C309-11 to the exterior cement.

3.07 FIELD TESTING AND ACCEPTANCE

- A. The Engineer or Owner may enter the manholes to inspect the benching, invert channels, manhole wall/pipe connections, surface preparation, and other parts of the work. Provide forced air ventilation, gas monitors and detectors, harnesses, lights, etc. for the Engineer or Owner to enter the manhole and perform the inspection in complete accordance with OSHA requirements.
- B. The manhole wall surfaces shall be sufficiently prepared for manhole the lining system as recommended by the lining manufacturer. The manhole wall surfaces shall be free from significant defects. Defects which will affect, in the foreseeable future, or warranty period,  
  
the integrity or strength of the manhole shall be repaired at the Contractor's expense, in a manner mutually agreed upon by the Engineer and the Contractor.
- C. No Active infiltration shall be observed in the manhole as confirmed by visual inspection of the Owner or Engineer. Infiltration found shall be repaired by the Contractor immediately.
- D. The Contractor is responsible for coordinating inspection times with the Engineer.
- E. The testing of each manhole lining system is described in specification Section 02767.

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END OF SECTION

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SECTION 02764 TELEVISION  
INSPECTION

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Each designated section shall be visually inspected during sealing operations by means of a closed-circuit television. The inspection will be done one section at a time and the section being inspected will be suitably isolated from the remainder of the sewer line as required.
- B. Video recordings shall be made of the television inspections and both copies of the recordings and printed inspection logs shall be supplied to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. The television camera used for the inspection shall be one specifically designed and constructed for such inspection. Lighting for the camera shall be suitable to allow a clear picture for the entire periphery of the pipe. The camera shall be operative in 100 percent humidity conditions. The camera, television monitor and other components of the video system shall be capable of producing a minimum 500 line resolution video picture. Picture quality and definition shall be to the satisfaction of the Engineer. The Lighting System shall minimize reflective glare.

PART 3 EXECUTION

3.01 PERFORMANCE

- A. The camera shall be moved through the line in either direction at a uniform rate, stopping when necessary to insure proper documentation of the sewer's condition but in no case will the television camera be pulled at a speed greater than 30 fpm. 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. If, during the inspection operation the television camera will not pass through the entire manhole section, the Contractor shall re-set up his/her equipment in a manner so that the inspection can be performed from the opposite manhole. If, again, the camera fails to pass through the entire section, the Contractor shall remove the obstruction by excavation and replacement of that section of pipe as specified herein.
- B. Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones, radios, or other suitable means of communication shall be set up between the two manholes of the section being inspected to ensure that good communications exist between members of the crew.
- C. The accuracy of the measurements cannot be stressed too strongly. Measurement for location

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of defects shall be above ground by means of a meter device. Marking on cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement meters will be accurate to two tenths of a foot over the length of the section being inspected. Accuracy of the measurement meters shall be checked daily by use of a walking meter, roll-a-tape or other suitable device.

- D. Documentation of the television results shall be as follows:
1. Television Inspection Logs
    - a. Printed location records shall be kept by the Contractor and will clearly show the location, in relation to adjacent manholes, of each source of infiltration discovered. In addition, other data of significance including the locations of building and house service connections, along with an estimation of infiltration from such services, joints, unusual conditions, roots, storm sewer connections, collapsed sections, presence of scale and corrosion and other discernible features will be recorded and a copy of such records will be supplied to both the Owner and the Engineer.
  2. Video recordings of the data on the television monitor shall be made by the Contractor copies of which, in digital format, shall be provided to the Owner.

END OF SECTION

SECTION 02765  
SEWER LINE AND MANHOLE CLEANING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required to clean sewer pipe and fittings installed and/or rehabilitated, complete as shown on the Drawings and as specified herein.
- B. Cleaning shall include proper high-pressure water jetting, rodding, bucketing, brushing and flushing of sewers and manholes prior to inspection by closed circuit television (CCTV), pipeline rehabilitation or replacement, point repairs, manhole preparation, and testing operations.
- C. Goal of cleaning is to remove debris, roots, intruding services, deposits, and other blockages to a minimum of 95 percent open. Contractor shall perform sewer cleaning work to an acceptable level as necessary to perform a thorough television inspection of sewer. If pipe condition is such that cleaning may cause a potential collapse, then pipe shall be televised without attempting to clean it to 95 or 98 percent condition, pending approval by Engineer.

1.02 RELATED WORK

- A. Closed Circuit Television Inspection of Sewers is included in Section 02764.
- B. By-Pass Pumping is included in Section 02659.

1.03 SUBMITTALS

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- A. Submit a safety plan prior to performing any on-site work that includes the following as a minimum:
  - 1. Confined Space Entry.
  - 2. Personal Protective Equipment.
- B. Closeout Documents: Submit one complete set of documentation regarding inspections and work performed. Based on work scope, submit written reports, photographs taken, and USB flash drives that incorporated color video recordings.

1.04 QUALITY ASSURANCE

- A. Contractor shall have a minimum of five years experience in sewer line and underground structure cleaning. Submit a list of at least three customers who have had similar work completed. Furnish trained and qualified technicians with proper experience operating equipment that is being used on this project.

1.05 SYSTEM DESCRIPTION

- A. City of North Port's wastewater collection system.

1.06 PROJECT/SITE REQUIREMENTS

- A. Recording of Field Observations: Record video inspections in color on USB flash drives. Submit inspection report in Microsoft Access format database and recorded onto compact discs (CDs). Original recordings and inspection reports shall become property of Owner. Observations shall include:
  - 1. Television Inspection Logs: Each segment inspection shall have a separate inspection report that is recorded onto a USB flash drive in a Microsoft Access or Excel format that shall be given to Owner for its use; also submit a paper copy of the report that is clear and concise to reader. Clearly show location, in relation to adjacent manholes, of each source of infiltration/inflow discovered. In addition, other data of significance including locations of building and house service connections, along with an estimation of infiltration/inflow from such services, joints, unusual condition, roots, cracked or collapsed sections, presence of scale and corrosion, sewer line sections that the camera failed to pass through and reasons for failure and other discernible features shall be recorded.
  - 2. Photographs: During CCTV inspection, stop camera at significant observations to ensure a clear and focused view of pipe condition. At this point, if video equipment has video printer capabilities for instantaneous photographs, take photographs of significant observations for use in inspection documentation report. If the video equipment does not have capabilities for instantaneous photographs, take digital photographs of monitor with significant observations on screen. Provide Owner with a USB flash drive that includes all photographs.
  - 3. Recordings: Purpose is to supply a visual and audio record of problem areas of sewer lines that may be replayed both daily and at future presentations by Owner. Recording playback shall be at same speed that it was recorded. Slow motion or stop motion playback features shall be supplied at option of the Contractor. Make recordings in color.

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Have recordings and necessary playback equipment readily accessible for review by Owner during the project. At project completion furnish original recordings on USB flash drive to the Owner. Contractor shall keep a copy of recordings for 30 days after Substantial Completion, at which time recordings may be erased at Contractor's option.

- B. Traffic Control: Coordinate traffic control required to perform work of this Section under the provisions of the Contract General Conditions and Special Provisions.

## 1.07 DEFINITIONS

- A. Light Cleaning: Small amounts of debris existing within sewer line and where sewer reaches do not require heavy cleaning, as defined below, and that produce little or no debris.
- B. Heavy Cleaning: Large deposits of debris or heavy root growth existing within sewer line and where sewer reaches require debris removal of depths up to 25 percent of pipe height.

## PART 2 PRODUCTS

## 2.01 EQUIPMENT

- A. Hydraulic Sewer Cleaning Equipment:

- 1. Equipment used shall be of a movable dam type and be constructed so that a portion of the dam may be collapsed at any time during cleaning operation to protect against flooding of sewer. Movable dam shall be same diameter as pipe being cleaned and shall provide flexible scraper around outer periphery to ensure total removal of grease. If sewer cleaning balls or other such equipment which cannot be collapsed instantly are used, take special precautions against flooding of sewers and public or private property.

- B. High Velocity Jet (Hydrocleaning) Equipment:

- 1. Have a minimum of 500 feet of high pressure hose.
- 2. Have a selection of two or more velocity nozzles that are capable of producing a scouring action from 15 to 45 degrees in all size lines to be cleaned. Also include a high velocity gun for washing and scouring manhole walls and floor.
- 3. Be capable of producing a minimum of 80 gallons per minute flows from a fine spray to a long distance solid stream and delivering up to 1000 psi. Be able to carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel. Locate controls so equipment can be operated above ground. Select flowrates and pressures as required for each size of sewer, type of debris, and amount of debris, and as recommended by nozzle manufacturers.
- 4. Have a water tank, auxiliary engines and pumps, and a hydraulically driven hose reel.
- 5. Have root cutting blades that are hydraulically spun.

- C. Mechanical Cleaning Equipment:

- 1. Bucket machines shall be in pairs and with sufficient power to perform the work in an

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efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe shall not be acceptable.

2. Power rodding machines shall be either sectional or continuous type capable of holding a minimum of 750 feet of rod. Rod shall be specifically treated steel. To ensure safe operation, machine shall have a fully enclosed body and an automatic safety release clutch or relief valve.

## PART 3 EXECUTION

## 3.01 GENERAL

- A. Cleaning Precautions: During sewer cleaning operations, satisfactory precautions shall be taken in use of cleaning equipment. When hydraulically propelled cleaning tools (which depend upon water pressure to provide their cleaning force) or tools which retard flow in sewer line are used, precautions shall be taken to ensure that water pressure created does not damage or cause flooding of public or private property being served by sewer. When possible, flow of sewage in sewer shall be utilized to provide necessary pressure for hydraulic cleaning devices. When additional water from fire hydrants is necessary to avoid delay in normal work procedures, water shall be conserved and not used unnecessarily.
- B. No sewer cleaning shall take place in a particular sewer segment until upstream pipe segments have been cleaned. If cleaning is done in a downstream pipe segment in order to facilitate overall cleaning operations, segment shall be re-cleaned at no additional cost to Owner, after pipes upstream of that segment have been cleaned.
- C. Sewer line walls shall be cleaned adequately to provide for proper operation of joint testing and sealing equipment or internal inspection to discern structural defects, misalignment and infiltration/inflow sources. Cleaning shall be performed immediately prior to joint testing and sealing and internal inspection to preclude build-up of debris from infiltration/inflow sources and discharges from upstream pipeline sections.
- D. Designated sewer manhole sections shall be cleaned using hydraulically propelled, high velocity jet, or mechanically powered equipment. Selection of equipment used shall be based on conditions of lines at the time the work commences. Equipment and methods selected shall be satisfactory to Owner's Representative. If cleaning of an entire section cannot be successfully performed from one manhole, equipment shall be set up on other manhole and cleaning again attempted. If, again, successful cleaning cannot be performed or equipment fails to traverse entire manhole section, it will be assumed that a major blockage exists and cleaning effort shall be repeated with other types of equipment. Immediately report any blockages to Engineer.
- E. Water for sewer cleaning shall be purchased by Contractor and obtained at locations in accordance with utility owner. If water is obtained from a potable supply, provide appropriate backflow prevention devices as required by authority having jurisdiction to protect potable system from cross connections and contamination. Contractor shall be solely responsible for preventing cross contamination of any public or private water systems used for this purpose.

## 3.02 PREPARATION

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- A. Selection of cleaning equipment shall be based on conditions of manhole and sewer lines at the time the work commences. Equipment and methods selected shall be acceptable to Engineer. Acceptance of proposed method of cleaning does not relieve Contractor of its responsibility to adequately remove dirt, grease, rocks, sand, and other materials and obstructions from sewer lines and manholes to allow performance of other work.
- B. Take satisfactory precautions to protect sewer lines from damage that might be caused by improper use of cleaning equipment. Whenever using hydraulically propelled cleaning tools that depend upon water pressure to provide their cleaning force, or any tools that retard flow of water in sewer line, take precautions to ensure that water does not cause damage or flooding to public or private property.
- C. No fire hydrant shall be obstructed in case of a fire in area served by hydrant.
- D. Remove water meters, piping, and related equipment from fire hydrants at end of each work day.

3.03 PERFORMANCE

- A. Selection of cleaning equipment shall be based on conditions of manholes and sewer lines at the time the work commences based on pre-construction CCTV inspection to be conducted by Contractor.
- B. Contractor shall provide appropriate screening to stop passing of materials into downstream sewers. Sludge, dirt, sand, rocks, grease, and other solid or semisolid residue, debris, and material resulting from cleaning operations shall be removed at downstream manhole of section of sewer being cleaned. Passing material from manhole section to manhole section which could cause line stoppages, accumulations of sand in wet wells, or damage to pumping equipment shall not be permitted.
- C. Debris, residue, and other materials resulting from cleaning operations shall become property of Contractor and shall be removed from site at end of each workday and shall be disposed of in an approved and lawful manner. Under no circumstances will accumulation of debris, residue, and other matter be permitted on site beyond stated time, unless prior written authorization is given for storage in totally enclosed containers.
- D. Light Cleaning: Use balls, scooters, and three (3) passes of high pressure water jetting equipment, brushes and swabs. Costs related to cleaning of such sewers shall be included in Contractor's unit prices for CCTV and Light Cleaning.
- E. Heavy cleaning: Use bucket machines, scrapers, and augers with cleaning which requires more than three (3) passes with hydraulic cleaning equipment to achieve acceptable results. Heavy cleaning will be conducted only upon approval and direction of Engineer. Costs related to cleaning of such sewers shall be included in Contractor's unit prices for Heavy Cleaning. Costs related to televising of such sewers following heavy cleaning shall be included in Contractor's unit prices for CCTV and Light Cleaning. Compensation for heavy cleaning of a particular line will only be paid if:
  - 1. Heavy cleaning was authorized by Engineer prior to Contractor performance of the work.

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2. Contractor proves that both significant time and effort was necessary to clean the line, (i.e. time required to clean and inspect the line must have been at least twice the average time required to clean and inspect other sewers of comparable length and diameter in project area.
  3. Adequate video proof of blockage, debris, grit or grease build-up, or other condition is provided by Contractor. Heavy Cleaning will be paid for on a lineal foot basis only for length required to be cleaned, i.e., from downstream manhole to approximate location of heavy cleaning. This may or may not include entire pipe section, unless otherwise approved by Engineer or Owner.
- F. Obtain video proof of heavy cleaning by acquiring a 'before' video of accessible portions of obstructed reach; submit to Engineer along with completed inspection.
1. A submerged camera does not justify a need for heavy cleaning; proof that submergence was due to a blockage or heavy debris and not a sag in the line will be required.
- G. Pipes that contain roots or debris depths greater than 25 percent of pipe height may be paid on a time and material basis, upon approval by Engineer. Engineer or Owner may determine any individual pipe be cleaned on a time and material basis.
- H. Flushing of sanitary sewers to facilitate cleaning activities without the capture of solids and debris is expressly prohibited.
- I. Retrieval of equipment lodged in pipes or a wet well is Contractor's responsibility and shall be performed at Contractor's expense.
- 3.04 FIELD QUALITY CONTROL
- A. Acceptance of sewer line cleaning shall be contingent on satisfactory completion of television inspection. If television inspection shows cleaning to be unsatisfactory, sewer line shall be re-cleaned and re-inspected until cleaning is shown to be satisfactory.
  - B. If internal joint testing and sealing is to follow cleaning, give particular attention to adequacy of cleaning to ensure that proper seating of sealing packer can be achieved.
  - C. Inspection of cleaning operations will be made on a daily basis by the Engineer.
- 3.05 CLEANING
- A. Upon cleaning of underground sewer lines or structures, remove debris from finish grade and clean work areas so conditions at conclusion of the work are equal to or better than areas prior to work of this Section.

END OF SECTION

## SECTION 02767 MONOLITHIC

EXHIBIT B  
TECHNICAL SPECIFICATIONS  
MANHOLE LINING SYSTEMS

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PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to install and test Cementitious Manhole Monolithic Lining, Epoxy Manhole Monolithic Lining System, and Cured-In-Place Manhole Liner as noted on the Drawings and as specified herein for the purpose of:
  - 1. Eliminating infiltration and exfiltration.
  - 2. Providing corrosion protection.
  - 3. Repairing voids and restoration of the manhole structural integrity as a result of applying a monolithic liner to the wall and bench surfaces of brick, concrete or any other masonry construction material.
  - 4. Extending lining from invert to top of cone, as specified.
- B. Accurately field measure and size each individual manhole. Contractor is reminded that each existing sewer manhole designated to receive monolithic lining may have a different configuration and varying field dimensions. Field measurements shall conform to requirements of monolithic lining manufacturer.
- C. Do not install manhole lining until other manhole rehabilitation and procedures for manhole preparation and cleaning as specified on the Drawings and in Section 02763 "Manhole Rehabilitation" work is complete.
- D. Contractor is advised that presence or absence of leakage through manhole wall noted on manhole inspection reports and as seen in Contractor's independent inspection of manholes prior to bidding is dependent upon ground water levels and conditions at time of inspections. High ground water levels in project area typically occur in summer months (June through October) but will vary with rainfall in any given year. Contractor shall reflect its assumptions and judgments on leakage through manhole walls based on this information in unit prices bid for lining manholes. Stop leakage prior to lining manholes. No additional payment will be made to Contractor for repairing leaks not visible prior to bidding or sewer rehabilitation.

1.02 RELATED WORK

- A. Trenching, Backfilling and Compaction is included in Section 02221.
- B. Sewer Line Cleaning is included in Section 02765.
- C. Manhole rehabilitation is included in Section 02763.
- D. Precast Concrete Manholes and Structures is included in Section 02605.

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- E. By-Pass Pumping is included in Section 02659.
- F. Cured-in-Place Pipe Liner is included in Section 02769.

1.03 ACRONYMS

- A. CMML: Cementitious Manhole Monolithic Lining.
- B. EMMLM: Epoxy Manhole Monolithic Liner Material.
- C. CIPM: Cured-In-Place Manhole Liner.

1.04 SUBMITTALS

- A. Submit to Engineer, in accordance with Section 01300 shop drawings, product data, and installation methods. Submittals shall include, but are not limited to the following:
  - 1. Manufacturers' product data, including physical properties, surface preparation, repair, application, curing, and field quality control procedures.
  - 2. Manufacturer and applicator qualifications as specified in Paragraph 1.05 below.
  - 3. Type of monolithic lining system to be installed for each manhole.
  - 4. Diameter, depth (rim to invert), and material for each manhole.
  - 5. Design data and specification data sheets listing parameters used in EMMLS and/or CIPM design and thickness calculations based on applicable provisions of ASTM C 722 and/or ASTM F 1216.
  - 6. Design calculations sealed by a Registered Professional Engineer in the State of Florida.
  - 7. A list of municipal installations performed by the manufacturer and Contractor over past five (5) years along with contact name, telephone number, and brief description of work performed.
- B. Submit to Engineer, within 10 days of Effective Date of the Agreement, name of supplier (manufacturer), name of installer, and a list of materials to be furnished.
- C. Submit a step-by-step description of methods, practices, intervals, etc. to be used in application and curing of monolithic lining system to meet requirements of this specification Section.
- D. Test Reports:
  - 1. Prior to each shipment of materials, submit certified test reports that materials for this Contract were manufactured and tested in accordance with ASTM Standards specified herein.

1.05 REFERENCE STANDARDS

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- A. ASTM International (ASTM):
1. ASTM C 109 - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars.
  2. ASTM C 150 - Standard Specification for Portland Cement.
  3. ASTM C 267 - Standard Test Method for Chemical Resistance of Mortars, Grouts, and Monolithic Surfacing.
  4. ASTM C 293 - Test Method for Flexural Strength of Concrete.
  5. ASTM C 321 - Test Method for Bond Strength of Chemical-Resistant Mortars.
  6. ASTM C 496 - Test Method for Splitting Tensile Strength of Cylindrical Concrete Specimens.
  7. ASTM C 579B - Test Method for Compressive Strength of Chemical-Resistant Mortars, Grouts and Monolithic Surfacing.
  8. ASTM C 596 - Test Method for Drying Shrinkage of Mortar Containing Portland Cement.
  9. ASTM C 666 - Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
  10. ASTM C 722 - Standard Specification for Chemical-Resistant Resin Monolithic Surfacing.
  11. ASTM C 882 - Test Method for Bond Strength of Epoxy-Resin Systems Used with Concrete.
  12. ASTM C 884 - Test Method for Thermal Compatibility Between Concrete and an Epoxy-Resin Overlay.
  13. ASTM C 1244 - Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test Prior to Backfill.
  14. ASTM D 638-98 - Standard Test Method for Tensile Properties of Plastics.
  15. ASTM D 695-96 - Standard Test Method for Compressive Properties of Rigid Plastics.
  16. ASTM D 790 - Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics.
  17. ASTM D 870 - Practice for Testing Water Resistance of Coatings Using Water Immersion.
  18. ASTM D 1763 - Standard Specifications for Epoxy Resins.
  19. ASTM D 2240-97e1 - Standard Test Method for Rubber Property Durometer Hardness.

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20. ASTM D 2247 - Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
  21. ASTM D 4787-13 - Standard Practice for Continuity Verification of Liquid or Sheet Linings Applied to Concrete Substrates.
  22. ASTM D 5813-04 (2012) - Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping Systems.
  23. ASTM D 6132-08 - Standard Test Method for Nondestructive Measurement of Dry Film Thickness of Applied Organic Coatings Using an Ultrasonic Gage.
  24. ASTM D 7234-12 - Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
  25. ASTM F 1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits By the Inversion and Curing of a Resin-Impregnated Tube.
  26. ATSM F 2414-04 (2009) - Standard Practice for Rehabilitation of Sewers Using Chemical Grouting.
- B. Where reference is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.06 QUALIFICATIONS

- A. Contractor performing the work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner. Contractor shall submit the following information to the Engineer for review and approval before any work is performed:
1. Be certified by manufacturer to install monolithic lining system.
  2. Have a minimum of five (5) years experience or 500 manholes in performing this type of specialized work. This may be waived by Owner through their product approval process with documented demonstration projects.
  3. Be capable of providing crews as needed to complete this work without undue delay.
  4. Owner reserves right to disapprove use of Contractor, based on insufficient qualifications.

1.07 QUALITY ASSURANCE

- A. Supplier shall be responsible for provisions of test requirements specified in above referenced ASTM Standards as applicable. In addition, monolithic lining products to be installed under this Contract may be inspected at plant for compliance with these specifications by an independent testing laboratory provided by Owner. Contractor shall require manufacturer's cooperation in these inspections. Cost of plant inspection of lining products and materials approved for this Contract shall be borne by Owner.
- B. Inspections of lining products and materials may also be made by Engineer or other

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representatives of Owner after delivery. Lining products and materials shall be subject to rejection at any time on account of failure to meet any of Specification requirements, even though samples may have been accepted as satisfactory at place of manufacture.  
Lining

materials rejected after delivery shall be marked for identification and shall be immediately removed from job site.

- C. Contractor shall furnish services of cementitious manhole liner manufacturer's field service technician, who has complete knowledge of manhole rehabilitation, to advise and assist cementitious manhole lining installation and provide instruction to Contractor for rehabilitation of first five manholes. Field service technician shall be fully qualified and experienced in manhole rehabilitation work including cementitious, epoxy and/or cured-in-place manhole lining systems depending on proposed lining system.
- D. Provide monolithic epoxy lining from a single manufacturer. Supplier shall be responsible for provisions for test requirements specified in ASTM Standards C 722, C 882, C 884, D 870, D 1763, and D 2247 as applicable for monolithic lining.
- E. Inspections of EMMLM may be made by Engineer or other representatives of Owner after delivery. EMMLM shall be subject to rejection at any time on account of failure to meet any of Specification requirements, even though sample EMMLM may have been accepted as satisfactory at place of manufacture. EMMLM rejected after delivery shall be marked for identification and shall be removed from the job at once.

## 1.08 DELIVERY, STORAGE AND HANDLING

- A. Care shall be taken in shipping, handling and placing to avoid damaging lining products. Extra care may be necessary during cold weather construction. Lining product or material damaged in shipment shall be replaced as directed by Engineer.
- B. Lining product showing deterioration or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage can be seen, shall be marked as rejected and removed at once from the work.
- C. While stored, lining products shall be adequately packaged and protected. Lining products shall be stored in a manner as recommended by manufacturer.
- D. Materials shall be stored, shipped, and handled according to their material safety data sheet and manufacturer's recommendations. EMMLM damaged in shipment shall be replaced as directed by Engineer at no additional cost to Owner.

## 1.09 SAFETY AND SITE CONDITIONS

- A. Comply with and enforce Federal, State, and Local safety regulations. Contractor's personnel shall be certified for confined space entry.

## 1.10 WARRANTY

- A. Warranty monolithic lining placed by Contractor for a period of two years from date of

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Substantial Completion. During this period, defects discovered in monolithic lining, as determined by Owner or Engineer, shall be repaired or replaced in a satisfactory manner at no cost to Owner. Such repair or replacement shall include cost of removal and reinstallation. After 21 months following Substantial Completion of manhole lining, Owner or Engineer will inspect the work to ensure proper performance. If deficiencies are found during these inspections, Contractor shall make necessary repairs at no additional cost to Owner.

- B. Contractor shall be responsible for stopping leaks prior to installation of monolithic lining system.

PART 2 PRODUCTS

2.01 SYSTEM REQUIREMENTS

- A. Design and install monolithic manhole lining system to protect concrete, brick, mortar, and other manhole surfaces from corrosion. Design products to stop infiltration, root intrusion, and further deterioration in manhole. Interior surfaces to be protected shall include walls, benches, invert, pipe junctions and chimney (corbel). Table below outlines different monolithic manhole lining systems and respective product specification Articles for each lining system. The pH limits listed below are typical and type of manhole lining used shall be as shown on the Drawings or as directed by Engineer.
  1. Portland Based Cementitious Liner: No or very mild hydrogen sulfide conditions, pH of 4.0 or higher.
  2. Calcium Aluminate Cementitious Liner: Mild to harsh hydrogen sulfide conditions, pH of 2.0 or higher.
  3. Epoxy Liner: Harsh hydrogen sulfide conditions, pH of 1.0 or higher. Structures with very turbulent flow such as pump station wet wells and forcemain discharge structures.
  4. CIPM: Harsh hydrogen sulfide conditions, pH of 1.0 or higher. Structures with very turbulent flow such as pump station wet wells and forcemain discharge structures. Severe infiltration and structural integrity issues.

Monolithic Manhole Lining System Type	Specification Paragraph
Portland Based Cementitious Liner	2.01.A.1, B, C, D, E, F, G, H
Calcium Aluminate Cementitious Liner	2.01.A.2, B, C, D, E, F, G, H
Epoxy Liner	2.02
Cured-In-Place Manhole (CIPM )	2.03

2.02 CEMENTITIOUS MANHOLE MONOLITHIC LINING (CMML) SYSTEM

- A. CMML system shall be a monolithic, Portland based or calcium aluminate cementitious liner system suitable for use as a trowel- or spray-applied monolithic surfacing in sewer manholes.
- B. Minimum thickness of Portland based cementitious lining shall be one (1")-inch thick.

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- C. Minimum thickness of calcium aluminate based cementitious lining shall be one (1")-inch thick.
- D. Cementitious lining system shall be:
1. Type 1: Portland-based Cementitious Liner [no sulfide conditions (substrate surface of pH 4.0 or higher)].
    - a. Acceptable Manufacturers and Products:
      - 1) Strong MS-2A.
      - 2) Quadex QM-1s Restore.
      - 3) Standard Cement Re-liner MSP.
      - 4) Permacast MS-10,000.
      - 5) Mainstay ML-72.
      - 6) Dinjer CMS 10K.
      - 7) Or pre-approved equal.
    - b. Portland-based cementitious liner product shall be used to form a structural monolithic liner covering interior substrate surfaces and have following minimum requirements:

Minimum Requirements			
Compressive Strength	ASTM C 109	28 days	>9000 psi
Tensile Strength	ASTM C 496	28 days	>800 psi
Flexural Strength	ASTM C 293	28 days	>1200 psi
Shrinkage @90% R.H.	ASTM C 596	28 days	0%
Bond	ASTM C 882	28 days	>2000 psi
Density, When Applied			134 ± 5lbs/ft <sup>3</sup>
Freeze/Thaw	ASTM C 666	N/A	300 cycles no visible damage

- c. Portland-based liner shall be made with Type I Portland Cement and shall be used according to manufacturer's recommendations in applications where there are no sulfide conditions (substrate surface of pH 4.0 or higher). Material shall meet or exceed industry standards and shall not have any basic ingredient that exceeds EPA maximum allowable limits for heavy metals. Water used to mix product shall be clean and free from contaminants. Questionable water shall be tested by a laboratory per ASTM C 94 procedure. Potable water need not be tested.
2. Type 2: Calcium Aluminate Cementitious Liner [mild sulfide conditions (substrate surface of pH 2.0 or higher)].
    - a. Acceptable Manufacturers and Products:
      - 1) Strong MS-2C.
      - 2) Quadex Aluminaliner.
      - 3) Standard Cement Maximum CA.
      - 4) Permacast CR-9,000.
      - 5) Mainstay ML-CA.
      - 6) SewperCoat.
      - 7) Or pre-approved equal.

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- b. Calcium aluminate cementitious liner product shall be used to form a structural monolithic liner covering interior substrate surfaces and shall have the following minimum requirements:

Minimum Requirements			
Compressive Strength	ASTM C 109	28 days	>9000 psi
Tensile Strength	ASTM C 496	28 days	>800 psi
Flexural Strength	ASTM C 293	28 days	>1500 psi
Shrinkage @90% R.H.	ASTM C 596	28 days	0%
Bond	ASTM C 882	28 days	>2000 psi
Density, When Applied			134 ± 5lbs/ft3
Freeze/Thaw	ASTM C 666	N/A	300 cycles no visible damage

- c. Calcium aluminate cementitious liner shall be made with calcium aluminate cement and shall be used according to manufacturer’s recommendations in applications where there are mild sulfide conditions (substrate surface of pH 2.0 or higher). Liner product shall be reinforced with alkaline resistant fiberglass rods or other similar fibers not less than one half (1/2”) inch in length. Material should meet or exceed industry standards and shall not have any basic ingredient that exceeds EPA maximum allowable limits for heavy metals. Water used to mix product shall be clean and free from contaminants. Questionable water shall be tested by a laboratory per ASTM C 94 procedure. Potable water need not be tested.
- E. When cured, CMML shall form a continuous, tight-fitting, hard, impermeable surfacing which is suitable for sewer system service and chemically resistant to chemicals or vapors normally found in domestic sewage.
  - F. CMML shall cover complete interior of existing sewer manhole including benches (shelves). Lining shall effectively seal interior surfaces of sewer manhole and prevent any penetration or leakage of groundwater infiltration.
  - G. Lining shall be compatible with thermal condition of existing sewer manhole surfaces. Surface temperatures will range from 20 degrees F to 100 degrees F. Provide test data on shrinkage of cementitious lining based on ASTM C 596.
  - H. If an internal flexible chimney seal is called for in the Drawings, then lining shall be installed one (1”)-inch below bottom of manhole frame. If no internal flexible chimney seal is called for in the Drawings, then lining shall be installed to two (2”) to three (3”) inches above bottom of manhole frame. Termination of and surface of lining shall be suitable for proper installation of manhole frame-chimney seal specified in Section 02763.
  - I. Cured system shall be continuously bonded to brick, mortar, concrete, chemical sealant, grout, pipe, and other surfaces inside sewer manhole.
  - J. Chemical sealants, grouts or patching materials used to seal active manhole leaks, to patch cracks, to fill voids and to otherwise prepare manhole surface prior to application of

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system shall be fully compatible with the system.

- K. System shall provide a minimum service life of 25 years.
- 2.03 EPOXY MONOLITHIC MANHOLE LINING SYSTEM (EMMLS) [HARSH SULFIDE CONDITIONS (SUBSTRATE SURFACE OF PH 1.0 OR HIGHER)]
- A. EMMLS shall be a resin-filled system suitable for use as a trowel-, spray- or spin-applied monolithic lining in sewer manholes. Resin shall be 100 percent epoxy resin. EMMLS shall conform to ASTM C 722. EMMLS materials shall be suitable for specified design conditions.
1. EMMLS shall provide a minimum service life of 25 years.
  2. Cured EMMLS shall be continuously bonded to brick, mortar, concrete, chemical sealant, grout, pipe and other surfaces inside sewer manhole. Provide bond strength data on cured EMMLS based on ASTM C882 test method.
  3. Cured EMMLS shall provide a minimum total thickness of 0.10 inches (100 mils). Cured lining thickness shall be continuous with proper sealing connections to unsurfaced areas.
  4. Chemical sealants or grouts used to seal active manhole leaks, to patch cracks, to fill voids and to otherwise prepare manhole surfaces shall be compatible with EMMLS.
- B. When cured, EMMLS shall form a continuous, tight-fitting, hard, impermeable lining, which is suitable for sewer system service and chemically resistant to any chemicals or vapors normally found in domestic sewage.
- C. EMMLS shall bond to sewer manhole being rehabilitated after being placed and cured. EMMLS shall cover complete interior of existing sewer manhole including benches (shelves), inverts (channels or troughs) and pipe connections. EMMLS shall provide a continuous watertight seal or barrier.
1. EMMLS shall effectively seal interior surfaces of sewer manhole and prevent any penetration or leakage of groundwater infiltration.
  2. Provide water resistance data on EMMLS based on ASTM Standards D 870 and D 2247 test methods.
  3. EMMLS shall be compatible with thermal condition of existing sewer manhole surfaces. Surface temperatures will range from 30 degrees F to 80 degrees F. Provide test data on EMMLS thermal compatibility based on ASTM C 884.
  4. EMMLS shall be separated from manhole frame by a suitable joint. Joint shall be sealed with joint sealing tape.
- D. EMMLS shall be as manufactured by Raven Lining Systems, IET Systems or pre-approved equal.
- 2.04 CURED-IN-PLACE MANHOLE LINER (CIPM) [HARSH SULFIDE CONDITIONS (SUBSTRATE

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SURFACE OF PH 1.0 OR HIGHER)]

- A. Manhole liner system shall be a cured-in-place system suitable for use as a monolithic surfacing in sewer manholes. CIPM system shall be Poly-Triplex Liner System, Terre-Hill, or pre-approved equal.
- B. Liner design and selection of materials shall be suitable for specified design conditions and shall meet minimum requirements outlined in Table 1. Thicker liners may be required based on design conditions. Liner shall be custom designed to fit each manhole and basis of design shall be submitted to Engineer in accordance with Paragraph 1.03. It is Contractor's responsibility to supply a CIPM liner that is most suitable for existing conditions and that meets requirements of this specification. Contractor shall assume groundwater at grade for all sites for purposes of liner thickness design unless otherwise instructed by Engineer.

<b>Table 1 Minimum Liner Physical Properties</b>						
Manhole Depth (grade to invert)	Minimum Liner Thickness <sup>(1)</sup> (inch) ASTM D5813	Minimum Pre- Saturated Fabric Weight (ounces)	Minimum Flexural Modulus of Elasticity (psi) ASTM D790	Minimum Compressive Strength (psi) ASTM D695	Chemical Resistance Testing in accordance with ASTM F1216 Appendix X2	Chemical Resistance Testing in accordanc e with Greenbook Standards
0 to 10 ft	0.117	56	1,000,000	11,000	PASS	n/a
10.1 to 15 ft	0.117	56	1,000,000	11,000	PASS	n/a
15.1 to 20 ft	0.158	68	1,000,000	11,000	PASS	n/a
(1) Minimum liner thickness includes only the strength portion of the liner. Non-structural layers are not included in minimum thickness requirements.						

- C. CIPM shall be installed on benches, walls, channels, and inverts of existing manholes. Cured surface shall be smooth and continuous with proper sealing connections to unsurfaced areas. CIPM shall begin below frame and frame/liner interface shall be sealed using an epoxy.
- D. CIPM shall provide a minimum service life of 25 years.
- E. CIPM shall be continuously bonded to brick, mortar, concrete, chemical sealant, grout, pipe and other surfaces inside sewer manhole. CIPM shall form a continuous, tight-fitting, hard, impermeable surfacing which is suitable for sewer system service and chemically resistant to chemicals or vapors normally found in domestic sewage. Liner shall effectively seal interior surfaces of sewer manhole and prevent any penetration or leakage of groundwater infiltration.
- F. Finished liner shall be repairable at any time during life of structure. Liner shall be flexible, and have an elongation sufficient to bridge up to a one quarter (1/4")-inch settling crack, without damaged to liner. Liner shall be able to bridge expansion cracks that may occur.

PART 3 EXECUTION

3.01 PREPARATION

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- A. Notify property owners who discharge sewage directly to manhole being surfaced to limit their use of sanitary service while lining is being placed, cured and active pipe and service connections are reopened. Notify individual property owners at least 72 hours in advance, giving date, start time, and estimated completion time for the work being conducted. This notification shall be coordinated with distribution of door hangers.
- B. When existing surfaces adjacent to areas where work of this Section is scheduled may be damaged or harmed, provide temporary materials to protect those existing surfaces. Contractor shall determine type and quantity of protective materials.

## 3.02 INSTALLATION - CEMENTITIOUS MANHOLE MONOLITHIC LINING (CMML)

- A. When cured, CMML shall form a continuous, tight-fitting, hard, impermeable surfacing which is suitable for sewer system service and chemically resistant to chemicals or vapors normally found in domestic sewage.
- B. CMML shall cover complete interior of existing sewer manhole including benches (shelves) and inverts. Lining shall effectively seal interior surfaces of sewer manhole and prevent penetration or leakage of groundwater infiltration.
- C. Lining shall be compatible with thermal condition of existing sewer manhole surfaces. Surface temperatures will range from 20 degrees F to 100 degrees F. Provide test data on shrinkage of lining based on ASTM C 596.
- D. Provide necessary bypass pumping of sewage flows where and when rehabilitation work is being performed, as specified in Section 02659 By-Pass Pumping.
- E. Place covers over invert to prevent extraneous material from entering the sewer lines.
- F. Clean sewer manhole to be surfaced and dispose of resulting material as specified in Section 02763 Manhole Rehabilitation, Paragraph 3.02 and as follows.
  - 1. Coatings that cannot be removed shall be sanded with coarse sand paper to roughen surface sufficient to obtain and ensure adequate bonding of CMMLS.
- G. Conduct a visual inspection of manhole after it is cleaned. Active, hydrostatic infiltration leaks shall be plugged or sealed with grout as specified in Section 02763 Manhole Rehabilitation. Remove loose mortar and rubble of existing benches and inverts. Remove protruding rubber gaskets between wall seams. Prepare manhole to receive CMML if proposed as necessary by reshaping and repairing benches, inverts, and wall where required. Protect pipe connections. Interior surfaces shall be prepared for CMML as recommended by manufacturer.
  - 1. Cracks and other voids shall be repaired and filled with suitable non-shrinking cements, sealants or grouts.
  - 2. Surfaces shall be clean and structurally sound.
  - 3. Manhole rungs/steps shall be removed, ground smooth and patched and not replaced. Step removal shall be incidental to manhole restoration costs.

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- H. Remove interior drop connections anchored to manhole walls prior to installing lining system. After installation and proper curing of lining, re-install interior drop connections to their condition prior to removal.
  - I. Liner shall be mixed as specified by manufacturer for 30 seconds to 1 minute after materials have been placed in mixing hopper. Mixing shall be accomplished such that the mix can be sprayed in a continuous manner without interruption until each application is complete.
  - J. Just prior to application, clean surface, be free of foreign material, and be damp without noticeable free water droplets or running water, but totally saturated. Materials shall be applied to a minimum uniform thickness, to ensure that cracks, crevices and voids are filled and a relatively smooth surface remains clean after light troweling. Perform light troweling to compact the material into voids and to set the bond.
  - K. If a flexible chimney seal is called for in the Drawings, then lining shall be installed one (1)-inch below bottom of manhole frame. If no flexible chimney seal is called for in the Drawings, then lining shall be installed to two (2") to three (3") inches above bottom of manhole frame. Termination of and surface of lining shall be suitable for proper installation of manhole frame- chimney seal, if specified.
  - L. Covers placed over invert shall be removed and bench sprayed such that a gradual slope is produced from walls to invert with thickness at edge of invert being no less than one half (1/2") inch. Round wall/bench intersection to a uniform radius full circumference of the intersection.
  - M. Caution shall be taken to minimize exposure of applied product to sunlight and air movement. At no time shall finished product be exposed to sunlight or air movement for longer than 15 minutes before replacing manhole cover. In extremely hot and arid climates, shade manhole while reconstruction is in process. Final application shall have a minimum of four (4) hours cure time before being subjected to active flow. Traffic shall not be allowed over manholes for 24 hours after reconstruction is complete.
  - N. No application shall be made to frozen surfaces or if freezing is expected to occur inside manhole within 24 hours after application. If ambient temperatures are in excess of 95 degrees F, precautions shall be taken to keep mix temperature at time of application below 90 degrees F. Mix water temperature shall not exceed 85 degrees F. Chill with ice if necessary.
  - O. After preparation has been completed, remove loose material and wash walls again. Bench, invert, or service line repairs shall be made at this time using quick setting patching mix per manufacturer's recommendations.
- 3.03 INSTALLATION - EPOXY MONOLITHIC MANHOLE LINING SYSTEM (EMMLS)
- A. Notify property owners who discharge sewage directly to manhole being surfaced to limit their use of sanitary service while EMMLS is being placed, cured and active pipe and service connections reopened. Notify individual property owners at least 72 hours in advance, giving date, start time, and estimated completion time for the work being conducted.

## TECHNICAL SPECIFICATIONS

- B. Provide bypass pumping of sewage flows where and when rehabilitation work is being performed.
- C. Place EMMLS in manhole. Installation of EMMLS shall be in complete accordance with applicable provisions of ASTM C 722 and manufacturers' specifications. Manufacturer's representative shall be present during actual installation.
  - 1. Prior to placing EMMLS, manufacturer's representatives shall approve surface preparation work and installation conditions including temperatures.
  - 2. Surfaces shall be sufficiently dry and even.
  - 3. Bottom and horizontal surfaces including benches and channels shall have EMMLS applied to required thickness by hand trowelling or spray-on methods.
  - 4. Side vertical surfaces shall have EMMLS applied to required thickness by manufacturer's recommended methodology.
  - 5. Temperature limitations shall be handled as appropriate and as approved by manufacturer.
- D. Cutting and sealing of EMMLS at manhole pipe, cured-in-place liner, rungs, and top connections shall provide watertight seals.

## 3.04 INSTALLATION - CURED-IN-PLACE MANHOLE LINER (CIPM)

- A. CIPM can be performed 24-hours after cementitious repair coating was applied as long as it meets cementitious coating characteristics specified in Paragraph 2.01.
- B. Prior to placing liner, Engineer will inspect and approve surface preparation work. Contractor is responsible for ensuring proper installation conditions, including temperature and moisture.
- C. Liner tube shall be fully saturated with selected resin at a site to be designated by Contractor for approval. When fully saturated, liner shall be inserted into manhole per manufacturer's instructions.
- D. Once properly inserted and oriented, liner shall be cured strictly according to manufacturer's instructions for that liner system. Heat cure time, cool down time, and temperatures shall be recorded in a log Engineer's review.

## 3.05 FIELD QUALITY CONTROL - GENERAL

- A. Engineer or Owner may enter manholes to inspect benching, invert channels, manhole wall/pipe connections, surface preparation, and other parts of the work. Contractor shall provide forced air ventilation, gas monitors and detectors, harnesses, lights, etc. for Engineer or Owner to enter manhole and perform inspection in complete accordance with OSHA requirements at no additional cost to Owner.
- B. Finished manhole surface shall be continuous and as free as commercially practicable from significant defects. Defects which will affect, in foreseeable future or warranty period, the integrity or strength of manhole shall be repaired at Contractor's expense, in a manner

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mutually agreed upon by Engineer and Contractor.

- C. There shall be no cracks, voids, pinholes, uncured spots, dry spots, lifts, delaminations or other type defects in liner. If any defects are discovered after liner has been installed, it shall be repaired or replaced in a satisfactory manner within 72 hours and at no additional cost to Owner. This requirement shall apply for entire warranty period.
- D. Active infiltration through lining system shall be zero.
- E. Contractor is responsible for coordinating testing times with Engineer schedule as field representative may be involved in other tasks for scope on this project.

3.06 FIELD QUALITY CONTROL - CEMENTITIOUS MANHOLE MONOLITHIC LINING SYSTEM

- A. Cementitious lining shall provide a continuous monolithic surfacing with uniform thickness throughout manhole interior. Contractor shall work with Field Representative to develop an easy method for measuring liner thickness. Use method so Field Representative does not have to enter manhole to measure thickness.
  - 1. One possible method would be to install pins (such as masonry nail) at four quadrants around manhole spaced every four (4') feet vertically. Pins would protrude slightly less than one (1") inch from wall. Lining would be installed to cover pins, and Field Representative could verify thickness by checking that no pins are exposed without entering manhole.
  - 2. Contractor may develop other methods.
  - 3. Costs associated with measuring liner thickness shall be included in unit bid price. If thickness of lining is not uniform or is less than specified, it shall be repaired or replaced at no additional cost to Owner.
- B. Contractor shall visually verify absence of leaks and perform a vacuum test. Vacuum test shall be performed as follows:
  - 1. Vacuum Test: Test rehabilitated manholes using vacuum test method, following manufacturer's recommendations for proper and safe procedures. Vacuum testing of manholes and structures shall be performed after curing of linings. Vacuum testing will not be required on manholes with sewer lines greater than 16-inches in diameter due to safety concerns. Any visible leakage in manhole or structure, before, during, or after test shall be repaired regardless of test results. Vacuum test shall be performed in accordance with ASTM C 1244.

3.07 FIELD QUALITY CONTROL - EPOXY MANHOLE MONOLITHIC LINING SYSTEM (EMMLS)

- A. Field acceptance of EMMLS shall be based on Engineer's evaluation of proper monolithic lining of manhole. Field acceptance shall also be based on Engineer's evaluation of appropriate installation and curing test data along with review of manhole inspections.
- B. EMMLS shall provide a continuous monolithic lining with uniform thickness throughout manhole interior. If thickness of EMMLS is not uniform or is less than specified, it shall be

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repaired or replaced at no additional cost to Owner.

1. Engineer or Owner will measure EMMLS cured thickness by physically cutting through lining (by drilling or coring) and making a direct measurement. Make a minimum of two thickness measurement locations in each EMMLS manhole. A suitable non-destructive type of thickness measurement may also be used.
  2. EMMLS thickness measurement locations shall be repaired by Contractor in accordance with manufacturer's recommendations. These repairs shall be included in two year EMMLS warranty.
  3. Contractor shall also perform in-place testing in each manhole to verify adhesion of EMMLS to existing manhole substrate. Adhesion strength tests shall be in accordance with ASTM D 7234 and test area shall be isolated from remaining portion of manhole by coring through liner into substrate. Two tests shall be performed in each manhole at locations directed by Engineer. Testing shall consist of a calibrated pull test. Equipment shall be provided by Contractor. Samples shall meet a minimum pressure resistance of 400 pounds per square inch (psi).
- C. There shall be no cracks, voids, pinholes, uncured spots, dry spots, lifts, delaminations or other type defects in EMMLS.
- D. Contractor shall submit proposed method for testing for these defects. One of the following tests shall be performed by Contractor as directed by Owner or Owner's Agent.
1. Vacuum Test: A vacuum test conforming to requirements of ASTM C 1244 shall be performed for every lined manhole or circular structure where practical.
  2. Holiday Detection Test: A high voltage holiday detection system may be used to determine if any holidays (pinholes, voids, etc.) exist in lining. Set sensitivity control of holiday tester to accommodate thickness of applied lining (100-125 volts for each one (1) mil thickness). Follow guidelines of holiday testing equipment manufacturer for correct control settings. One such service is Tinker & Rasor Holiday Tester Model APW.
  3. Should a holiday be detected, it shall be marked and lining installation Contractor shall repair void according to correct procedure determined by system manufacturer.
  4. Ultrasonic Testing: Per ASTM D 6132.
- 3.08 FIELD QUALITY CONTROL - CURED-IN-PLACE MANHOLE LINER (CIPM)
- A. Field acceptance of CIPM shall be based on Engineer's evaluation of proper monolithic lining of manhole. Field acceptance shall also be based on the Engineer's evaluation of appropriate installation and curing test data along with review of manhole inspections.
  - B. CIPM shall provide a continuous monolithic lining with uniform thickness throughout manhole interior. If thickness of CIPM is not uniform or is less than specified, it shall be repaired or replaced at no additional cost to Owner.

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1. Engineer or Owner will measure CIPM cured thickness by physically cutting through lining (by drilling or coring) and making a direct measurement. Make a minimum of two thickness measurement locations in each CIPM manhole. A suitable non-destructive type of thickness measurement may also be used.
  2. CIPM thickness measurement locations shall be repaired by Contractor in accordance with manufacturer's recommendations. These repairs shall be included in two year warranty.
  3. Contractor shall also perform in-place testing in each manhole to verify adhesion of CIPM to existing manhole substrate. Adhesion strength tests shall be in accordance with ASTM D 7234 and test area shall be isolated from remaining portion of manhole by coring through liner into substrate. Two tests shall be performed in each manhole at locations  
directed by Engineer. Testing shall consist of a calibrated pull test. Equipment shall be provided by Contractor. Samples shall meet a minimum pressure resistance of 400 psi.
- C. There shall be no cracks, voids, pinholes, uncured spots, dry spots, lifts, delaminations or other type defects in CIPM.
- D. Contractor shall submit proposed method for testing for these defects. One of following tests shall be performed by Contractor as directed by Owner or Owner's Agent.
1. Vacuum Test: A vacuum test conforming to requirements of ASTM C 1244 shall be performed for every lined manhole or circular structure where practical.
  2. Holiday Detection Test: Per ASTM D4787, a high voltage holiday detection system may be used to determine if any holidays (pinholes, voids, etc.) exist in lining. Normally sensitivity control of holiday tester is set to accommodate thickness of applied lining (100- 125 volts for each 1 mil thickness). Follow guidelines of holiday testing equipment manufacturer for correct control settings. One such service is Tinker & Razor Holiday Tester Model APW. Should a holiday be detected, it shall be marked and lining installation Contractor shall repair void according to correct procedure determined by system manufacturer.
  3. Ultrasonic Testing: Per ASTM D 6132
- 3.09 CLEANING
- A. Remove temporary protective materials at existing surfaces surrounding work of this Section.
  - B. Remove excess materials, installation equipment, and clean work areas around manholes. Properly remove trash and debris leaving work area in condition that existed prior to work performed under this Section.

END OF SECTION

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SECTION 02767  
GRAVITY SEWER SYSTEM SMOKE TESTING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment and incidentals required and smoke test those sewers designated and submit all corresponding field data forms identifying potential sources of inflow discovered as a result of smoke testing.
- B. Undertake a physical survey concurrent with smoke testing for the purpose of identifying sources of infiltration/inflow (I/I).

1.02 SUBMITTALS

- A. Submit the following:
  - 1. Schedule of smoke testing work as well as notifying the Engineer and Owner's Fire Chief of the time and location of all smoke testing prior to commencing.
  - 2. Manufacturer's data sheets on the smoke candles and the blower to be used on the project.
  - 3. Proposed field data gathering and observation forms prior to the start of the work.

PART 2 PRODUCTS

2.01 MATERIALS

- A. The "Smoke Candles" used in smoke testing shall be acceptable for both indoor and outdoor use, shall be non-contaminating and shall leave no residue to stain clothing or the interior of buildings.

2.02 EQUIPMENT

- A. The air blower used to force smoke the into sewer pipe shall have a minimum capacity rating of 1500 cfm and a maximum capacity rating not to exceed 3750 cfm.
- B. A metal basket shall be used to hold and retrieve the smoke candles.

PART 3 EXECUTION

3.01 TESTING

- A. Sewer sections shall be smoke tested by setting the blower at the up-stream manhole and blowing the smoke to the down-stream manhole.
- B. Isolate the sewer line section to be tested by installing sewer plugs to shut off the flow completely in the sewer system up-stream of the sewer section to be tested.

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- C. Install an inflatable sewer plug in the down-stream sewer section and inflate the down-stream sewer plug after a heavy concentration of smoke arrives.
- D. Testing Locations
  - 1. Residential Areas
    - a. Up to three reaches not exceeding a total of 500 linear feet of sewer line may be tested at one time based on the use of a blower with a maximum capacity rating of 1500 cfm. Up to five reaches not exceeding a total of 1200 linear feet of sewer line may be tested at one time based on the use of a blower with a maximum capacity rating of 3750 cfm.
  - 2. Industrial-Apartment Complex Areas
    - a. Up to two reaches not exceeding a total of 400 linear feet of sewer line may be tested at one time based on the use of a blower with a maximum capacity rating of 1500 cfm. Up to three reaches not exceeding a total of 900 linear feet of sewer line may be tested at one time based on the use of a blower with a maximum capacity rating of 3750 cfm.
- E. Candles
  - 1. In Residential Areas a minimum of one three (3) minute smoke candle shall be simultaneously used for each reach of sewer in the sewer section tested.
  - 2. In Industrial-Apartment Complex Areas a minimum of two three (3) minute smoke candles shall be simultaneously used for the first reach of sewer, increased by one three (3) minute smoke candle for each additional reach of sewer in the sewer section tested.
- F. The metal basket used to hold and retrieve smoke candles shall be placed as close as possible to the sewer pipe invert during testing.
- G. Testing shall not be done during rainy weather and testing shall be closely monitored on windy days. If smoke coming out of the ground is blown away so quickly as to escape accurate detection, testing will cease until such time that conditions permit.
- H. Be solely responsible for the operations and for preventing sewer backups into area homes and causing sewage overflow.
- I. Adequately notify residents/occupants, fire department and other affected by smoke testing as to time and place of the smoke testing.
- J. Be solely responsible for the safety of their crews.
- K. The Engineer or his/her project representative reserves the right to observe field crews and evaluate effectiveness of identifying returns.

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3.02 RECORDING OF FIELD OBSERVATIONS

- A. Document observations regarding each leak identified on a smoke sketch log. The smoke sketch shall include manhole numbers, direction of sewer flow, direction of smoke, manhole condition, sewer length, date, mini-system number, test number per date, crew, weather condition, wind condition, smoke intensity, infiltration probability function, address and other comments.
- B. Photograph using digital camera. Each photograph shall show the smoke escaping, at the source, in the foreground with the reference structure in the background. The photographs shall be attached to the field data gathering and observation form and also provided electronically.
- C. The address or house number shall be recorded under the sketch. A description of the leak, possible cause and recommended suggested rehabilitation method shall be recorded on the field data gathering and observation form.
- D. The sketch shall provide a north arrow orientation. A sketch of the building and/or structure shall be drawn. A GPS coordinate location (accurate to within 3-feet) or a minimum of two tie measurements from permanent reference points to the smoke leak shall be shown.
- E. Document as part of the physical survey any aspect defect contributing to infiltration/inflow for the Owner to undertake further evaluation. The physical survey shall identify such suspected I/I sources as:
  - 1. Leaking manhole bottoms
  - 2. Leaking manhole riser
  - 3. Manhole ponding area
  - 4. Manhole frame not attached to manhole structure
  - 5. Exposed brickwork not grouted
  - 6. Leaking pipes at manhole

END OF SECTION

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SECTION 02769  
CURED-IN-PLACE PIPE LINING

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required to install and test the cured-in- place pipe (CIPP) lining and appurtenances complete as shown on the Drawings and as specified herein, including, but not limited to services necessary for traffic control, bypass pumping and/or diversion of sewage flows, cleaning and television inspection of sewers to be lined, liner installation, reinstatement of service connections, quality control, providing samples for performance of required material tests, final television inspection, testing of lined pipe system and warranty work, all as specified herein.
- B. Sewer cleaning, pre-rehabilitation and post-rehabilitation closed circuit television (CCTV) inspection of all pipes to be rehabilitated by CIPP lining methods are required per applicable Specifications as listed in Paragraph 1.02 of this Section.
- C. Contractor shall remove obstructions and protruding service connections as required to complete the CIPP rehabilitation. Removal of all pipeline obstructions and protruding service connections required for sewer rehabilitation using cured-in-place pipe lining shall be completed prior to the pre-rehabilitation CCTV inspection.
- D. 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 or production of any detrimental compounds or by-products in the system or at the wastewater treatment plant. Notify the Owner and identify any by-products produced as a result of the installation operations, test and monitor the levels, and comply with any and all local waste discharge requirements. Cleanup, restore existing surface conditions and structures, and repair any of the CIPP system determined to be defective. Conduct installation operations and schedule cleanup in a manner to cause the least possible obstruction and inconvenience to traffic, pedestrians, businesses, and property Owners or tenants.
- E. The Contractor, or contractor performing the Work, shall not change any material, design values or procedural matters stated or approved herein, without informing the Owner/Engineer and receiving written approval of the change. Such changes constitute a breach of contract and shall result in rejection and removal of work performed with the unapproved materials or processes at no cost to the Owner.
- F. Maintenance and Protection of Traffic, confined space entry, and work site protection shall be the responsibility of the Contractor and costs of these items are included in the cost of the project. Notify Police, Fire, Ambulance agencies, and residents/businesses in advance of any and all road closures. Comply with applicable OSHA trench safety rules and confined space and sewer system entry.

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1.02 RELATED WORK

- A. By-Pass Pumping is included in Section 02659.
- B. Pre and Post CCTV Inspection are included in Section 02764.
- C. Sewer line cleaning is included in Section 02765.
- D. Grouting lateral connections is included in Section 02761.

1.03 SUBMITTALS

- A. Submit to the Owner/Engineer, in accordance with Section 01300, shop drawings, product data, materials of construction, design calculations, and details of installation. The Contractor shall provide this information without delay or claim to any confidentiality. Contractor shall note that there are two different sets of submittals required with different time frames as shown below in Sections 1.03.B. and 1.03.C.
- B. Submittals required with the bid shall include the following:
  - 1. Letter to certify that the CIPP will conform to the project requirements as outlined in the Scope of Work and as delineated in these specifications and that the Contractor's personnel have successfully installed a minimum of 250,000 feet (total) of proposed CIPP liner for a continuous period of at least three (3) years installing CIPP liners in pipe of a similar size, length and configuration as contained in this contract as documented by verifiable references.
  - 2. Submit information in following subparagraphs for review and approval before any CIPP lining work is performed.
    - a. Number of years of Contractor's experience in installing CIPP lining.
    - b. Documentation and a sufficient number of references to meet qualifications requirements as listed in Paragraph 1.05 of this Section.
    - c. Names and product information of the CIPP felt tubes and resin materials to be utilized for this project and their suppliers.
    - d. A certified statement from manufacturer that Contractor is an approved installer as certified and/or licensed by the CIPP liner manufacturer.
  - 3. A list of a minimum of five (5) municipal clients that CIPP Contractor has performed this type of work for without defects or performance problems for a period of five (5) years after installation. The list shall contain the following:
    - a. Names, addresses, telephone numbers, and e-mails of persons to be called to verify previous satisfactory performance.
    - b. A full description of the actual work performed.

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- c. Name of CIPP lining manufacturer and supplier for each referenced project.
  4. Five (5) reports from projects within past two (2) years from independent testing laboratory analysis of liner materials showing: Modulus of elasticity as determined by appropriate ASTM standard and flexural stress as determined by ASTM D790 standard. Lining shall be of same resin system and felt tube materials as proposed for this project.
- C. Submittals required within 10 days after notice to proceed shall include the following:
1. Detailed information on the CIPP installation procedures (wet-out, heating, curing, and cool down, if applicable) and all tools and equipment required for a complete installation. Identify which tools and equipment will be redundant on job site in the event of equipment breakdown. Equipment to be furnished for the project, including proposed back-up equipment, shall be clearly described. Contractor shall outline the mitigation procedure to be implemented in the event of key equipment failure during the installation process.
  2. CIPP lining schedules including field-verified lengths and diameters of all CIPP lining and appurtenances required. Plans should include map(s) that show insertion points for all CIPP installations.
  3. Shop drawings and product data to demonstrate compliance with these specifications and identify materials of construction (including resins, catalysts, felt, etc.), felt manufacturer, location of the felt manufacturing facility, location of the wet-out facility, etc., flexible membrane (coating) material (including recommended repair/patching procedure, if applicable).
  4. Manufacturers' shipping, storage and handling recommendations for all components of the CIPP System.
  5. MSDS sheets for all proposed products and materials to be furnished for the project.
  6. Detailed sample collection, laboratory testing and quality control procedures, including schedule and shipping and storage requirements.
  7. Written description and/or plan for odor control that will ensure that project specific odors such as styrene will be minimized at the project site and surrounding area.
  8. The end seal material(s) and description of their installation.
  9. Detailed written plan of the method of flow maintenance (Bypass Pumping plan) and noise prevention measures.
  10. 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.

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11. A detailed written traffic-control plan that details every street that will be impacted and how impacts will be mitigated.
12. Data on the maximum allowable stresses and elongation of the tube during installation and the means in which the Contractor will monitor stress and elongation (i.e., ideal inversion head and maximum cold head, minimum inversion head, maximum hot head).
13. A detailed public notification plan shall be prepared and submitted including detailed staged notification to residences affected by the CIPP installation.
14. A complete description of the proposed wet-out procedure for the proposed technology.
15. A Safety Plan identifying all competent persons, 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.
16. A detailed quality control plan (QCP) that fully represents and conforms to the requirements of these specifications. At a minimum the QCP shall include the following:
  - a. A detailed discussion of the proposed quality controls to be performed by the Contractor.
  - b. 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 specific personnel.
  - c. Proposed procedures for quality control including those pertaining to fit and finish, and product sampling and testing shall be defined and submitted as part of the plan.
  - d. 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.
  - e. A schedule for performance and product test result reviews between the Contractor and Owner/Engineer at a regularly scheduled job meeting.
  - f. 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.
17. Design data and specification data sheets listing all parameters used in the CIPP liner design for six (6) millimeter thickness. All calculations shall be prepared under the supervision of and stamped by a professional engineer registered in the State of Florida.

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- D. Submittals before, during and after CIPP installation work shall include the following:
1. Prior to each shipment of CIPP lining, submit certified test reports that the CIPP lining for this Contract was manufactured and tested in accordance with all ASTM Standards specified and referenced herein.
  2. CIPP lining schedules including field-verified lengths and diameters of all CIPP lining and appurtenances required to show that the contractor has physically measured every pipe to be rehabilitated. Plans should include map(s) that show insertion points for all CIPP installations.
  3. Detailed installation procedures and manufacturer's recommended cure method for each diameter and thickness of CIPP liner to be installed, including CIPP lining production schedule, acceptable inversion heads and pressures, inversion or winching procedures, curing and cool-down procedures detailing the curing rate of temperature increases and cool down and the method of application, and times for each stage of the process.
  4. Wet-out forms/reports for each CIPP segment with detailed information including but not limited to: date and time of wet-out, wet-out facility address, volumes and/or weights of resin, length and diameter of CIPP liner (both wet-tube and dry-tube), roller gap settings, start times, finish times, resin used (product name and batch/shipment number) and quantity, gel times, resin injection locations, thickness of CIPP liner (dry and wet), catalyst(s) name and quantity used, and any other pertinent data documenting the wet-out for each section of CIPP liner manufactured. The wet-out forms shall be submitted prior to CIPP liner installation and shall be provided without delay or claim to any confidentiality. Wet out forms shall be submitted to the Owner/Engineer field representative on the day of delivery.
  5. CIPP liner field curing reports documenting the liner installation for all sewer segments. The CIPP liner reports shall document all details of liner installation, including manhole numbers, street names/sewer location, project number, date, time, ambient temperature, heads used during the inversion process, pressures and/or heads (minimum inversion pressure, ideal head, maximum hot head and maximum cold head) used during curing (including cool down if applicable), curing temperature, curing time, rate of cool down, CIPP liner thickness, etc. A sample report shall be submitted to the Owner/Engineer for approval prior to the installation of any CIPP lining. The reports shall be submitted prior to requesting payment and shall be provided without delay or claim to any confidentiality.
  6. Complete certified copies of the report(s) output(s) of the continuous temperature monitoring systems used in the control of the curing, printed and in electronic format. The reports shall be submitted prior to requesting payment and shall be provided without delay or claim to any confidentiality. Also provide the Owner/Engineer with access to the website where the secure reports can be obtained.

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7. Pre-rehabilitation and post-rehabilitation closed-circuit television (CCTV) inspection data as further defined herein. Post-rehabilitation CCTV inspection data shall be submitted within one week after the CIPP segment is installed.
8. Samples of installed liner(s) for testing to be performed by an ASTM-certified independent testing laboratory, as described further herein.
9. Information on any grouts, epoxy, or cements the Contractor is proposing to use for sealing at manholes or for other uses.
10. Submittals shall be provided in electronic format.
11. Submit daily production reports to the Owner/Engineer's Superintendent and/or field representative at the end of each workday.
12. A list of all service laterals (with distances and clock position) that were abandoned or reconnected as part of the work as further defined herein.
13. Some installations may result in the need to repair or replace a defective CIPP. Submit in writing, for review by the Owner/Engineer, 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 to also include the following:
  - a. Defects in the installed CIPP that will not affect the operation and long-term life of the product shall be identified and defined.
  - b. Repairable defects that may occur in the installed CIPP 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. Repairable defects may include but are not limited to blisters, wrinkles, fins, pinholes, over- or under-cut lateral connections, and any voids found between liner and the host pipe.
  - c. Un-repairable defects that may occur to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP. Un-repairable defects may include but are not limited to thickness below required minimum thickness, structural strength below required limits, lifts, shrinkage, folds, bulges, and delamination.
14. A list of all repair or replacement of CIPP defects that were executed by the contractor including identification of segment, location of the repair, and type of repair.

1.04 REFERENCE STANDARDS

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A. ASTM International (ASTM):

1. ASTM D 543 - Standard and Practice for Evaluating the Resistance of Plastics to Chemical Reagents.
2. ASTM D 638 - Standard Test Method for Tensile Properties of Plastics.
3. ASTM D 790 - Standard Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
4. ASTM D 792 - Standard Test Methods for Density and Specific Gravity of Plastics by displacement.
5. ASTM F1216 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by the Inversion and Curing of a Resin-Impregnated Tube.
6. ASTM F1336-15 - Standard Specification for Polyvinyl Chloride (PVC) Gasketed Sewer Fittings
7. ASTM F 1743 - Standard Practice for Rehabilitation of Existing Pipelines and Conduits by Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe (CIPP).
8. ASTM F 2019 – 11 - 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)
9. ASTM D 2122-98(2004) - Standard Test Method for Determining Dimensions of Thermoplastic Pipe and Fittings.
10. ASTM D 2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
11. ASTM F 2561-11 - 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.
12. F2599-11 - Standard Practice for Sectional Repair of Damaged Pipe by Means of an Inverted Cured-In-Place Liner.
13. ASTM D 2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
14. ASTM D 5813 - Standard Specification for Cured-in-Place Thermosetting Resin Sewer Piping Systems.

B. National Association of Sewer Service Companies (NASSCO):

1. NASSCO Pipeline Assessment and Certification Program (PACP) Reference

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Manual, current edition, including addenda.

- C. Water Research Centre, UK:
  - 1. Sewerage Rehabilitation Manual, Type II Design, 4<sup>th</sup> edition (April 2001), WRc Publications.
- D. Where reference is made to one of the above standards, the latest revision/update in effect at the time of bid opening shall apply.

1.05 QUALIFICATIONS

- A. Contractor performing CIPP lining work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner and shall be certified and/or licensed as an installer by CIPP lining manufacturer. Contractor's personnel shall have successfully installed a minimum of 250,000 feet (total) of proposed CIPP liner for a continuous period of at least three (3) years installing CIPP liners in pipe of a similar size, length and configuration as contained in this contract as documented by verifiable references. Submit name and experience of each lead individual performing work on this Contract. Personnel replaced by Contractor shall have similar verifiable experience as personnel originally submitted for project.
- B. Full-time, on-site superintendent/foreman that will supervise CIPP lining installation shall have successfully installed a minimum of 100,000 feet (total) of proposed size range of CIPP liner for a period of at least two (2) years as documented by verifiable references.
- C. Lead personnel including superintendent, foreman and lead crew personnel each shall have a minimum of three (3) years of total experience with CIPP technology proposed and shall have demonstrated competency and experience to perform the scope of work as documented by verifiable references.
- D. Owner and/or Engineer reserves the right to approve or disapprove Contractor, Superintendent, and/or manufacturer based on submitted qualifications and a follow-up interview.
- E. CIPP felt and resin manufacturer(s) shall have successfully supplied a minimum of 500,000 feet of proposed liner and one million pounds of resin as documented by verifiable references.
- F. The lateral cutter is required to have at least six (6) months of experience reinstating the connection between the sewer main and lateral lining as documented by verifiable references.

1.06 GUARANTEE

- A. CIPP lining placed shall be guaranteed by Contractor and manufacturer for a period of two (2) years from date of Substantial Completion. During this period, serious defects discovered in CIPP lining, as determined by Owner and which may materially affect the

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integrity, strength, function and/or operation of pipe, shall be removed and replaced as recommended by the manufacturer in a satisfactory manner by Contractor at no cost to Owner. Owner may conduct an independent CCTV inspection, at its own expense, of CIPP lining work prior to completion of warranty period. Defects replaced at that time shall be fully warranted by Contractor and manufacturer for a period of two (2) years from date the defect was repaired. Wrinkles in flow stream, blisters that may affect the longevity of CIPP liner, dry spots where liner tube has no resin saturation, or other defects that may affect the integrity or strength of the CIPP or the flow capacity of the pipe, are unacceptable. Contractor shall be responsible to remove and repair, at Contractor's expense, all such defects in a manner that is satisfactory to Owner/Engineer. Defects also include but not limited to the following:

1. Leakage through the liner or between liner and pipe.
2. Reduction of liner thickness of more than ten percent (10%) of the thickness designed and/or required. Final liner thickness shall be delivered by Contractor based on installed product physical properties and as specified in Contract requirements.
3. Separation of liner from host pipe where an annular space is clearly noticed, shrinkages (longitudinal and/or circumferential), dry spots, delamination of liner, cured lifts, dry spots, bulges due to external loading, reverse curvatures, splits, cracks, lifts, breaks, folds, major wrinkles (as defined further herein), flats, pinholes, crazing and any other defects that in the CIPP lining will compromise the longevity of the installed product.
4. Circumferential defects (wrinkle, fin, bulge, etc.) in the invert of pipe between 4:00 and 8:00 o'clock shall not exceed three (3%) percent of the host pipe diameter or one half (1/2")-inches by visual measurement, whichever is smaller, at the discretion of the Owner.
5. Longitudinal wrinkles or fins shall not exceed maximum allowable height of five (5%) percent of equivalent host pipe diameter or one (1")-inch, whichever is smaller.
6. Structural strength below the required limits

1.07 QUALITY ASSURANCE

- A. CIPP linings shall follow the quality control plan submitted by Contractor.
- B. CIPP linings shall be from a single manufacturer. Suppliers shall be responsible for provisions of all test requirements specified herein as applicable. In addition, CIPP lining to be installed under this Contract may be inspected at the plant for compliance with these specifications by an independent testing laboratory provided by Owner. Contractor shall require manufacturer's cooperation with these inspections. Cost of plant inspection of all CIPP lining approved for this Contract will be the responsibility of Owner.

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- C. Inspections of CIPP lining may also be made by Engineer or other representatives of Owner after delivery. CIPP lining shall be subject to rejection at any time on account of failure to meet any of the requirements specified, even though sample CIPP lining may have been accepted as satisfactory at the place of manufacture. CIPP lining rejected after delivery shall be marked for identification and shall be removed from the job site.
- D. In the event that an installation is rejected based on review of the post-rehabilitation CCTV inspection, the Contractor shall repair the sewer segment to the satisfaction of the Owner/Engineer at no additional cost to the Owner.
- E. Along with the physical properties testing and post installation CCTV survey, the Contractor shall deliver a certified copy of the curing report output from the temperature monitoring system used in the control of the curing process for pipes; or provide the Owner/Engineer with access to the website where the secure report can be obtained.

1.08 DELIVERY, STORAGE AND HANDLING

- A. Care shall be taken in shipping, handling and laying to avoid damaging the CIPP liner. CIPP liner damaged beyond repair in shipment shall be replaced as directed by Owner/Engineer.
- B. Any CIPP liner showing a visible split, tear, or defect, shall be repaired per manufacturer's recommendations and to the satisfaction of the Engineer or, if not possible, shall be removed at once from the project site.
- C. While stored, CIPP shall be adequately supported and protected in a manner as recommended by manufacturer.
- D. CIPP liner shall be maintained at a proper temperature in refrigerated facilities to prevent premature curing at all times prior to installation. CIPP liner shall be protected from UV light. CIPP liner showing evidence of premature curing will be rejected for use and shall be immediately removed from the site.

PART 2 PRODUCTS

2.01 CIPP FELT LINER AND RESIN

- A. CIPP liner shall be Inliner by Layne Inliner, Inc., Insituform by Insituform Technologies, Inc., National Liner by National EnviroTech Group LLC, SAK Liner by SAK Construction LLC, CIPP Corp., Sancon CIPP by Sancon Engineering Inc., Improved Technologies Group, or pre-approved equal.
- B. CIPP liner shall be composed of tubing material consisting of one or more layers of a flexible non-woven polyester felt with or without additives such as woven fiberglass or other fibers and meet the requirements of ASTM F 1216, ASTM F 1743, and ASTM D 5813. Felt content of CIPP liner shall be determined by Contractor, but shall not exceed 15 percent of the total impregnated liner volume. Fabric tube shall be capable of absorbing and carrying resins, constructed to withstand installation pressures and curing

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temperatures and stretch to fit irregular pipe sections. Contractor shall submit certified information from felt manufacturer on normal void volume in the felt fabric that will be filled with resin.

- C. CIPP liner tube may be made of single or multiple layer construction, with any layer not less than 1.5 mm thick, unless the tube is made of fiberglass material. Wet-out fabric tube shall have a uniform thickness and void space for resin distribution that when compressed at installation pressures will produce a predictable finished thickness that meets or exceeds the design thickness after cure.
- D. No material shall be included in fabric tube that may cause de-lamination in cured CIPP. No dry or unsaturated layers shall be acceptable upon visual inspection as evident by color contrast between felt fabric and activated resin containing a colorant.
- E. Wall color of 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. Hue of the color shall be dark enough to distinguish a contrast between fully resin saturated felt fabric and dry or resin lean areas.
- F. Seams in the fabric tube, if applicable, shall meet the requirements of ASTM D5813.
- G. The outside layer of the tube shall be coated with an impermeable material compatible with the resin and fabric.
- H. Resin: Shall be a corrosion resistant polyester or vinyl ester resin and catalyst system or epoxy and hardener system manufactured specifically for sewer rehabilitation, that, and when properly cured within the tube composite, meets the requirements of ASTM F 1216, ASTM F 1743 or ASTM F 2019, the physical properties herein, and those, which are to be utilized in the design of CIPP for this project. Resin shall produce CIPP that will comply with or exceed structural and chemical resistance requirements of this specification. Liner material and resin shall be completely compatible. Generally, resin shall not contain fillers, except those required for viscosity control or fire retardance or increase strength, and with applications for which inert fillers would facilitate better heat transfer and retention during installation. Liner contractor may add up to five (5%) percent by mass, a thixotropic agent for viscosity control, which will not interfere with visual inspection.
- I. Resins may contain pigments, dyes, or colorants, which shall not interfere with visual inspection of cured liner. Quantity of resin used for tube impregnation shall be sufficient to fill volume of air voids in tube with additional allowances for polymerization shrinkage and loss of resin through cracks and irregularities in original pipe wall. Use serial vacuum impregnation or pressure impregnation process (or equal) to provide maximum resin impregnation throughout the tube.
- J. Prior to inversion, if applicable, outside and/or inside layer of 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 resin saturation during the resin impregnation (wet out) procedure.

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- K. Exterior of manufactured tube shall have distance markings along its length at regular intervals not to exceed five (5') feet. Use these marks as a gauge to measure elongation during insertion. Should overall elongation of a reach exceed five (5%) percent, liner tube shall be rejected and replaced.
- L. Contractor shall identify the wet-out facility where all CIPP liner under this Contract will be manufactured. All CIPP liner shall be manufactured from this designated wet-out facility throughout entire Contract unless specifically approved otherwise by Engineer in writing. Multiple wet-out facilities shall not be allowed.
- M. Owner and/or an agent of Owner may inspect CIPP liner during manufacturing and wet-out. Owner/Engineer shall be given an opportunity to witness manufacturing of all CIPP liner for this project. Owner is responsible for costs associated with witnessing the manufacturing of CIPP liner.
- N. If Owner/Engineer decides to inspect the manufacturing of CIPP liner, Contractor shall provide full access to witness wet-out process and shall provide any and all information related to the manufacturing as requested by Owner or Owner's agent without delay and without claims of confidentiality or product privacy.
- O. Application of resin to felt tubing (wet-out) shall be conducted under factory conditions using vacuum impregnation and materials shall be fully protected against UV light, excessive heat and contamination at all times. If on-site wet out is required, Contractor shall be required to maintain ambient conditions similar to those encountered during factory wet outs.
- P. Liners that are impregnated at the factory and transported to the project site in refrigerated trucks shall be installed as soon as possible and no more than two (2) weeks after the date of impregnation at the factory.
- Q. When cured, CIPP liner shall form a continuous, tight-fitting, hard, impermeable liner that is chemically resistant to any chemicals normally found in domestic sewage per Table 2.1 in ASTM F 1216. CIPP liner shall be chemically resistant to trace amounts of gasoline and other oil products commonly found in municipal sewerage and soils adjacent to sewer pipe to be lined.
- R. CIPP liner tube shall be manufactured or fabricated to a size that will tightly fit internal circumference of sewer being rehabilitated after being installed and cured. CIPP liner shall be capable of fitting into irregularly shaped pipe sections and through bends and dips within the pipeline. Allowance for longitudinal and circumferential expansion shall be taken into account when sizing and installing CIPP liner. Tube shall be properly sized to diameter of existing pipe and length to be rehabilitated and be able to stretch to fit irregular pipe sections and negotiate bends. Contractor shall determine minimum tube length necessary to effectively span designated run between manholes. Contractor shall verify lengths in field prior to ordering and prior to impregnation of tube with resin, to ensure that tube will have sufficient length to extend entire length of the run, which is defined as the length of the existing host pipe measured from the interior walls of the

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manholes, and/or from the ends of the pipe when/if the pipe extends into the manholes. Contractor shall also measure inside diameter and circumference of existing pipelines at face of each manhole in field prior to ordering liner so that liner can be installed in a tight-fitted condition with little or no wrinkling.

- S. Length of CIPP liner shall be as deemed necessary by Contractor to effectively carry out insertion of CIPP liner and sealing of CIPP liner at outlet and inlet manholes. Required diameter and length of each pipe segment shall be measured in advance of wet-out and a list of these measurements shall be submitted to Engineer at least one week prior to installation of each CIPP liner.
- T. Contractor shall be responsible for ensuring that correct liner is installed in each sewer reach being rehabilitated.
- U. All pipes of diameter 12-in and greater shall have a minimum finished thickness of six (6) millimeters or as designed, whichever is greater.
- V. Contractor shall verify proposed CIPP liner thicknesses and submit associated calculations. Actual cured liner thickness shall be  $-5/+10$  percent of approved design thickness and shall not include thickness of any non-structural membrane (inner/pre-liner). CIPP liner shall be designed in accordance with applicable provisions of ASTM F 1216 for "fully deteriorated gravity pipe conditions", unless Engineer agrees, in writing, prior to installation that "partially deteriorated gravity pipe conditions" shall apply based upon review of CCTV video. CIPP liner shall meet following design conditions, unless Engineer agrees, in writing, of their change:
1. AASHTO H 20 Live Load.
  2. Constrained soil modulus of native soil in the pipe zone of 1,000 psi.
  3. Soil weight of 120 pounds per cubic foot and a coefficient of friction of  $Ku=0.130r$  shall be used for the installed depths.
  4. Long-term flexural modulus used in design calculations shall be estimated by multiplying lowest short-term flexural modulus used in design calculations by a retention factor of 0.50 (i.e., long-term retention of mechanical properties equal to 50 percent.)
  5. Design safety factor of 2.0.
  6. Typical groundwater levels shall be considered to be at the ground surface. Groundwater depth used in calculations shall be from ground surface to invert of interior pipe or at elevation specified for bidding purposes in Contract Documents.
  7. Service temperature range shall be 40 to 100 degrees F.
  8. Minimum ovality of host pipe of two (2) percent.

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9. Long-term retention of mechanical properties equal to 50 percent.
10. Thickness to be used for CIPP liner shall be largest thickness as determined by calculations for deflection, bending, buckling and minimum stiffness.
11. CIPP liner thickness for non-round pipes or circular pipes with greater than 10% ovality shall be designed on accordance with WRc Sewerage Rehabilitation Manual, Type II Design, Section 5.3.2.iii.
12. Minimum liner thickness after installation and curing for all pipes 12-inches in diameter and larger shall be six (6) mm or as designed, whichever is greater. Thicknesses following installation and curing shall be based on design calculations provided by Contractor.
13. CIPP liner shall provide a minimum service life of 50 years and, for design purposes, shall have the following minimum initial and long-term properties:

Property	Test Method	Initial (psi)	Long Term (psi)
Flexural Strength	ASTM D 790	4,500	2,250
Flexural Modulus of Elasticity	ASTM D 790	350,000	175,000

14. The CIPP shall be designed to withstand all imposed loads, including dead and live loads and, if applicable, hydrostatic pressure. The liner shall have sufficient wall thickness to withstand all anticipated external pressures and loads that may be imposed after installation.

2.02 END SEALS

- A. End seals shall be composed of hydrophilic rubber and molded as a one-piece, three-inch (3") wide cylinder which when installed will form a 360-degree seal between the host pipe and the newly installed liner. Use of caulking, rope or band type of an end seal shall not be allowed. Acceptable end seals are Insignia™ End Seals by LMK Enterprises or approved equal.
- B. For sections of pipe in which manholes are not also rehabilitated, Contractor shall install epoxy at the end of each lined pipe to cover any piece of existing pipe that are exposed at the manhole wall. Acceptable epoxy resins are Sikadur 31 or approved equal.

2.03 SERVICE LATERAL SEALS

- A. Service lateral connections shall be sealed. If the sewer is not under the phreatic surface, seal service lateral connection by injecting a chemical hydrophilic grout into the space between the connection and the main line. If the sewer is under the phreatic surface, seal the service lateral connection by installing a hydrophilic rubber connection seal.
- B. Chemical grouts shall conform to Section 02761 Grouting Lateral Connections.

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- C. Rubber connection seals shall be composed of a hat made of hydrophilic polymeric neoprene rubber designed with a specified wall thickness to provide a compression seal at connection of a lateral and a mainline pipe. Use of caulking, rope or band type of an end seal shall not be allowed.
- D. Acceptable hydrophilic rubber seals are Insignia™ Hydrophilic Connection Hat by LMK Enterprises, or approved equal.

2.04 STYRENE REDUCING AGENT

- A. The styrene reducing agent shall be StyRedux by Integrated Chemical & Equipment Corporation, or approved equal.
- B. The styrene reducing agent shall be a gelatin, water soluble, biodegradable, non-toxic, FDA approved powder and/or capsule. The styrene reducing agent shall be added in a calculated amount according to manufacturer's recommendations into the down-tube for water curing or directly into the water holding tank for steam curing.

PART 3 EXECUTION

3.01 PRE-INSTALLATION

- A. Notify all property owners or businesses that discharge sewage directly to sewer being lined and whose service lateral will be affected by lining work, to limit their use of sanitary service during installation of CIPP liner. Deliver written notification to each such resident or business at least 72 hours in advance, giving the date, start time and estimated completion time for the work being conducted, and any restrictions on use of sewage system facilities including exact days and hours when sewer system cannot be used. Method of notification, and the text included in the notification, shall be approved by Owner.
- B. Clean each length of pipe to be lined and shall dispose of all resulting material offsite as specified in Section 02765
- C. Conduct a pre-rehabilitation CCTV inspection of all sewers to be rehabilitated by CIPP lining methods in accordance with Sections 02764. Inspection shall be for purpose of identifying defects in pipe, to document location of all service lateral connections, and to confirm point repair locations. The Contractor's project manager and/or superintendent shall review the pre-rehabilitation inspection videos to confirm the quality of the videos, locations of lateral connections, and locations of point repairs to be performed; only after the Contractor has confirmed that the quality of the videos is adequate for a clear review of pipeline, shall be submitted to the Engineer. Engineer will review pre-rehabilitation inspection videos to confirm locations of point repairs to be performed by Contractor. If an Inspector or Engineer is on site or immediately available, Contractor shall allow the Inspector or Engineer to view the pre-installation video to verify the pipe is ready for CIPP installation which includes proper cleaning, trimming protruding taps and mitigating any significant infiltration.
- D. If the data is available, Owner/Engineer will provide Contractor information on location

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of known active laterals and cleanouts; however, this list may not be interpreted as all-inclusive. Contractor shall be responsible for verifying active customer service connection prior to rehabilitation. Contractor shall compare service connections from CCTV video and compare with above ground measurements at approximate location of center of each house or building. Any discrepancies between CCTV data and above ground measurements of laterals shall be brought to attention of Owner/Engineer for a determination of lateral reinstatements. If Contractor discovers an error or addition to the list provided, Contractor shall immediately notify Engineer for additional investigation. Upon completion of rehabilitation work, a list of all service laterals abandoned or reconnected as part of the work shall be submitted to Owner. Compiled list can be in the form of post-inspection installation inspection logs and shall include the following information:

1. Location of each service lateral based on CCTV inspection logs. Location shall include both accurate distance measured from centerline of starting manhole as well as a notation (by clock-reference) of where on circumference of pipe, the service lateral connects.
  2. Status (Active or Inactive).
  3. Address of each customer and associated active lateral location.
- E. During pre-rehabilitation CCTV inspection and prior to installation of CIPP lining, all service lateral connections protruding into main line by one half (1/2")-inch or more shall be internally cut or ground down flush with pipe wall with a robotic cutter specifically designed for this purpose. Internal cutter shall be capable of cutting unreinforced concrete pipe (CP), cast iron pipe, PVC, vitrified clay pipe (VCP), ductile iron pipe, and Orangeburg pipe. All materials / cuttings shall be removed from sewer and properly disposed of.
- F. Infiltration runners or gushers as defined by NASSCO PACP that are observed during the pre-rehabilitation CCTV shall be stopped by injecting a chemical hydrophilic grouting as required in Section 02761 using a remote packer, unless otherwise approved by the Engineer. If the pipe is larger than 36", man-entry with hand-applied fast-setting epoxy can be performed to stop the infiltration.
- G. Maximum amount of time any home or business shall be without sanitary sewer service is 10 hours and not between 6:00 PM and 8:00 AM. Any service out longer than 10 hours shall be bypassed to a sanitary sewer at no cost to Owner.
- H. Provide bypass pumping of sewage flows in accordance with Section 02659. Service connection effluent may be plugged only after proper notification to affected residence and may not remain plugged overnight. Installation of liner shall not begin until Contractor has installed required plugs or a sewage by-pass system and all pumping facilities have been installed and tested under full operating conditions including bypass of mainline and side sewer flows. Once lining process has begun, existing sewage flows shall be maintained, until resin/felt tube composite is fully cured, cooled down, fully televised and CIPP ends finished.

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- I. Wastewater flows from existing sewers shall not be allowed to enter the new or rehabilitated facilities until the new or rehabilitated facilities have been cleaned and tested as required in the Contract Documents.
- J. Provide CIPP liner in full length of sewer as shown on work orders. Installation of CIPP liner shall be in complete accordance with applicable provisions of ASTM F 1216 or ASTM F 1743 and manufacturer's recommendations.
- K. Install a hydrophilic end seals at face of each manhole at all manhole penetrations per Paragraph 2.02 prior to inverting or pulling in uncured CIPP liner.
- L. If in the opinion of CIPP liner manufacturer and/or the Owner/Engineer, rate of infiltration in sewer segment is high enough to risk washout of resin, perform measures, as required, to minimize infiltration prior to installation, including pre-liners, grouting, etc. If during pre-lining CCTV inspection, any infiltration runners or gushers (per NASSCO PACP®) are observed, Contractor shall submit, in writing for approval by Owner/Engineer, methods and materials for mitigating any adverse impacts from the infiltration.
- M. Pressure gauges for the ends shall be digital pressure/vacuum gauges with a pressure range of 0 to 50 psi and  $\pm 0.25\%$  test gauge accuracy.

3.02 INSTALLATION

- A. CIPP liner shall be installed via inversion using hydrostatic head or air pressure in accordance with ASTM F 1216 or ASTM F 1743 and manufacturer's recommendations, or inserted through a manhole by means and methods required by the manufacturer. Hydrostatic head and/or steam pressure used during installation process shall be sufficient to hold liner tight to pipe wall; producing dimples at all service connections, and flared ends at two access manholes. Contractor shall closely follow the requirements in the submitted liner field curing reports, including the minimum inversion pressure, ideal head, maximum hot head and maximum cold head for each installation.
- B. If CIPP does not fit tightly against original pipe at its termination points, at no additional cost to Owner, the full circumference of CIPP exiting host pipe shall be filled with a resin mixture compatible with CIPP, approved by CIPP manufacturer and Owner/Engineer. There shall be no significant leakage of groundwater between existing pipe and CIPP at manhole connection or service lateral connections. Any leakage shall be removed and/or eliminated by Contractor at no additional cost to Owner. Any infiltration found at manhole and/or service connections shall be eliminated by Contractor at no additional cost to Owner. Any infiltration runners or gushers as defined by NASSCO PACP shall be stopped with chemical hydrophilic grouting as required in Section 02761.
- C. Fit heat source with monitors to accurately gauge temperature of incoming and outgoing water or steam supply. Place another such gauge between CIPP liner and pipe invert at downstream end to determine temperature during curing process. Temperature in CIPP

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during curing process shall be as recommended by resin manufacturer. Length of time for allowing curing process to be completed shall be of duration recommended by manufacturer, during which time Contractor shall maintain required temperature throughout CIPP. Provide a written temperature data chart/curing log to Owner's Representative for review to ensure that curing temperatures for resin meet manufacturer's recommendations.

- D. The full length from manhole to manhole of the installed resin-impregnated flexible felt tube CIPP liner shall be cured using circulating heated water or steam in accordance with ASTM F 1216 and manufacturer's recommendations or with UV light sources to affect desired cure throughout length of the tube, extending full length from manhole to manhole(s). Resin shall be cured into a hard impermeable pipe with minimum specified thickness, providing a structurally sound, uniformly smooth interior and tight-fitting liner within existing pipe. Cool-down procedures shall be in accordance with ASTM F 1216 and manufacturer's recommendations. The cool-down shall follow manufacturer's guidelines, be measured digitally to allow inspector to inspect or record, be linear, and be gradual; no super cooled air shall be allowed to be injected. UV cured CIPP shall not be permitted without written approval from Owner/Engineer and after documentation has been reviewed that liner is compatible with all specifications and other related work including any lateral lining systems.
- E. Contractor may install CIPP lining in multiple sewer segments at one time where possible. When installing CIPP lining in multiple sewer segments at one time, the top one-half of CIPP liner in intermediate manhole shall be neatly removed, leaving the invert in place, and void between CIPP liner and existing channel shall be filled with non-shrink grout. Manhole bench shall be reconstructed as required to provide a smooth transition to new CIPP liner.
- F. All cutting and sealing of CIPP liner at manhole connections shall provide watertight pipe and manhole seals. All cut edges of cured liner shall be thoroughly sealed with same resin as was used in liner. Catalyst or hardener used shall be compatible with resin/catalyst used in liner previously, but shall not require an external heat source to begin exothermic reaction (curing). There shall be no leakage of groundwater into manhole between CIPP liner and existing sewer pipe and between existing sewer pipe and manhole wall.
- G. Curing of resin system shall be as per recommendations of CIPP system manufacturer of CIPP product. Temperatures achieved and duration of holding the liner at those temperatures shall be per System Manufacturer's established procedures. If any sensor or sensors along reach indicates that there is a localized issue with respect to achieving proper curing per written installation procedure, Contractor shall address the issue prior to acceptance of the liner. Sensor array's database required in above paragraph shall have an output report that identifies each sensor by its station in reach and shows maximum temperature achieved during processing of CIPP and time sustained at or above Manufacturer's required curing temperature at each sensor. The temperature of the liner shall be recorded until the liner has completed the cool-down process.
- H. If cool-down is to be accomplished by introduction of cool water into an inversion

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standpipe to replace water being drained from a small hole made in downstream end, the hardened liner shall be cooled down to a temperature below 100 degrees F (38 degrees C), or ambient temperature, whichever is smaller, before relieving static head in inversion standpipe. Contractor shall take measures to ensure that, in release of static head, a vacuum will not be produced that could damage the newly installed CIPP liner.

- I. Incorporate mitigation measures to control styrene odors during installation and curing of the liner. If any styrene odor complaints occur on the jobsite, the Contractor shall have means and methods to immediately mitigate the issue.
- J. Vent and/or exhaust noxious fumes or odors generated during and remaining after curing process is completed. This process shall remain in place at all manholes, laterals, etc., until noxious odors have dissipated to an acceptable level in accordance with OSHA requirements for materials used and there is no more air pollution or potential health hazard left to general public or construction workers.
- K. Provide piping, pumps, valves, and other equipment to discharge curing water.
- L. After the installation of the first 1,000 linear feet of CIPP lining, no additional CIPP lining shall be installed until acceptance testing demonstrates that the product meets all thickness and strength properties specified herein. Once the Engineer has reviewed and approved the test results, the remainder of the lining installation may resume.

3.03 REINSTATEMENT OF SERVICES

- A. After new CIPP has been cured and completely cooled down, if applicable, Contractor shall reconnect existing service laterals as designated by pre-installation television inspection report generated by Contractor. This shall be done without excavation but from interior of pipeline by means of a television camera and a remote cutting device that reestablishes service connection to not less than 95 percent or better of original diameter and to a maximum of 100 percent of original diameter; overcut connections are not acceptable. All openings shall be clean and neatly cut and the cut shall be buffed with a wire brush to remove rough edges and provide a smooth finish. Bottom of openings shall be flush with bottom of lateral pipe and shall have smooth edges with no protruding material capable of hindering flow or catching debris. All service lateral connections shall be sealed per section 2.03 of this specification.
- B. Coupons shall be removed from laterals by any means possible including entering homes to flush the material via access from cleanout.
- C. Excess resin that builds up and hardens in and around the lateral connections(s) must be removed and/or ground down prior to acceptance of the re-instatement. Contractor will be required to supply an extended lateral cutter bit to reach resin buildup beyond standard length bits.
- D. Inactive service laterals will be abandoned by not reopening the service connection after installation of the cured-in-place pipe liner. If necessary, because of uncertainty of matching each tap in the sewer with each property, the Contractor shall dye test

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to verify if a service connection is active at the direction of the Engineer.

- E. Service laterals that were determined to be inactive during CCTV inspection will be abandoned by not reopening service connection after installation of cured-in-place pipe liner. All lateral connections shall be identified as repaired or abandoned in post rehabilitation CCTV. Contractor to provide image file for all lateral locations along a given pipe segment. Contractor to provide image file at location of lateral even if lateral connection has been abandoned.
- F. Contractor shall not open abandoned/capped service connections except at Engineer's direction. If an abandoned service connection is opened without Owner/Engineer's approval, Contractor shall perform an internal spot repair to close connection, at no additional cost to the Owner.
- G. Contractor shall provide a fully operational backup device for reinstating service laterals. If there is any doubt about live vs. dead service based upon above property comparison with pipe connections, then Contractor shall verify with dye testing. If for any reason remote cutting device fails during reinstatement of a service lateral, Contractor shall immediately deploy standby device to complete reinstatement. Backup equipment shall be onsite throughout reinstatement process.
- H. For service lateral reconnections and/or renewals to be made by excavation methods, InsertaTees may be used for solid wall pipes having a 0.36-inch or greater wall thickness. InsertaTees shall be "Fatboy" type with hub manufactured of SDR 26 PVC material incorporating a 360-degree integral stop on the hub surface and exceeding ASTM F1336 Section 10.3 Pipe Stop Load Support Test, or approved equal. Romac type saddles shall be used for pipes having a wall thickness thinner than 0.36-inches. Saddle connections shall be seated and sealed to new CIPP using grout or resin compatible with the CIPP.
- I. All existing break-in and/or hammer-tap (break-in) laterals shall be cut and sealed per Paragraph 2.03 of this Section to provide a watertight connection between the lateral and the lined pipe. Contractor shall submit a method for cutting and sealing of each lateral.

3.04 FIELD TESTING AND ACCEPTANCE

- A. Field acceptance of CIPP lining shall be based on Owner's and Engineer's evaluation of installation, including a review of the CIPP liner curing data, review of post-rehabilitation CCTV inspection data, and review of certified test data for installed CIPP liner, including air testing. All CIPP sample testing, and repairs to installed CIPP as applicable, shall be completed before final acceptance, meeting requirements of these specifications and documented in written form.
- B. For every 1,000 linear feet of CIPP liner installed for the first 5,000 linear feet, the Contractor shall perform sampling and testing to determine the installed CIPP liner flexural properties and CIPP liner thickness. After the first five (5) test results have been collected and all have passed the minimum standards per the specification, the Owner may require collecting random samples up to one sample per 5,000 linear feet for

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testing. Frequency of testing may be reduced as approved by Owner/Engineer after sufficient tests are performed to verify CIPP liner design, production and installation procedures. Likewise, frequency of testing may be increased by Engineer and performed by Contractor at no additional cost to Owner when required tests show that installed CIPP liner does not meet specifications. If a test is not passed, Contractor shall re-evaluate liner thickness design to determine if installed physical properties meet minimum design requirements; if it does not, liner shall be replaced or relined with approval from Engineer at no additional cost to Owner.

- C. Testing shall be performed by an independent testing laboratory certified by the American Association for Laboratory Accreditation (A2LA). Contractor shall submit to Engineer the name and location of independent testing laboratory, a certified statement from laboratory indicating that they are independent from and not associated with Contractor in any way, and A2IA certification for independent testing laboratory.
- D. All expenses for sampling and testing of installed liner shall be paid for by Contractor. Chain of custody for test samples shall be through Owner's representative. Cost of all manufacturer's testing to qualify products furnished to project site shall be the responsibility of Contractor.
- E. Sampling and testing of the installed CIPP liner shall conform to ASTM F 1216 and the following requirements:
  - 1. Remove one restrained sample of installed CIPP liner at least 18-inches in length. Sample shall be captured by installing CIPP liner through a section of PVC pipe (same diameter as existing sewer diameter) within the most downstream manhole of installation and at all intermediate manholes if multiple sewer segments are lined at same time. Contractor may elect to cut the sample longitudinally and provide 1/2 the sample to Owner's representative or inspector for direct shipping to laboratory and keep other half of sample for additional testing if necessary.
  - 2. CIPP liner thickness shall be measured in accordance with ASTM D 5813. Flexural properties shall be determined in accordance with ASTM D 790. Contractor shall label and date all samples and provide to inspector or Owner's representative same day of installation for shipping to independent testing laboratory. Engineer shall be copied on all transmittals to independent testing laboratory. Testing results shall be submitted to Engineer or Owner within 30 days after installation of CIPP liner or payment will be withheld.
  - 3. After recalculations performed in accordance with Paragraph 3.04, B above, any CIPP lining that does not meet new calculated thickness requirements shall be corrected by Contractor in a manner approved by Engineer at no additional cost to Owner. Owner's decision on how to correct deficient CIPP liner installations shall be final. Options for correcting deficient CIPP liner installations that will be considered by Owner include the following: removal of existing CIPP liner and re-lining the sewer, open-cut replacement of sewer from manhole to manhole, re-lining sewer with existing CIPP liner in place.

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- F. Contractor shall perform a post-rehabilitation CCTV inspection of all sewers rehabilitated using CIPP lining methods in accordance with Section 02764. Post-rehabilitation CCTV inspection shall be performed following installation of CIPP liner and reinstatement of all active service laterals. The Contractor's project manager and/or superintendent shall review the post-rehabilitation inspection videos to confirm the quality of the videos and of the installed CIPP; only after the Contractor has confirmed that the video is of good quality, the videos shall be submitted to the Owner. If it is determined that any repairs are needed at any segment, a new CCTV inspection shall be performed of the entire segment(s) after the repairs have been completed.
- G. Liner Installation Inspection - A visual inspection of the liner will be considered acceptable if liner shows no significant, wrinkles, lifts, ridges, splits, cracks, delaminations, flats, dry spots, pinholes, shrinkage, foreign inclusions, crazing, reverse curvatures, or other type of defects in the CIPP lining. Significant defects shall be defined as those listed in paragraph 1.06 of this section; and/or any defect that may create a maintenance issue in future such as inhibiting CCTV cameras or allowing solids to get caught on defect, and/or any defect that appears to reduce long-term structural strength or stability of pipeline. Longitudinal wrinkles/fins in height up to a maximum of five percent of inside diameter of host pipe or one (1")-inch, whichever is smaller, may be acceptable and shall be evaluated by Engineer for acceptance on a case by case basis. Defective lining shall be repaired or replaced at no additional cost to Owner. If during removal process, the pipe is damaged, Contractor shall perform a point repair at Contractor's own expense.
- H. Post CCTV Video Inspection and Submittals: Contractor shall submit a digital CCTV of post-lined sewer within seven (7) business days for each pipe segment. Engineer shall review and approve payment based upon satisfactory completion of a liner that is free of significant defects as defined in Paragraph 1.06 of this Section.
1. Removal of wrinkles or fins deemed significant at the discretion of the Owner, shall be removed using a milling head, relined or replaced by the Contractor as directed by the Owner at no additional cost. There shall be no evidence of other major defects in the CIPP lining.
  2. Longitudinal shrinkage of the CIPP liner's length, of more than three (3") inches from the face of the manhole shall be repaired with a fiberglass reinforced CIPP spot repair per Paragraph 2.04 of this Section at no cost to the Owner.
  3. Circular shrinkage shall be measured by the Contractor via man entry to try to insert a 1/16" thick ruler or similar into any gap more than eight (8") inches past the MH wall. The Contractor shall document these measurements with digital photos that shall be submitted to the Owner/Engineer for approval. Circular shrinkage shall be repaired per manufacturer recommendations at no cost to the Owner.
- I. The CIPP liner shall be watertight. Groundwater infiltration through the wall of the liner shall be zero.

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- J. All service connections shall be opened to a minimum of 95 percent and a maximum of 100 percent of opening so that a new lateral or lateral lining can be installed properly. Any overcuts more than 105 percent shall be repaired with hydrophilic seal hat connection, CIPP liner or other approved method by Engineer.
- K. All coupons and excess resin shall be removed from reinstated service laterals prior to acceptance of CIPP lining.
- L. All pipe-to-manhole connections shall be watertight and free of infiltration.
- M. When CIPP is installed using pressurized air, Contractor shall perform an air-test per Section 02762 in presence of Owner's representative immediately following cool down and prior to lateral reinstatement. Otherwise, hydrostatic testing (exfiltration test) of completed liner shall be performed after liner curing and cool down in accordance with ASTM F 1216. Hydrostatic testing shall be performed prior to reinstatement of active services.
- N. Installed CIPP shall be tested for water tightness using an exfiltration test. Maximum allowable leakage shall be 50 gallons per day per diameter inch of pipe per mile in accordance with ASTM F 1216.
- O. For pipe segments where manholes are not also rehabilitated, after all installations are complete, inspected, post-construction CCTV has been reviewed and approved by the Owner/Engineer, and all work is satisfactory to Owner/Engineer, contractor shall cut and trim the new liner at each manhole wall. Seal liner to manhole wall with a sealant material per Paragraph 2.02 of this Section.

3.05 MEASUREMENT AND PAYMENT

A. Payment:

- 1. Payment for CIPP pipe liner shall be made at Contract unit price per linear foot for each size as stated in the Bid, complete in place, in accordance with Contract Documents. Payment will be based on actual number of feet installed, as measured by Engineer. Pipe will be measured horizontally, on surface, from center-to-center of manholes to nearest 0.1-foot, unless another method is approved by the Owner/Engineer.
- 2. Price paid per linear foot for pipe liner shall include full compensation for furnishing labor, materials, tools, equipment and incidentals necessary to provide CIPP liner, manhole seals, traffic control, sewage bypassing, control of water, service lateral reinstatement service lateral sealing, manhole connections, preconstruction inspection, cleaning, disposal of sewer cleaning materials, final inspection, perform leakage testing of the CIPP pipe liner, post-construction inspection, protection of existing utilities and adjacent property, and all required surface restoration work and traffic control, complete in place, as shown in Drawings and specified herein.

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END OF SECTION

CURED-IN-PLACE SPOT REPAIR

PART 1 GENERAL

1.01 SCOPE OF WORK

- A. Furnish all materials, labor and equipment and perform all incidental work necessary to install and test cured-in-place spot repairs (CIPSR) as shown on the Drawings and as listed in Section 01010.

1.02 RELATED WORK

- A. Television inspection is included in Section 02764.
- B. Sewer line cleaning is included in Section 02765.
- C. Cured-in-place pipe lining is included in Section 02769.
- D. By-Pass Pumping is included in Section 02659

1.03 SUBMITTALS

- A. Submit, in accordance with Section 01300, and within 15 days of the Effective Date of the Agreement, the name of CIPSR supplier and a list of materials to be furnished.
- B. Provide two submittals of certified test reports to confirm that CIPSR materials have been manufactured and tested in accordance with the ASTM Standards specified herein.
  - 1. Within 15 days of the Effective Date of the Agreement, submit test reports for the materials to be used for this work. Test results shall be the manufacturer's standards for acceptance of field fabricated and installed CIPSR.
  - 2. Prior to the installation of any CIPSR, make test specimens from the materials to be utilized for this work. Make sufficient number of specimens for conducting the referenced testing. Specimens shall be cut from the resin-impregnated patch prior to insertion into the pipe.

1.04 REFERENCE STANDARDS

- A. ASTM International
  - 1. ASTM D543 - Standard Practices for Evaluating the Resistance of Plastics to Chemical Reagents.

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2. ASTM D638 - Standard Test Method for Tensile Properties of Plastics.
  3. ASTM D790 - Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  4. ASTM D2412 - Standard Test Method for Determination of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
  5. ASTM D2990 - Standard Test Methods for Tensile, Compressive, and Flexural Creep and Creep-Rupture of Plastics.
- B. Where referenced is made to one of the above standards, the revision in effect at the time of bid opening shall apply.

1.05 QUALITY ASSURANCE

- A. The Contractor or subcontractor to furnish and install CIPSRs shall be fully qualified, experienced and equipped to complete the work in a timely and satisfactory manner. Submit the following information to the Engineer for review and approval before CIPSR work is performed.
1. The number of years of experience in performing this type of specialized work.
  2. Name of the CIPSR manufacturer and supplier for this work and previous work performed. The Contractor shall be certified by the manufacturer to install the CIPSR patches.
  3. A list of all municipal installations performed over the past five (5) years along with the contact name, telephone number, and brief description of work performed.
  4. The Owner reserves the right to disapprove the use of the CIPSR Contractor based on the submitted qualifications.
- B. All CIPSR spot repairs, regardless of pipe size or length, shall be furnished, fabricated and installed by a single manufacturer.
- C. As directed by the Engineer, replace all CIPSRs that utilized materials or methods of installation other than that approved. Remove and replace the CIPSR section or replace the affected pipe with new pipe at no cost to the Owner.

1.06 GUARANTEE

- A. All CIP spot repairs shall be guaranteed by the Contractor for a period of five (5) years from the date of acceptance. During this period, all defects in the CIPSR's shall be repaired in a manner satisfactory to the Engineer or the affected pipe shall be removed and replaced with new pipe at no additional cost to the Owner.

PART 2 PRODUCTS

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2.01 FIBERGLASS/POLYESTER FELT REPAIR MATERIAL

- A. The CIPSR shall be a resin impregnated fiberglass/polyester felt sleeve which is wrapped around an inflatable packer and positioned in the sewer to be rehabilitated and cured in place by circulating hot water to cure the resin. Ambient curing shall not be allowed
- B. The CIPSR sleeve shall be fabricated from a minimum of two layers of fiberglass with a single layer of polyester felt sandwiched between the fiberglass layers. The material shall be sewn together with multiple polyester threads using zigzag stitching spaced evenly over the full width of the material. The three-layer composite reinforcement material shall have a minimum mass of 40.6 ounces per square yard (oz/sq yd) with a thickness not less than 0.24-inches. Fiberglass alone shall not be acceptable.
- C. The fiberglass shall be woven roving having a minimum weight of 24 oz/sq yd and shall be made of "E" glass coated with a sizing compatible with the resin being used.
- D. The polyester felt shall be needle punched and have a minimum weight of 16.5 oz/sq yd.
- E. The resin shall be a two-part epoxy type liquid thermosetting resin suitable for the intended use as well as the proposed curing method. The diluted epoxy resin shall contain at least 60 percent of bisphenol A, 10 to 20 percent of bisphenol F with the remainder of the mixture being a diluent. Epoxy resin shall be D.E.R. (R) 353 by the Dow Chemical Company; ME 948 by Micon or equal.
- F. The epoxy resin shall be brought on site in the resin manufacturer's original containers. Each container shall be clearly labeled as to contents and product data. The resin shall be stored, mixed and applied in accordance with the manufactures recommendations.
- G. The CIPSR shall provide a service life of 25 years and shall have, as a minimum, the initial and long term properties listed below.

MECHANICAL PROPERTY	INITIAL	LONG-TERM
Flexural Strength	8,000 psi	-----
Flexural Modulus of Elasticity	280,000 psi	140,000 psi
Tensile Strength	5,000 psi	-----
Tensile Modulus of Elasticity	280,000 psi	140,000 psi

- H. When cured, the CIPSR shall form a continuous, tight-fitting, hard, impermeable liner which is chemically resistant to any chemicals normally found in domestic sewage. The CIPSR shall have a suitable membrane coating for protection of the interior surface and to provide a uniform, smooth flow surface. No membranes or plastic coating shall be allowed between the repair patch and the pipe wall.
- I. The fiberglass/polyester felt sleeve shall be fabricated to a size that will tightly fit the sewer being rehabilitated after being installed and cured. The transition from the patch to the existing pipe must be smoothly tapered.

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- J. The CIPSR shall be by Avanti International of Webster, TX or equal.
- K. Thickness of the cured liner shall be as recommended by the manufacturer, but shall not exceed one quarter (1/4") -inch when cured unless authorized in writing by the Engineer.
- L. Spot repairs shall have a minimum length of three (3')-feet and shall not exceed 30-feet in length. CIPSR lengths shall extend a minimum of one (1')-foot beyond the pipe defects at each end of the repaired section. Length of each required repair shall be verified in the field prior to installation.
- M. CIP spot repairs shall not begin or end at a service connection or pipe joint.
- N. All cured-in-place spot repairs shall be one piece. Separately fabricated or installed CIPSRs utilizing overlapped or "butted" ends shall not be acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

- A. Clean each length of pipe to be lined and dispose of all resulting material as specified in Section 02765
- B. All obstructions in the sewer which may impede the insertion of the liner shall be removed by the Contractor.
- C. Conduct a television inspection of each length of pipe after it is cleaned as specified in Section 02765. Document the location of all active service connections and verify the lengths of repairs. A copy of these recordings shall be submitted to the Engineer and provided to the Owner on a USB flash drive.
- D. Notify all property owners who discharge sewage directly to the sewer being repaired that their service will be discontinued while the CIPSR is being inserted, cured and active service connections reopened. Notify individual property owners at least 72 hours in advance, giving the date, start time and estimated completion time for the work being conducted. If needed, setup bypass pumping.
- E. Furnish bypass pumping of sewage flows where the rehabilitation work is being performed. Bypass pumping shall be conducted in conformance with the requirements of Section 02659.
- F. The CIPSR material shall be measured, cut and impregnated with epoxy resin in the field to the measurements determined from the videotape inspections. The installation and curing of the CIPSRs shall be in complete accordance with the manufacturers' specifications and a representative of the manufacturer shall be present during the first day of installation.
- G. The installed spot repair shall be cured by circulating hot water through the resin impregnated patch. Ambient curing shall not be allowed.

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- H. The inflatable element and hydrostatic pressure used during the installation process shall be sufficient to tightly hold the CIPSR to the existing pipe wall, producing dimples at all service connections and squeezing surplus resin into any cracks in the pipe. This pressure shall be great enough to overcome or prevent infiltration from entering the existing pipeline during the curing process.
- I. The Contractor shall ensure that the shroud covering the packer is completely removed from the repaired pipe.
- J. Where CIPSRs connect to existing manholes, the repair shall create a watertight seal at the pipe connection and into the trough. All cut edges of the cured liner shall be thoroughly sealed with the same resin as was used in the CIPSR materials.
- K. Reopen all of the existing active service connections on each length of sewer following patching. The active service connections shall be reopened from inside the sewer by means of a cutting device controlled by a closed-circuit television camera. All cut out material shall be flushed out of the sewer.
- L. Each active service connection shall be cut completely open and shall have smooth edges with no protruding material capable of hindering flow or catching and holding solids contained in the flow stream.
- M. Following installation of the spot repairs and reopening the active service connections, conduct a second recorded CCTV inspection of the completed work. This recording, along with the recording made in Paragraph 3.01B above shall become the property of the Owner and provided on a USB flash drive.

3.02 FIELD TESTING AND ACCEPTANCE

- A. Field acceptance of all CIP spot repairs shall be based on the Engineer's evaluation of the installation and curing data along with review of the recordings and manhole inspections.
- B. Groundwater infiltration of CIPSR shall be zero.
- C. All active service connections shall be open and clear.
- D. There shall be no dry spots, voids, lifts, delaminations or any other type defect in the CIPSR.
- E. Defective CIPSRs shall be removed and replaced with new CIPSRs. If the replacement CIPSR is not satisfactory to the Engineer, then remove the entire section of pipe being rehabilitated and replace it with new PVC pipe at no additional cost to the Owner.

END OF SECTION

ATTACHMENT C  
FEE SCHEDULE

Contract No. 2018-41.001

<b>Gravity Sewer and Manhole Rehabilitation to Reduce Inflow and Infiltration</b>			
<b>Unit Rate Pricing Spreadsheet</b>			
<b>2018</b>			
<b>No</b>	<b>Description</b>	<b>Unit</b>	<b>Unit Cost</b>
<b>SYSTEM INVESTIGATION</b>			
1	Sewer Cleaning & CCTV - 6" Dia.	LF	\$1.80
2	Sewer Cleaning & CCTV - 8" Dia.	LF	\$2.00
3	Sewer Cleaning & CCTV - 10" Dia.	LF	\$2.10
4	Sewer Cleaning & CCTV - 12" Dia.	LF	\$2.20
5	Heavy Sewer Cleaning - 8" Dia.	LF	\$7.80
6	Heavy Sewer Cleaning - 10" Dia.	LF	\$7.80
7	Heavy Sewer Cleaning - 12" Dia.	LF	\$7.80
8	Gravity Sewer Smoke Testing	LF	\$.70
<b>REHABILITATION</b>			
9	Mobilization/Demobilization for Rehabilitation	EA	\$38,000.00
10	Locate & Expose Buried MH	EA	\$ 1,340.30
11	Grouting Service Lateral Connection	EA	\$335.10
<b>CURED-IN-PLACE LINER</b>			
12	Cured in Place Liner - 6" Dia. (6 mm thick)	LF	\$33.10
13	Cured in Place Liner - 8" Dia. (6 mm thick)	LF	\$26.75
14	Cured in Place Liner - 10" Dia. (6 mm thick)	LF	\$33.20
15	Cured in Place Liner - 12" Dia. (6 mm thick)	LF	\$39.50
16	Reinstate Service Lateral Connection	EA	\$160.00
<b>CURED-IN-PLACE SPOT REPAIR</b>			
17	Cured-In-Place Spot Repair - 0-10' deep	LF	\$726.00
18	Cured-In-Place Spot Repair - >10' deep	LF	\$949.40
<b>MANHOLE REHABILITATION</b>			
19	MH Rehabilitation (48" Dia.) - 0-6' deep	EA	\$784.10
20	MH Rehabilitation (48" Dia.) - 6-8' deep	EA	\$929.30
21	MH Rehabilitation (48" Dia.) - 8-10' deep	EA	\$1,161.60
22	MH Rehabilitation (48" Dia.) - 10-12' deep	EA	\$1,393.90
23	MH Rehabilitation (48" Dia.) - 12-14' deep	EA	\$1,626.20
<b>CEMENTITIOUS MONOLITHIC MANHOLE LINING SYSTEM - ALTERNATIVE 1</b>			

EXHIBIT C  
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24	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 0-6' deep	EA	\$1,960.20
25	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 6-8' deep	EA	\$2,613.60
26	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 8-10' deep	EA	\$3,267.00
27	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 10-12' deep	EA	\$3,920.40
28	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 12-14' deep	EA	\$4,573.80
<b>EPOXY MONOLITHIC MANHOLE LINING SYSTEM - ALTERNATIVE 2</b>			
29	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 0-6' deep	EA	\$1,960.20
30	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 6-8' deep	EA	\$2,613.60
31	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 8-10' deep	EA	\$3,267.00
32	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 10-12' deep	EA	\$3,920.00
33	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 12-14' deep	EA	\$4,573.80
<b>CURED-IN-PLACE MONOLITHIC MANHOLE LINING SYSTEM - ALTERNATIVE 3</b>			
34	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 0-6' deep	EA	No Bid
35	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 6-8' deep	EA	No Bid
36	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 8-10' deep	EA	No Bid
37	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 10-12' deep	EA	No Bid
38	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 12-14' deep	EA	No Bid

<b>Gravity Sewer and Manhole Rehabilitation to Reduce Inflow and Infiltration</b>			
<b>Unit Rate Pricing Spreadsheet</b>			
<b>2019</b>			
<b>No.</b>	<b>Description</b>	<b>Unit</b>	<b>Unit Cost</b>
<b>SYSTEM INVESTIGATION</b>		-	-
1	Sewer Cleaning & CCTV - 6" Dia.	LF	\$1.85
2	Sewer Cleaning & CCTV - 8" Dia.	LF	\$2.06
3	Sewer Cleaning & CCTV - 10" Dia.	LF	\$2.16
4	Sewer Cleaning & CCTV - 12" Dia.	LF	\$2.27
5	Heavy Sewer Cleaning - 8" Dia.	LF	\$8.03
6	Heavy Sewer Cleaning - 10" Dia.	LF	\$8.03
7	Heavy Sewer Cleaning - 12" Dia.	LF	\$8.03
8	Gravity Sewer Smoke Testing	LF	\$0.72
<b>REHABILITATION</b>		-	-
9	Mobilization/Demobilization for Rehabilitation	EA	\$39,140.00

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10	Locate & Expose Buried MH	EA	\$1,380.51
11	Grouting Service Lateral Connection	EA	\$345.15
	<b>CURED-IN-PLACE LINER</b>		
12	Cured in Place Liner - 6" Dia. (6 mm thick)	LF	\$34.09
13	Cured in Place Liner - 8" Dia. (6 mm thick)	LF	\$27.55
14	Cured in Place Liner - 10" Dia. (6 mm thick)	LF	\$34.20
15	Cured in Place Liner - 12" Dia. (6 mm thick)	LF	\$40.69
16	Reinstate Service Lateral Connection	EA	\$164.80
	<b>CURED-IN-PLACE SPOT REPAIR</b>		
17	Cured-In-Place Spot Repair - 0-10' deep	LF	\$747.78
18	Cured-In-Place Spot Repair - >10' deep	LF	\$977.88
	<b>MANHOLE REHABILITATION</b>		
19	MH Rehabilitation (48" Dia.) - 0-6' deep	EA	\$807.62
20	MH Rehabilitation (48" Dia.) - 6-8' deep	EA	\$957.18
21	MH Rehabilitation (48" Dia.) - 8-10' deep	EA	\$1,196.45
22	MH Rehabilitation (48" Dia.) - 10-12' deep	EA	\$1,435.72
23	MH Rehabilitation (48" Dia.) - 12-14' deep	EA	\$1,674.99
	<b>CEMENTITIOUS MONOLITHIC MANHOLE LINING SYSTEM - ALTERNATIVE 1</b>		
24	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 0-6' deep	EA	\$2,019.01
25	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 6-8' deep	EA	\$2,692.01
26	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 8-10' deep	EA	\$3,365.01
27	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 10-12' deep	EA	\$4,038.01
28	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 12-14' deep	EA	\$4,711.01
	<b>EPOXY MONOLITHIC MANHOLE LINING SYSTEM - ALTERNATIVE 2</b>		
29	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 0-6' deep	EA	\$2,019.01
30	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 6-8' deep	EA	\$2,692.01
31	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 8-10' deep	EA	\$3,365.01
32	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 10-12' deep	EA	\$4,038.01
33	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 12-14' deep	EA	\$4,711.01
	<b>CURED-IN-PLACE MONOLITHIC MANHOLE LINING</b>		

EXHIBIT C  
FEE SCHEDULE

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SYSTEM - ALTERNATIVE 3			
34	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 0-6' deep	EA	No Bid
35	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 6-8' deep	EA	No Bid
36	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 8-10' deep	EA	No Bid
37	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 10-12' deep	EA	No Bid
38	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 12-14' deep	EA	No Bid

Gravity Sewer and Manhole Rehabilitation to Reduce Inflow and Infiltration			
Unit Rate Pricing Spreadsheet			
2020			
No.	Description	Unit	Unit Cost
<b>SYSTEM INVESTIGATION<sup>1</sup></b>		-	-
1	Sewer Cleaning & CCTV - 6" Dia.	LF	\$1.91
2	Sewer Cleaning & CCTV - 8" Dia.	LF	\$2.12
3	Sewer Cleaning & CCTV - 10" Dia.	LF	\$2.23
4	Sewer Cleaning & CCTV - 12" Dia.	LF	\$2.33
5	Heavy Sewer Cleaning - 8" Dia.	LF	\$8.28
6	Heavy Sewer Cleaning - 10" Dia.	LF	\$8.28
7	Heavy Sewer Cleaning - 12" Dia.	LF	\$8.28
8	Gravity Sewer Smoke Testing	LF	\$0.74
<b>REHABILITATION<sup>2</sup></b>		-	-
9	Mobilization/Demobilization for Rehabilitation	EA	\$40,314.20
10	Locate & Expose Buried MH	EA	\$1,421.92
11	Grouting Service Lateral Connection	EA	\$355.51
<b>CURED-IN-PLACE LINER</b>			
12	Cured in Place Liner - 6" Dia. (6 mm thick)	LF	\$35.21
13	Cured in Place Liner - 8" Dia. (6 mm thick)	LF	\$28.38
14	Cured in Place Liner - 10" Dia. (6 mm thick)	LF	\$35.22
15	Cured in Place Liner - 12" Dia. (6 mm thick)	LF	\$41.91
16	Reinstate Service Lateral Connection	EA	\$169.74
<b>CURED-IN-PLACE SPOT REPAIR</b>			
17	Cured-In-Place Spot Repair - 0-10' deep	LF	\$770.21
18	Cured-In-Place Spot Repair - >10' deep	LF	\$1,007.22

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	<b>MANHOLE REHABILITATION</b>		
19	MH Rehabilitation (48" Dia.) - 0-6' deep	EA	\$831.85
20	MH Rehabilitation (48" Dia.) - 6-8' deep	EA	\$985.89
21	MH Rehabilitation (48" Dia.) - 8-10' deep	EA	\$1,232.34
22	MH Rehabilitation (48" Dia.) - 10-12' deep	EA	\$1,478.79
23	MH Rehabilitation (48" Dia.) - 12-14' deep	EA	\$1,725.24
	<b>CEMENTITIOUS MONOLITHIC MANHOLE LINING SYSTEM - ALTERNATIVE 1<sup>3</sup></b>		
24	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 0-6' deep	EA	\$2,079.58
25	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 6-8' deep	EA	\$2,772.77
26	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 8-10' deep	EA	\$3,465.96
27	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 10-12' deep	EA	\$4,159.15
28	Cementitious MH Monolithic Lining (CMML) System (48" Dia.) - 12-14' deep	EA	\$4,852.34
	<b>EPOXY MONOLITHIC MANHOLE LINING SYSTEM - ALTERNATIVE 2<sup>3</sup></b>		
29	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 0-6' deep	EA	\$2,079.58
30	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 6-8' deep	EA	\$2,772.77
31	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 8-10' deep	EA	\$3,465.96
32	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 10-12' deep	EA	\$4,159.15
33	Epoxy MH Monolithic Lining (EMML) System (48" Dia.) - 12-14' deep	EA	\$4,852.34
	<b>CURED-IN-PLACE MONOLITHIC MANHOLE LINING SYSTEM - ALTERNATIVE 3<sup>3</sup></b>		
34	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 0-6' deep	EA	No Bid
35	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 6-8' deep	EA	No Bid
36	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 8-10' deep	EA	No Bid
37	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 10-12' deep	EA	No Bid
38	Cured-In-Place MH Liner (CIPM) (48" Dia.) - 12-14' deep	EA	No Bid



