

LEE COUNTY UTILITIES DIVISION
LEE COUNTY WASTEWATER COLLECTION SYSTEM REHABILITATION
TECHNICAL SPECIFICATIONS

TABLE OF CONTENTS

<u>DIVISION 1 - GENERAL REQUIREMENTS</u>	<u>SECTION</u>
Summary of Work	01010
Measurement and Payment	01026
Project Coordination	01041
Reference Standards	01090
Submittals	01300
Progress Schedule (Simple)	01310
Shop Drawings, Working Drawings, and Samples	01340
Quality Control	01400
Construction Facilities and Temporary Controls	01500
Protection of Existing Facilities	01530
Site Access and Storage	01550
Traffic Regulation	01570
Materials & Equipment	01600
Materials for Sewer Rehabilitation Methods	01610
Project Closeout	01700
Cleaning	01710
Contract Close Out	01720
Operation and Maintenance Manuals	01730
Warranties and Bonds	01740
<u>DIVISION 2 - SITEWORK</u>	
Shoring, Sheeting, and Bracing	02151
Excavation – Earth and Rock	02222
Backfilling	02223
Temporary Erosion and Sedimentation Control	02276
Lawn Restoration	02400
Groundwater Control for Open Cut Excavation	02530
Pavement Repair and Restoration	02575
SherFlex Coating System	02603

Raven Coating System	02604
IET Coating System	02606
Sewer Manholes	02607
Polyvinyl Chloride (PVC) Gravity Sewer Pipe	02610
Cured-In-Place-Pipe (CIPP) Liner	02624
Fold and Form Pipe Liner (HDPE)	02625
Fold and Form Pipe Liner (PVC)	02626
Pressurized Wastewater Pipe (Force Main) Rehabilitation	02627
Wastewater Service Reconnection, Sealing, and Inspection	02651
Wastewater By-Pass Pumping	02652
Preparatory Pipe Cleaning and Root Removal	02653
Manhole Lining (Structural)	02654
Manhole Lining (Non-structural)	02655
Manhole Repairs for Inflow Prevention	02656
Leakage Tests	02676
Point Repair of Sanitary Sewer	02757
CIP Full Circle Main / Lateral Connection	02770
Miscellaneous Work and Cleanup	02999
<u>DIVISION 3 – CONCRETE</u>	
Concrete Formwork	03100
Concrete Reinforcement	03200
Concrete Accessories	03250
Concrete for Non-Plant Work	03311
Precast Concrete Structures	03410
<u>DIVISION 5 – METALS</u>	
Metal Castings	05540
<u>DIVISION 13 – SPECIAL CONSTRUCTION</u>	
Televising and Inspection	13511

SECTION 01010
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of Work
- B. Constraints
- C. CONTRACTOR's Use of Site
- D. Work Sequence
- E. Owner Occupancy

1.2 DESCRIPTION OF WORK

- A. General: The Work to be done under this Contract consists of the rehabilitation of sanitary sewer mains, laterals, and manholes as shown and specified in Contract Documents entitled "Lee County Wastewater Collection System Rehabilitation".
 - 1. It is the intent of the OWNER to select and retain a contractor to perform wastewater collection system rehabilitation services. The contractor will be selected based upon qualifications, technologies, and ability to perform the required services during the stipulated contract period and cost.
- B. The Work includes:
 - 1. Furnishing of all labor, material, superintendence, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, mobilization, demobilization, services and other means of construction necessary or proper for performing and completing the Work.
 - 2. Sole responsibility for adequacy of plant and equipment.
 - 3. Maintaining the Work area and site in a clean and acceptable manner.
 - 4. Identifying and maintaining existing facilities in service at all times except where specifically provided for otherwise herein.
 - 5. Protection of finished and unfinished Work.

6. Repair and restoration of Work damaged during construction.
 7. Furnishing proper equipment and machinery, of a sufficient capacity, to facilitate the Work and to handle all emergencies normally encountered in Work of this character.
 8. Furnishing, installing, and protecting all necessary guides, track rails, bearing plates, anchor and attachment bolts, and all other appurtenances needed for the installation of the devices included in the equipment specified. Make anchor bolts of appropriate size, strength and material for the purpose intended. Furnish substantial templates and shop drawings for installation.
 9. Providing Pre-Installation and Post-Installation videos in accordance with Specification Section 13511 - TELEVISIONING AND INSPECTION.
 10. Providing Record Drawings per Specification Section 01720 – CONTRACT CLOSE OUT indicating the actual length of liner pipe for each sewer run, actual diameter and depth of manholes lined, locations of point repairs made, materials utilized, date of installation, and date of final acceptance.
- C. Implied and Normally Required Work: It is the intent of these Specifications to provide the OWNER with complete operable systems, subsystems and other items of Work. Any part or item of Work which is reasonably implied or normally required to make each installation satisfactorily and completely operable is deemed to be included in the Work and the Contract Amount. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of these Specifications are included in the Work and the Contract Amount even though these appurtenances may not be specifically called for in these Specifications.
- D. Quality of Work: Regard the apparent silence of the Contract Documents as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished as meaning that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Interpretation of these Specifications will be made upon this basis.

1.3 CONSTRAINTS

- A. The Contract Documents are intended to allow the CONTRACTOR flexibility in construction of the Work, however, the following constraints apply:
1. Access to homes and businesses must be maintained at all times.

2. Written notice of the project shall be delivered to all homes and businesses affected by the project at least 14 days prior to commencement of construction.
3. Coordinate with Lee County Utilities to reduce the flow in the sewer system by temporarily turning off lift stations as needed.

1.4 CONTRACTOR'S USE OF SITE

- A. In addition to the requirements of the General Conditions, limit use of site and premises for work and storage to allow for the following:
 1. Coordination of the Work under this CONTRACT with the work of the other contractors where Work under this CONTRACT encroaches on the Work of other contractors.
 2. OWNER occupancy and access to operate existing facilities.
 3. Coordination of site use with OWNER.
 4. Responsibility for protection and safekeeping of products under this CONTRACT.
 5. Providing additional off-site storage as needed at no additional cost to the OWNER. The OWNER will not provide any space or place to store materials for this project. No payment will be made for stored materials.

1.5 WORK SEQUENCE

- A. Construct Work in stages to accommodate OWNER's use of premises during construction period and in accordance with the limitations on the sequence of construction specified. Coordinate construction schedules and operations with the ENGINEER.
- B. The OWNER at any time may check all or any portion of the work, and the CONTRACTOR shall afford all necessary assistance to the OWNER in carrying out such checks. Any necessary corrections to the work shall be performed immediately by the CONTRACTOR.

1.6 OWNER OCCUPANCY

- A. OWNER will occupy premises during entire period of construction in order to maintain normal operations. Cooperate with OWNER's representative in all construction operations to minimize conflict, and to facilitate OWNER usage.

- B. Conduct operations so as to inconvenience the general public in the least.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 STARTING WORK

- A. Start Work within 10 days following the date stated in the Notice to Proceed and execute with such progress as may be required to prevent delay to other contractors or to the general completion of the project. Execute Work at such items and in or on such parts of the project, and with such forces, material and equipment, as to complete the Work in the time established by the Contract. At all times, schedule and direct the Work so that it provides an orderly progression to completion within the specified time for completion.

END OF SECTION

SECTION 01026

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Explanation and Definitions
- B. Measurement
- C. Payment
- D. Schedule of Values
- E. Application for Payment

1.2 EXPLANATION AND DEFINITIONS

- A. The following explanation of the Measurement and Payment for the bid form items is made for information and guidance. The omission of reference to any item in this description shall not, however, alter the intent of the bid form or relieve the CONTRACTOR of the necessity of furnishing such as a part of the Contract.
- B. The prices and conditions stated in this bid shall be in effect for a period of (1) year contract with the option of being renewed for four (4) additional one (1) year periods.

1.3 MEASUREMENT

- A. The quantities set forth in the bid form are approximate only and are given to establish a uniform basis for the comparison of bids. The COUNTY does not expressly or indirectly agree that the actual amount of work to be done in the performance of the contract will correspond with the quantities in the Bid Proposal; the amount of work to be done may be more or less than the said quantities and may be increased or decreased by the COUNTY as circumstances may require. The increase or decrease of any quantity shall not be regarded as grounds for an increase in the unit price or in the time allowed for the completion of the work, except as provided in the Contract Documents.
- B. The quantities for payment under this Contract shall be full compensation determined by actual measurement of the completed items, in place, ready for service, and accepted by the COUNTY, unless otherwise specified. The COUNTY will witness all field measurements.

- C. When depths of cuts are indicated in the bid items, they shall be measured vertically from the existing grade at excavation point, paved or unpaved, to the finished pipe invert.

1.4 PAYMENT

- A. Payment shall be made for the items listed on the Bid Form on the basis of the work actually performed and completed, such work including but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, clean up, restoration of disturbed areas, and all other appurtenances to complete the construction and installation of the work as described in the specifications. No direct or separate payment will be made for providing miscellaneous temporary or accessory works, services, field offices, layout surveys, job signs, sanitary requirements, testing, safety devices, approval and record drawings, water supplies, power, maintenance of traffic, site preparation, removal of waste, site cleanup, watchmen, bonds, insurance, mobilization, demobilization, and any other requirements of the General Conditions and Bidding and Contract Requirements. Compensation for all such services, equipment and materials shall be included in the prices stipulated for the unit pay items listed herein.
- B. Unit prices are used as a means of computing the final figures for bid and Contract purposes, for periodic payments for work performed, for determining value of additions or deletions and wherever else reasonable.
- C. The County will not provide any space or place to store materials for this project. No payment will be made for stored materials.
- D. Payment shall fully reimburse the CONTRACTOR for cooperating with and meeting all the requirements of the State of Florida Trench Safety Act (Florida Statutes 90-96)
- E. Payment items for cleaning and televising of mains will apply when sewer is cleaned and televised for inspection only, or when a sewer repair is not performed due to changed field conditions revealed by the pre-repair video inspection. Cleaning and television inspection performed to prepare for a repair or to document a completed repair are not considered separate pay items. Costs for such cleaning and TV inspection shall be included in the contract unit cost for each particular repair. Lateral inspection shall be performed using a camera launched from the main unless conditions within the sewer require lateral inspection from the cleanout.

1.5 APPLICATION FOR PAYMENT

- A. Required Copies: Submit a minimum of three (3) copies of each application on the Lee County "Estimate and Requisition for Payment" Form No. CMO:013. Present required information in typewritten form or on electronic media printout.
- B. Prepare and submit the application for payment in accordance with Article 14 of the General Conditions and Supplementary Conditions of these Contract Documents. Execute the certification with the signature of an authorized officer. Provide original signatures on each copy of the Application for Payment.
- C. Change Orders: If the CONTRACTOR determines that any foreseeable item of expense is not covered by a pay item under this contract, the CONTRACTOR shall notify the OWNER of this fact prior to initiation of the associated work and shall await authorization to proceed. In the event that no such prior notification is made and no such prior authorization is received, the CONTRACTOR will not be paid for the expense(s) in question. No after-the-fact change order will be considered or approved. List each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of work.
- D. Final Payment: Prepare and submit the Application for Final Payment as required in the General Conditions.
- E. Submit an updated progress schedule in accordance with the Supplementary Conditions with each Application for Payment.
- F. Submit application for payment to COUNTY on, or before, the first of each month.

PART 2 EXECUTION

2.1 MEASUREMENT AND PAYMENT

- A. Payment shall be made on the basis of work actually performed completing each item in the Bid, such work including, but not limited to:
 - 1. Group "A" – Excavation Point Repairs: Point Repairs, cleanout installation, bypass pumping, surface restoration, and TV survey.
 - 2. Group "B" – Chemical Grouting: Testing and chemical grouting of pipe, root removal, cleanout installation, bypass pumping and TV surveying.
 - 3. Group "C" – Manhole Rehabilitation: Replacing manhole frames and covers and performing other miscellaneous manhole repairs, installing manhole coatings, replacing entire manholes and bypass pumping.

4. Group “D” – Cured-in-Place Sectionals and Lateral Lining: Cured-in-place lateral lining, sectional lining of mains and mainline/lateral connection. Television survey on service lateral pipes using special camera systems and associated cleanout installation and bypass pumping. Lateral camera survey’s must have pan and tilt capabilities, associated work such as cleaning and preparation, cleanout installation, bypass pumping, traffic control and TV survey.
5. Group “E” – Cured-in-place Lining: Cured-in-place pipe lining for gravity mains and laterals and associated work such as cleaning and preparation, lateral reinstatement, cleanout installation, bypass pumping, traffic control and TV survey. Cured-in-place lateral lining, sectional lining of mains, and mainline/laterals connection interface seal installation. Television survey on service lateral pipes using special camera systems and associated cleanout installation and bypass pumping.
6. Group “F” – Fold-and-Form Lining: Fold-in-form pipelining for gravity mains, and associated work such as cleaning and preparation, lateral reinstatements, cleanout installation, bypass pumping, traffic control and TV survey. Television survey on service lateral pipes using special camera systems and associated cleanout installation and bypass pumping.
7. Mobilization and Demobilization.
8. The furnishing and mobilization of all necessary labor, materials, equipment, and transportation.
9. Providing temporary sanitary sewer service of service laterals, bypass pumping or plugging, if necessary.
10. Bonds and Insurance.
11. Proper notification to LCU customers of service disruptions.
12. Reinstatement of connections.
13. Root removal.
14. Cleaning.
15. Test pits or other methods required for locating existing underground utilities and/or structures.
16. Maintenance of Traffic including plans, permitting, and MOT devices.

17. Erosion and sedimentation control.
18. Excavation, backfilling, and compaction.
19. Sheeting, shoring and bracing.
20. Protection of existing structures, utilities, and customer service lines.
21. De-watering.
22. Installation and removal of plugs and bulkheads.
23. Pressure testing and leakage testing.
24. Reconstruction and regrading of pavement areas, road shoulders, and ditches or swales disturbed by construction activity.
25. Finish grading and disposal of surplus material, unsuitable material, and all debris.
26. Cleanup and restorations.
27. All other appurtenances to complete the construction and installation of the work to the configuration and extent as described in the specifications.
28. Replacement of defective materials.
29. Accessing mains or manholes in difficult locations.
30. If repairs are required due to damage caused by the CONTRACTOR's operation, materials for repair shall, if required, include pipe, fittings and specials, pipe bedding, and materials for surface restoration; transportation and handling costs delivered to the work site; any bypass pumping providing provisional mains to maintain service; complying with the State of Florida Trench Safety Act, including shoring; removal, transportation and disposal of existing main excavation; supporting and protecting existing utilities as required; dewatering; sheeting and shoring, if necessary; furnishing and installing replacement pipe, fittings and repair couplings; unloading material and placing it in the trench; cutting pipe; furnishing and installing joint materials including lubricant; making all connections within the lines to existing wastewater mains, laterals and structures; placing and compacting bedding and backfill; furnishing and installing additional and suitable backfill material, if required; furnishing all materials and equipment required to clean and test the main; temporary paving installation and removal; permanent

paving replacement; replacement of pavement markings as existed before repair; replacing utilities, catch basins, manholes, trees, grass, shrubs, mail boxes, sprinkler systems, concrete or rock bed driveways, sidewalk and all other similar items, to original locations and to equal or better than original conditions; obtaining and paying for any necessary permits; satisfying all requirements of the permits, and all other appurtenant and miscellaneous items and work including final cleanup.

B. 10% Retainage will be withheld from the final payment until written acceptance by the Owners Representative for all final clean up, restoration, and Record Drawings per Specification Section 01720 – CONTRACT CLOSE OUT indicating the actual length of liner pipe for each sewer run, actual diameter and depth of manholes lined, locations of point repairs made, materials utilized, date of installation, and date of final acceptance.

C. PAYMENT ITEMS:

1. Group “A” – Excavated Point Repairs Payment Items

a. Items A1 to A20 – Point repairs of gravity mains and laterals

(1) This work, of whatever nature, will be measured and paid for at the unit price per each as delineated by pipe size and depth brackets as named in the Bid Proposal. Payment of the unit price per each shall provide full compensation for all necessary and required work including, but not limited to pre- and post-construction television inspection and sonde locate if required; traffic control; excavation; removal, transportation, and disposal of existing pipe regardless of type; removal, transportation and disposal of material generated by cleaning and preparation; transportation and handling costs; furnishing and installing all materials including pipe (a minimum of 6 feet and a maximum of 15 feet), pipe joint material including lubricant, pipe bedding, repair sleeves, flexible banded couplings and adapters, rigid sleeves with compression joints, embedment materials, wyes or tees and the reconnection of service laterals; flow isolation; backfill; compaction; complying with the State of Florida Trench Safety Act; supporting and protecting existing utilities as required; dewatering; sheeting and shoring, if necessary; cutting pipe; making all connections within the lines to existing sewers and structures; testing; cleanup; final cleanup; all labor, materials and equipment required to provide a complete and acceptable pipe installation, including all appurtenances, in accordance with the Contract Documents, the manufacturer's specifications and compliance with all applicable regulatory requirements; and all

incidentals related to point repairs to achieve a repaired segment of sewer gravity main or lateral complete in place, tested, and ready for use. Additional repairs required outside of the base 15 feet maximum will be paid for by dividing the base unit price for the item by 15 feet. This price per foot (beyond the 15 feet) will be paid per additional foot of pipe repair, in accordance with the technical specifications.

- (2) Payment for bypass pumping, if required (other than because of damage caused by the CONTRACTOR), will be paid for under a separate item.
- (3) Asphalt and concrete repair, if required, will be paid for as a separate item.

b. Item A21 - Install polyethylene fused-on saddle (open trench)

- (1) This item of work will be measured and paid at the unit price per each lateral reinstated and shall include, but not be limited to, furnishing all labor, equipment, and material necessary to install prefabricated polyethylene saddles by electrofusion in accordance with the manufacturer's recommendations, complete and in place.
- (2) The starting point for this item of work will be the performance of a point repair (one of Items A1 to A15) to expose the main, to provide an open trench with the sewer main located and exposed, as well as subsequent backfill and compaction.

c. Items A22 to A46 – Items in common

- (1) Reference Part C.7 of this section

2. Group "B" – Chemical Grouting Payment Items

a. Items B1 to B3 – Testing sewer joints

- (1) This item of work will be measured and paid for at the unit price per each joint of pipe tested as delineated by the pipe size brackets named in the Schedule of Price Bid. Each unit price bid shall include all work including but not limited to setups, flow isolation, testing, maintenance, transportation, traffic control, labor, work, materials, reporting and documentation, or any other costs associated with pipe joint test.

- b. Items B4 to B6 – Testing and sealing sewer joints
 - (1) These items of work will be measured and paid for at the unit price per each joint of pipe tested and sealed as delineated by the pipe size brackets named in the Schedule of Price Bid. Each unit price bid shall include all work including, but not limited to, setups, flow isolation, testing, sealing, maintenance, transportation, traffic control, labor, work, materials, reporting and documentation, or any other costs associated with pipe joint testing and sealing.
- c. Items B7 – Work in rear-yard easements (Items B1 to B6)
 - (1) Reference Park C.7 of this section
- d. Item B8 – Chemical grout for sealing sewer joints
 - (1) This item of work will be measured and paid for at the unit price per gallon of grout used to seal sewer joint regardless of pipe size. The price shall include all setups, maintenance, transportation, traffic control, labor, work, materials or any other costs associated with chemical grouting of sewer joints. Chemical grout for sealing sewer laterals or lateral connections will not be paid for by this item
- e. Items B9 to B10 – Chemical root removal in sewer lines
 - (1) This item of work will be measured and paid for at the unit price per linear foot for each sewer size bracket named in the Schedule of Price Bid. Measurement of lines shall be made based on the horizontal projection of the centerline of the pipe between manholes, measured to the nearest foot from inside wall of manhole to inside wall of manhole, not including the manhole chamber, in the pipe which root removal/treatment was performed.
 - (2) Each unit price bid for root removal and chemical root treatment in sewer lines shall include: cleaning; all mechanical methods of root removal specified or not; all herbicides or chemical treatment specified or not and/or all equipment, materials and labor which shall be used to provide an open sewer (no blockages or constrictions due to roots or vegetation) to an acceptable condition and ready for any and all repairs.

restoration to original condition or better to provide a complete and acceptable installation, in accordance with the technical specifications.

b. Items C3 to C4 – Realignment of Manhole ring and cover

- (1) This item of work will be measured and paid for at the unit price per each manhole, regardless of size of frame and type of surface features which must be restored. Realignment may be horizontal, vertical, or both. Payment of the bid unit price shall include all necessary excavation, cleanup, labor, tools, equipment, materials and all incidentals required for lifting, removing and replacing of the ring and cover in its correct position; patching as required, surface restoration; cleaning and preparing the surface of the chimney of the manhole for setting a new ring concentric to the existing manhole opening; installing butyl rubber rope mastic and placing the ring and cover; installing an external or internal chimney seal; backfilling and surface restoration to original condition or better to provide a complete and acceptable installation, in accordance with the technical specifications.

c. Items C5 to C7 – Provide and Install Manhole coating/liner

- (1) This item of work will be measured and paid at the unit price per vertical foot of manhole wall for installation of spray-applied coating/liner on manhole interior surfaces. Measurement will be made from the bench, at its highest point, to the bottom of the frame. Payment of the unit price per vertical foot shall include all necessary cleaning, abrasive blasting and preparation of the interior manhole surfaces; furnishing and supplying of all materials or combination of materials making up the spray-applied coating/liner; temporarily blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation activities; television surveys before and after installation; testing; cleanup; all labor, materials, equipment and all incidentals required to provide a complete and acceptable installation in accordance with the technical specifications.
- (2) Payment for bypass pumping, if required (other than because of damage caused by the CONTRACTOR), will be paid for under a separate item.

d. Item C8 – Repair manhole bench and invert

- (1) This item of work will be measured and paid at the unit price of manhole invert repaired. Payment of the unit price will provide compensation for cleaning and patching the manhole bench and flow channels, isolation of the manhole by plugging entering lines, testing labor, tools and equipment and all incidentals and materials needed to restore the manhole bench and invert, in accordance with the technical specifications.
- e. Item C9 – Replace manhole bench and invert
- (1) This item of work will be measured and paid at the unit price per each of manhole invert replaced. Payment of the unit price will provide compensation for cleaning; injecting chemical grout to stop active infiltration, if necessary; furnishing labor, equipment, and all materials or combination of materials applying them; removal and re-installing flow channel and benches; isolation of the manhole by plugging entering lines; testing labor, tools and equipment; and all incidentals necessary to obtain a watertight, sealed manhole bench and invert, in accordance with the technical specifications.
- f. Item C10 – Remove Existing Coating/Liner
- (1) This item of work will be measured and paid at the unit price per vertical foot of manhole wall for removing the existing coating/liner on manhole interior surfaces. Measurement will be made from the bench, at its highest point, to the bottom of the frame. Payment of the unit price per vertical foot shall include all necessary cleaning, abrasive blasting and preparation of the interior manhole surfaces; furnishing and supplying of all materials or combination of materials to remove existing coating/liner; temporarily blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation activities; television surveys before and after installation; testing; cleanup; all labor, materials, equipment and all incidentals required to provide a complete and acceptable installation in accordance with the technical specifications.
- g. Item C11 – Repair Existing Coating/Liner
- (1) This item of work will be measured and paid at the unit price per vertical foot of manhole wall for repairing the existing coating/liner on manhole interior surfaces. Measurement will be made from the bench, at its highest point, to the bottom of the frame.

Payment of the unit price per vertical foot shall include all necessary cleaning, abrasive blasting and preparation of the interior manhole surfaces; furnishing and supplying of all materials or combination of materials to repair existing coating/liner; temporarily blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation activities; television surveys before and after installation; testing; cleanup; all labor, materials, equipment and all incidentals required to provide a complete and acceptable installation in accordance with the technical specifications.

h. Items C12 to C13-Repair Manhole Defect/Leak

(1) This item of work will be measure and paid for the unit price per each repair. Payment of the unit per each will provide complete compensation for furnishing and repairing manhole defect/leaks, labor tools, equipment and incidentals necessary for a complete in place, acceptable repair, in accordance with the technical specifications.

i. Item C14 – Work in rear-yard easement (Items C1 to C13)

(1) Reference Part C.7 of this section.

j. Items C15 to C21 – Manhole Replacement

(1) This item of work will be measured and paid for at the unit price per each precast manhole installed, with or without outside drop connections, and depth brackets as named in the Proposal Bid Form. Payment of the unit price per each will provide complete compensation for all necessary and required traffic control; excavation; removal, transportation, and disposal of existing structure; removal, transportation and disposal of material generated by cleaning and preparation; transportation and handling costs; cutting pipe; furnishing and installing all materials, including pipe, pipe joint material, repair sleeves, manhole base, wall sections, cone chimney, frame and cover, and embedment materials; isolation of reaches of sewers by plugging; excavation; backfill; compaction; complying with the State of Florida Trench Safety Act; supporting and protecting existing utilities as required; dewatering; sheeting and shoring, if necessary; cleanup; connection of all existing piping to new manholes; final cleanup; testing; all labor, materials and equipment required to provide a complete and acceptable installation, including all appurtenances, in accordance with the Contract Documents, the

manufacturer's specifications and compliance with all applicable regulatory requirements; and all incidentals related to new manhole construction complete in place, tested, and ready for use, in accordance with the technical specifications.

- (2) Asphalt and concrete repair, if required, will be paid for as a separate item.
 - (3) Bypass pumping, if required, will be paid for as a separate item.
- k. Item C22 – Work in rear-yard easement (Items C15 to C24)
- (1) Reference Part C.7 of this section.
- l. Items C23 to C36 – Items in common.
- (1) Reference Part C.7 of this section.
4. Group “D” – Sectional Liners and Lateral Liners Payment Items
- a. Items D1 to D6 – Install cured-in-place sectional pipe liners
- (1) Items D1, D3, and D5 will be measured and paid at the unit price per each cured-in-place sectional pipe liner installed up to 6 feet, as delineated by the pipe size brackets named in the Schedule of Price Bid. Each unit price bid shall provide full compensation for all work including, but not limited to, furnishing and installing section of liner; pipe cleaning; television inspections; all labor, materials and equipment specified or not which will provide a complete and acceptable liner installation, in accordance with the technical specifications.
 - (2) Items D2, D4, and D6 will be paid for in addition to the price paid under corresponding Items D1, D3, or D5 as applicable, at the unit price bid per linear foot of liner installed beyond 6 feet and up to 9 feet. This item will be full compensation for all additional costs associated with work of installing sectional liner beyond 6 feet. Any sectional liner extending beyond 9 feet and up to 12 feet shall be paid for as two single liners under Items D1, D3, or D5, in accordance with the technical specifications.
 - (3) Payment for bypass pumping, if required (other than because of damage caused by the CONTRACTOR), will be paid for under a separate item.

- b. Item D7 – work in rear-yard easements (Items D1 to D6)
 - (1) Reference Part C.7 of this section.

- c. Item D8 – Reinstall laterals and grout annular space
 - (1) This item of work will be measured and paid at the unit price per each lateral reinstated and shall include, but not be limited to, blocking or plugging incoming line; removal, transportation and disposal of material generated by cleaning and preparation; television surveys, furnishing the equipment necessary to internally cut out the liner to at least 95 percent of the circumference of the lateral, cutting out the coupon; wire-brushing the cut to remove jagged edges; recovering all waste material from the sewer; service pipe cleaning; sealing the lateral connection to the liner including the first joint of the lateral connection; grouting the annular space using 3' minimum lateral bladder; performing all repairs required due to damage caused by the CONTRACTOR, and all appurtenant and miscellaneous items and work, in accordance with the technical specifications.
 - (2) If the CONTRACTOR damages the host pipe during lateral reinstatement, the CONTRACTOR shall repair the host pipe to the satisfaction of the OWNER at no additional cost.
 - (3) If grouting of the annular space at the reinstated lateral results in residual grout in greater than 50 percent the circumference of the lateral, such grout shall be removed at no additional cost

- d. Items D9 to D11 – Items in common
 - (1) Reference Part C.7 of this section.

- e. Items D12 to D17 – Full Circle Lateral Repairs Liner (FCLRL), in various-sized main with 4-inch to 6-inch laterals
 - (1) This item of work will be measured and paid for at the unit price per each as delineated by the pipe size and depth brackets named in the Bid Form, and shall include up to 15 feet of lateral. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; pipe liner; cleaning; testing;

cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.

- (2) This item of work will be measured and paid for at the unit price per linear foot of sewer laterals lined beyond 15 feet of lateral, in addition to the corresponding item with Bid Form units of "EA". This item will be full compensation for all additional costs associated with work of installing liner beyond 15 feet.
- (3) Payment for bypass pumping, if required (other than because of damage caused by the CONTRACTOR) will be paid for under a separate item.

f. Items D18 to D19 – Install CIP liner in 4-inch to 6-inch laterals, various depths.

- (1) This item of work will be measured and paid for at the unit price per each and shall include up to 15 feet of lateral. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; pipe liner; cleaning; testing; cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.
- (2) This item of work will be measured and paid for at the unit price per linear foot of sewer laterals lined beyond 15 feet of lateral, in addition to the corresponding item with Bid Form units of "EA". This item will be full compensation for all additional costs associated with work of installing liner beyond 15 feet.
- (3) Payment for bypass pumping, if required (other than because of damage caused by the CONTRACTOR) will be paid under a separate item.

g. Items D20 to D21 – Install Full-Circle CIP mainline/lateral connection interface seal (minimum 3') in 6-inch to 21-inch main with 4-inch to 6-inch laterals, all depths.

- (1) This item will be paid at the unit price per each and shall include furnishing all labor, equipment, and materials needed to install a

mainline/lateral connection interface seal that extends a minimum of 3-feet into the lateral and has a minimum 3-inch “brim”. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; pipe liner; recovering all waste material from the sewer; testing; cleanup; performing all repairs required due to damage caused by the CONTRACTOR; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.

(2) Coating removal / Surface preparation will be required when an interface seal is installed over an existing Full-Circle CIP liner, and will be separately compensated using the applicable pay item.

h. Items D22 to D23 – Install Full-Circle CIP mainline/lateral connection interface seal 6-in to 21-inch main, 4-inch & 6-inch lateral pipe, up to 6-inch of lateral piping, all depths.

(1) This item will be paid at the unit price per each and shall include furnishing all labor, equipment, and materials needed to install a mainline/lateral connection interface seal that extends a minimum of 6-inches into the lateral and has a 6-inch “brim”. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; television surveys; pipe liner; recovering all waste material from the sewer; testing; cleanup; performing all repairs required due to damage caused by the CONTRACTOR; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.

(2) Coating removal / Surface preparation will be required when an interface seal is installed over an existing CIP liner, and will be separately compensated using the applicable pay item.

i. Item D24 – Transitional liner (6-inch to 4-inch)

- (1) This item of work will be measured and paid for at the unit price per each, as defined in the Bid Form. Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools, equipment and incidentals, to provide as directed by the OWNER, a transitional liner (6-inch to 4-inch), as part of a T-liner or lateral liner, complete in place. Payment for this item, when authorized by the OWNER, shall be in addition to a T-liner or lateral liner, in accordance with the technical specifications
- j. Item D25 – Coating Removal
- (1) This item of work will be measured and paid for at the unit price per each, as defined in the Bid Form. Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools, equipment and incidentals, to remove the coatings in mainline cured-in-place liners prior to the installation of a mainline/lateral connection interface seal “brim”. Payment for this item, when authorized by the OWNER, shall be in addition to a mainline/lateral connection interface seal, in accordance with the technical specifications.
- k. Item D26 – Items in common
- (1) Reference Part C.7 of this section.
- l. Item D27 – Televis service lateral and locate from mainline (up to 30 feet)
- (1) This item of work will be measured and paid at the unit price per each of lateral televised. Payment of the unit price per each will provide for complete compensation for furnishing all labor, equipment, tools, and materials for preparatory cleaning and televising of sanitary sewer service laterals, including all incidentals such as traffic control and sewer plugging, in accordance with the technical specifications.
- m. Item D28 – Televis service lateral and locate from mainline (beyond 30 feet)
- (1) This item of work will be measured and paid for at the unit price per foot of sewer laterals televised in addition to Item D1. Payment of the unit price for each will provide for complete compensation for furnishing all labor, equipment, tools and materials, preparatory cleaning and televising service lateral

including all incidentals such as traffic control and sewer plugging, in accordance with the technical specifications.

- n. Item D29 – Televis lateral from cleanout (up to 30 feet)
 - (1) This item of work will be measured and paid at the unit price per each of lateral televised. Payment of the unit price per each will provide for complete compensation for furnishing all labor, equipment, tools, and materials for preparatory cleaning and televising sanitary sewer service laterals, including all incidentals such as traffic control and sewer plugging, in accordance with the technical specifications.

- o. Item D30 – Televis lateral from cleanout (beyond 30 feet)
 - (1) This item of work will be measured and paid for at the unit price per foot of sewer laterals televised in addition to Item D4. Payment of the unit price for each will provide for complete compensation for furnishing all labor, equipment, tools and materials, preparatory cleaning and televising service lateral including all incidentals such as traffic control and sewer plugging, in accordance with the technical specifications.

- p. Item D31 to D35 – Items in common.
 - (1) Reference Part C.7 of this section.

- q. Items D36 - Lateral grouting (if required in preparation for FCLRL, lateral liner, or mainline/lateral connection interface seal installation)
 - (1) This item of work will be measured and paid at the unit price per each lateral grouting performed, with the advance concurrence of the OWNER, in association with the performance of a FCLRL, lateral liner, or mainline/lateral connection interface seal installation. Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools and equipment and incidentals, to chemically grout leaking laterals prior to the installation of a FCLRL, lateral liner, or mainline/lateral connection interface seal, complete in place. Payment for this item, when authorized by the OWNER, shall be in addition to a FCLRL, lateral liner, or mainline/lateral connection interface seal, in accordance with the technical specifications.

- r. Item D37 – Lateral testing

- (1) This item of work will be measured and paid at the unit price per each lateral tested (10% of installed liners). Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools and equipment and incidentals, to test laterals that have been lined. Payment for this item, when authorized by the OWNER, shall be in addition to a FCLRL, lateral liner, or mainline/lateral connection interface seal. There will be no payment for laterals that fail the test, in accordance with the technical specifications.
- s. Items D38 to D46 – Items in common
 - (1) Reference Part C.7 of this section.
5. Group “E” Cured-in-Place Pipe (CIPP) Lining Pay Items
 - a. Items E1 to E8 – Install CIPP liner in gravity mains, per ASTM F2561-11.
 - (1) This work will be measured and paid at the unit price per linear foot of liner as delineated by the pipe size and depth brackets named in the Bid Proposal. Measurement shall be made based on the horizontal projection of the centerline of the permanently installed liner between manholes, including the laying length of fittings along the run, measured to the nearest foot from the inside wall of manhole to inside wall of manhole for each section lined. Each unit price bid shall include, but not be limited to, all necessary or required resident notification, traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of material generated by cleaning and preparation; pre- and post-lining television surveys; chemical joint sealing if necessary; pipe lining; the cost of obtaining a water meter from the OWNER; cleaning; sample collection; grouting to eliminate infiltration at service connections and liner ends; cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.
 - (2) Where post-installation thickness measurements and/or physical property testing is performed, payment for installed liner will be made as itemized below:
 - (a) Full payment – If thickness, flexural strength, and flexural modulus of elasticity of installed liner are all 95 percent or

more of specified values, full payment will be made accordingly.

- (b) Adjusted payment for 90 to 94 percent of specified values – If thickness, flexural strength, or flexural modulus of elasticity of installed liner are between 90 and 95 percent of specified values, payment will be made based on an Adjusted Unit Price, which shall equal the Unit Price bid, multiplied by a Value Factor calculated as follows:

- 1)
$$\text{Value Factor} = \frac{*}{_} \text{ thickness} \times \frac{*}{_} \text{ flexural strength} \times \frac{*}{_} \text{ flexural modulus of elasticity}$$

*Insert actual measured or test result expressed as a fraction of the specified value. Maximum allowable is 1.

- (3) Payment for bypass pumping and service lateral connections, if required (other than because of damage caused by the CONTRACTOR) will be paid for under a separate item.

- b. Item E9 – Work in rear-yard easement (Items E1 to E8)

- (1) Reference Part C.7 of this section.

- c. Items E10 to E27 – Items in common

- (1) Reference Part C.7 of this section.

- 6. Group “F” – Fold and Form Lining Payment Items

- a. Items F1 to F4 – Install liner

- (1) This work will be measured and paid at the unit price per linear foot of liner as delineated by the pipe size named in the Bid Proposal. Measurement shall be made based on the horizontal projection of the centerline of the permanently installed liner between manholes, including the laying length of fittings along the run, measured to the nearest foot from the inside wall of manhole to inside wall of manhole for each section lined. Each unit price bid shall include, but not be limited to, all necessary or required resident notification, traffic control, sewer pipe cleaning and preparation of the existing sewer, including blocking or plugging incoming lines; removal, transportation and disposal of

material generated by cleaning and preparation; pre- and post-lining television surveys; chemical joint sealing if necessary; pipe lining; the cost of obtaining a water meter from the OWNER; cleaning; sample collection; grouting to eliminate infiltration at service connections and liner ends; cleanup; documentation and reporting; and all labor, materials and equipment required to provide a complete and acceptable liner installation, in accordance with the technical specifications.

- (2) Payment for bypass pumping and service lateral connections, if required (other than because of damage caused by the CONTRACTOR) will be paid for under a separate item.

b. Items F5 to F19 – Items in common

- (1) Reference Part C.7 of this section.

7. Items in Common

a. Sewer main cleaning and TV inspection

- (1) This item will be paid for at the unit price bid per foot of sewer cleaned and televised for inspection only, when a sewer repair is not performed due to change of field conditions, or as directed by the OWNER. The unit price shall provide full compensation for all work required to perform television inspection of sanitary sewer including, but not limited to, furnishing all labor, equipment and material for cleaning, flow isolation, TV inspection, and all incidentals related to sewer inspection. The products shall be acceptable to the OWNER or otherwise the CONTRACTOR shall re-televiser the sewer line to the satisfaction of the OWNER. Sewer main cleaning shall include drop connections, in accordance with the technical specifications.

- (2) Cleaning and TV inspection performed to prepare for a repair or to document a completed repair are not considered separate pay items. Costs for such cleaning and TV inspection shall be included in the contract unit cost for each particular repair.

b. Sewer lateral cleaning and TV inspection

- (1) This item will be paid for at the unit price bid per foot of sewer lateral cleaned and televised for inspection only, when a sewer repair is not performed due to change of field conditions, or as directed by the OWNER. The unit price shall provide full

compensation for all work required to perform television inspection of sanitary sewer service laterals including, but not limited to, furnishing all labor, equipment, tools and material for cleaning, flow isolation, TV inspection, and all incidentals related to sewer inspection. The products shall be acceptable to the OWNER or otherwise the CONTRACTOR shall re-televise the sewer line to the satisfaction of the OWNER, in accordance with the technical specifications.

- (2) Cleaning and TV inspection performed to prepare for a repair or to document a completed repair are not considered separate pay items. Costs for such cleaning and TV inspection shall be included in the contract unit cost for each particular repair.

c. Mechanical root or grease removal

- (1) Removal of grease or roots involving the use of special equipment will be considered special cleaning and will be measured and paid per linear foot additionally to cleaning, depending on the pipeline diameter and the type of cleaning, as shown on the Schedule of Prices. The unit price shall provide full compensation for all work required to perform such cleaning including, but not limited to, furnishing all labor, equipment and material for cleaning, flow isolation, pre- and post-cleaning TV inspection, traffic control, and all incidentals. The products shall be acceptable to the OWNER or otherwise the CONTRACTOR shall re-clean and re-televise the sewer line to the satisfaction of the OWNER, in accordance with the technical specifications.
- (2) Special cleaning not authorized in writing by the OWNER shall be considered part of the cleaning operation and shall not be considered a separate pay item.
- (3) Sewer line or manhole cleaning is not a separate bid item. The prices for all cleaning of sewers and manholes; verification of adequate cleaning by pulling double squeegees; hoses; nozzles; water; labor; materials and/or any other work required to clean the sewers to a degree acceptable for television inspection and subsequent repairs shall be included in the bid item in which the rehabilitation occurs.

d. Mechanical tuberculation/concrete removal

- (1) Removal of tuberculation in cast iron pipe, or concrete in pipe, involving the use of special equipment will be considered special

cleaning and will be measured and paid per linear foot additionally to cleaning, depending on the pipeline diameter and the type of cleaning, as shown on the Schedule of Prices. The unit price shall provide full compensation for all work required to perform such cleaning including, but not limited to, furnishing all labor, equipment and material for cleaning, flow isolation, pre- and post-cleaning TV inspection, traffic control, and all incidentals. The products shall be acceptable to the OWNER or otherwise the CONTRACTOR shall re-clean and re-televiser the sewer line to the satisfaction of the OWNER, in accordance with the technical specifications.

- (2) Special cleaning not authorized in writing by the OWNER shall be considered part of the cleaning operation and shall not be considered a separate pay item.
- (3) Sewer line or manhole cleaning is not a separate bid item. The prices for all cleaning of sewers and manholes; verification of adequate cleaning by pulling double squeegees; hoses; nozzles; water; labor; materials and/or any other work required to clean the sewers to a degree acceptable for television inspection and subsequent repairs shall be included in the bid item in which the rehabilitation occurs.

e. Protruding service connection removal by internal means

- (1) The OWNER may request that the CONTRACTOR remove protruding service connections, typically to allow completion of inspection or as a prelude to lining. The CONTRACTOR shall use non-destructive robotic techniques. The use of equipment that may damage the existing service connection will not be allowed. The CONTRACTOR shall not perform this work prior to receiving written authorization from the OWNER, in accordance with the technical specifications.
- (2) Measurement shall be per protruding service connection removed.
- (3) Payment shall be at the unit price bid, per each protruding service connection removed, provided in the Bid Proposal and shall include full compensation for accessing the site, wastewater flow control, performing the protruding service connection removal, and all else incidental thereto for which separate payment is not provided under other items in the Bid Proposal.

f. Exploratory excavation

- (1) Shall include vacuum excavation services for locating utilities 0 to 5 feet in depth below ground or pavement surface, including excavation, backfill, asphalt/concrete removal and disposal, compaction, surface restoration, primary locating services and appurtenances.
- (2) Payment will be made at the contract unit cost for each pothole including survey.
- (3) For exploratory excavations greater than 5 feet in depth, payment will be made at the contract unit cost for each vertical foot below 5 feet excavated. This item shall be paid in addition to the contract unit cost for the first 5 feet of depth.

g. Bypass pumping

- (1) These items shall provide full compensation for bypass pumping operations required for sewer and manhole repair work. The CONTRACTOR shall attempt to perform the sewer work without bypass pumping. However, if, in the opinion of the OWNER bypass pumping is necessary, it will be identified as a payment item. The pay item is a charge per day for all bypass pumping operations during a specific sewer repair, including services, regardless of the number of pumps required. Bypass Pumping shall be bid on the basis of sewer size which is bypassed, in accordance with the technical specifications.
- (2) These items shall include, but not be limited to, all necessary and required traffic control; pumps; piping; gasoline/diesel fuel; maintenance; transportation and storage; temporary bypass and service piping; labor; materials and/or any other costs associated with bypass pumping.
- (3) Plugging or blocking a sewer line shall be included in the appropriate bid item for which the flow must be stopped, and shall be considered incidental work and no additional payment shall be considered.
- (4) This item is not intended to address bypassing of force main flows where such flows discharge directly into a manhole being repaired or through a force main being repaired.

h. Cleanout installation

- (1) This item of work will be measured and paid for at the unit price per each. Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools, equipment and incidentals, to locate utilities; locate lateral; excavate; install a cleanout riser with cover and plug at the property line; backfill; compact; and restore surface in grass, asphalt, or concrete as applicable, complete in place, in accordance with the technical specifications.
 - (2) For cleanout installations greater than 5 feet in depth, payment will be made at the contract unit cost for each vertical foot below 5 feet excavated. This item shall be paid in addition to the contract unit cost for the first 5 feet of depth.
- i. Cleanout installation (open trench)
- (1) This item of work will be measured and paid for at the unit price per each. Payment of the unit price per each will provide complete compensation for furnishing materials and all labor, tools, equipment and incidentals, to install a cleanout riser with cover and plug at the property line, complete in place, beginning and ending with an open trench, in accordance with the technical specifications.
- j. Asphalt roadway replacement
- (1) The unit price bid for Asphalt Roadway Replacement shall provide full compensation for all work including, but not limited to furnishing all labor, equipment and material required for cutting, removing, protecting and replacing all existing asphalt paving and subgrade removed or damaged under this Contract; limerock base, prime coat, tack coat, asphalt, compaction, traffic markings, and maintenance of traffic. Payment will only be made if asphalt paving is encountered within the "Limits of Construction". All other replacement due to removal or damage as a result of the CONTRACTOR's operation shall be at the CONTRACTOR's expense, in accordance with the technical specifications.
 - (2) Payment for Asphalt Roadway Replacement will be made once and shall include both temporary and permanent Asphalt Roadway Replacement and will be made per square yard, based on base and asphalt thickness dimensions as required, installed and accepted.

k. Pavement overlay

- (1) Item for construction pavement repairs (per LCDOT/FDOT standards) will be paid for at the unit price bid times the number of square yards of overlay installed where directed by the OWNER, and the price bid shall provide full compensation for all work including, but not limited to, furnishing all materials, labor and equipment for a complete installation. Pavement overlay will be in addition to the asphalt concrete pavement restoration, in accordance with the technical specifications.

l. Concrete sidewalk replacement

- (1) The unit price bid for Concrete Sidewalk Replacement shall provide full compensation for all work including, but not limited to, furnishing of all labor, equipment and material required for cutting, removing, protecting and replacing all existing concrete sidewalks removed or damaged under this Contract, concrete, formwork, reinforcing, placing, finishing and curing (per LCDOT/FDOT standards). Payment will only be made if sidewalks are encountered within the "Limits of Construction" as described herein. All other replacement due to removal or damage as a result of the CONTRACTOR's operation shall be at the CONTRACTOR's expense, in accordance with the technical specifications.
- (2) Payment for concrete sidewalk will be made per square yard installed and accepted.

m. Concrete curb and gutter replacement

- (1) The unit price bid for Concrete Curb and Gutter Replacement shall provide full compensation for all work including, but not limited to furnishing all labor, equipment and material required for cutting, removing, replacing all existing concrete curbs and gutters removed or damaged under this Contract. Payment will only be made if curbs and gutters are encountered within the "Limits of Construction" as described herein. All other replacement due to removal or damage as a result of the CONTRACTOR's operation shall be at the CONTRACTOR's expense, in accordance with the technical specifications.
- (2) Payment for Concrete Curb and Gutter Replacement will be made per linear foot installed and accepted.

n. Asphalt driveway replacement

- (1) The unit price for Asphalt Driveway Replacement shall provide full compensation for all work including, but not limited to, furnishing of all labor, equipment and material required for cutting, removing, protecting and replacing all existing asphalt driveways removed or damaged under this Contract; limerock base, prime coat, tack coat, asphalt and compaction (per LCDOT/ FDOT standards). Payment will only be made if asphalt driveways are encountered within the "Limits of Construction" as described herein. All other replacement due to removal or damage as a result of the CONTRACTOR's operation shall be at the CONTRACTOR's expense, in accordance with the technical specifications.
- (2) Payment for asphalt driveway replacement will be made per square yard installed and accepted.

o. Concrete driveway replacement

- (1) The unit price for Concrete Driveway Replacement shall provide full compensation for all work including, but not limited to, furnishing of all labor, equipment and material required for cutting, removing, protecting and replacing all existing concrete driveways removed or damaged under this Contract, concrete, formwork, reinforcing, placing, finishing and curing. Payment will only be made if sidewalks are encountered within the "Limits of Construction" as described herein. All other replacement due to removal or damage as a result of the CONTRACTOR's operation shall be at the CONTRACTOR's expense, in accordance with the technical specifications.
- (2) Payment for concrete driveway replacement will be made per square yard installed and accepted.

p. Sod replacement

- (1) Sod replacement will be paid for at the unit price bid and shall provide full compensation for all work including, but not limited to, furnishing all labor, equipment and material required for replacing, planting sod removed or damaged under this Contract. Payment will only be made if sodded areas are encountered within the "Limits of Construction" as described herein. Measurement of payment shall be the number of square feet actually removed and replaced within the Limits of Construction. All other replacement due to removal or damage as a result of

the CONTRACTOR's operation shall be at the CONTRACTOR's expense, in accordance with the technical specifications.

- (2) Payment for Sod replacement will be made per square foot installed and accepted.

q. Installation in rear-yard easement

- (1) Payment shall be at the unit price bid, per easement repair performed, provided in the Bid Proposal and shall include full compensation for all additional labor, materials, equipment and incidentals required to perform work away from vehicular traveled ways, if so requested by the OWNER, in association with any other work under this contract. This item will be paid in addition to the price paid under the corresponding work item, and will only be paid when the area where work must necessarily be performed is in the easement area and presents restrictions to vehicular access from roads, alleys, driveways, or other features suitable for access by the installation vehicles. This item shall be full compensation for all additional costs associated with working in an easement area.
- (2) When the CONTRACTOR judges that this item is applicable, the CONTRACTOR shall obtain the OWNER's concurrence on such judgment in advance of performing the work.

r. Traffic control

- (1) Traffic control refers to the additional charge incurred for placing traffic control personnel or devices in areas deemed unsafe. This does not cover the placement of standard traffic cones, which is included in the unit price for trenchless pipe reconstruction and all other items under this contract. Payment is based on a unit price per each device or unit price per hour for personnel.
- (2) The CONTRACTOR shall advise the OWNER in advance in the event that traffic control beyond standard traffic cones is deemed necessary.

s. Expedited mobilization

- (1) Payment shall be at the unit price bid, per mobilization performed, provided in the Bid Proposal and shall include full compensation for all additional labor, materials, equipment and incidentals required to complete an expedited mobilization, if so

requested by the OWNER, in association with any other work under this contract. Payment shall be per mobilization performed, where CONTRACTOR shall commit to the expedited mobilization within 24 hours of the County's request and mobilize and actively initiate the repair work within 72 hours of the County's request.

- (2) The CONTRACTOR is not required to accomplish an expedited mobilization, but cannot otherwise earn the associated payment.

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SECTION 01041
PROJECT COORDINATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work Progress
- B. Private Land
- C. Work Locations
- D. Open Excavations
- E. Test Pits
- F. Maintenance of Traffic
- G. Maintenance of Flow

1.2 WORK PROGRESS

- A. Furnish personnel and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will allow the completion of the work within the time stipulated in the Bid of these Specifications. If at any time such personnel appears to the ENGINEER to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, he may order the CONTRACTOR to increase the efficiency, change the character or increase the personnel and equipment, and the CONTRACTOR shall conform to such order. Failure of the ENGINEER to give such order shall in no way relieve the CONTRACTOR of his obligations to secure the quality of the work and rate of progress.

1.3 PRIVATE LAND

- A. Do not enter or occupy private land outside of easements, except by permission of OWNER. Construction operations shall be conducted in accordance with Section 01500.

1.4 WORK LOCATIONS

- A. Existing structures and pipelines to be rehabilitated are located substantially as indicated on the drawings, but the OWNER reserves the right to make such

modifications in locations as may be found desirable. As such, the CONTRACTOR may be required to perform different or additional items where directed by the OWNER via the ENGINEER.

1.5 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The CONTRACTOR shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by the public and workmen.

1.6 TEST PITS

- A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the CONTRACTOR. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the ENGINEER. The costs for such test pits shall be borne by the CONTRACTOR.

1.7 MAINTENANCE OF TRAFFIC

- A. Maintenance of traffic shall be in accordance with Section 01570.
- B. All projects and work on highways, roads, and streets, shall have a traffic control plan, (TCP), as required by Florida Statute and Federal regulations. All work shall be executed under the established plan and Department approved procedures. The TCP is the result of considerations and investigations made in the development of a comprehensive plan for accommodating vehicular and pedestrian traffic through the construction zone.
- C. The complexity of the TCP varies with the complexity of the traffic problems associated with a project. Many situations can be covered adequately with reference to specific sections from the Manual on Uniform Traffic Control Devices (MUTCD), the Traffic Control Devices Handbook (TCDH), or Roadway and Traffic Design Standard Series 600.

1.8 MAINTENANCE OF FLOW

- A. Provide for the flow of sewers, drains, courses interrupted during the progress of the work, and shall immediately cart away and remove all offensive matter. The entire procedure of maintaining existing flow shall be fully discussed with the ENGINEER well in advance of the interruption of any flow.

PART 2 PRODUCTS

2.1 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed work shall be carefully protected from damage in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions damaged shall be reconstructed by the CONTRACTOR at his own expense.
- B. All structures shall be protected in a manner approved by the OWNER or OWNER's Authorized Representative. Should any of the floors or other parts of the structures become heaved, cracked or otherwise damaged, all such damaged portions of the work shall be completely repaired and made good by the CONTRACTOR at his own expense and to the satisfaction of the OWNER or OWNER's Authorized Representative. Special attention is directed to substructure bracing requirements, described in Section 02151. If, in the final inspection of the work, any defects, faults or omissions are found, the CONTRACTOR shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. The CONTRACTOR shall be fully responsible for the satisfactory maintenance and repair of the construction and other work undertaken herein, for at least the guarantee period described in the contract.
- C. Take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the OWNER.

PART 3 EXECUTION

3.1 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. Sequence and schedule work in a manner to preclude delays and conflicts between the work of various trades and CONTRACTORS. Each trade shall keep informed as to the work of other trades on the project and shall execute their work in a manner that will not interfere with the work of other trades.

3.2 DIAGRAMMATIC NATURE OF DRAWINGS

- A. Where layout is diagrammatic, such as pipelines, conduits, ductwork, etc., it shall be followed as closely as other work will permit. Changes from diagrams shall be made as required to conform to the construction requirements.
- B. Before running lines, carefully verify locations, depths and sizes and confirm that lines can be run as contemplated without interfering with other construction. Any deviation shall be referred to the OWNER for approval before lines are run. Minor

changes in location of the equipment, fixtures, piping, etc., from those shown on the Drawings, shall be made without extra charge if so directed by the ENGINEER before installation.

- C. Determine the locations and sizes of equipment, fixtures, conduit, ducts, openings, etc., in order that there will be no interference in the installation of the work or delay in the progress of other work. In the event that interferences develop, the ENGINEER's decision regarding relocation of work will be final.
- D. Any changes made necessary through failure to make proper arrangements to avoid interference shall not be considered as extras. Cooperate with those performing other work in preparation of interference drawings, to the extent that the location of piping, ductwork, etc., with respect to the installations of other trades shall be mutually agreed upon by those performing the work.

3.3 PROVISIONS FOR LATER INSTALLATION

- A. Where any work cannot be installed as the construction is progressing, provide for boxes, sleeves, inserts, fixtures or devices as necessary to permit installation of the omitted work during later phases of construction. Arrange for chases, holes, and other openings in the masonry, concrete or other work and provide for subsequent closure after placing equipment. Arrangement for and closure of openings shall be subject to the approval of the OWNER and all costs therefor shall be included in the contract price for the work.

3.4 COORDINATION

- A. The CONTRACTOR shall be fully responsible for the coordination of his work and the work of his employees, subcontractors, and suppliers with the OWNER, and regulatory agencies, and assure compliance with schedules.

END OF SECTION

SECTION 01090

REFERENCE STANDARDS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Abbreviations and Symbols
- B. Reference Standards
- C. Definitions

1.2 RELATED SECTIONS

- A. Information provided in this section is used where applicable in individual Specification Sections, Divisions 2 through 16.

1.3 REFERENCE ABBREVIATIONS

- A. Reference to a technical society, trade association or standards setting organization, may be made in the Specifications by abbreviations in accordance with the following list:

AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
ADC	Air Diffusion Council
AFBMA	Anti-friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	Association of Home Appliance Manufacturers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	American Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers

ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders' Hardware Manufacturers Association
BIA	Brick Institute of American
CABO	Council of American Building Officials
CAGI	Compressed Air and Gas Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CRD	U.S. Corps of Engineers Specifications
CRSI	Concrete Reinforcing Steel Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DOH	Department of Health
DOT	Department of Transportation
Fed. Spec.	Federal Specifications
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
HMI	Hoist Manufacturing Institute
HPMA	See HPVA
HPVA	Hardwood Plywood Veneer Association
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
MIL	Military Specifications
MSS	Manufacturer's Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NACM	National Association of Chain Manufacturers
NBS	National Bureau of Standards, See NIST
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NFPA	National Fluid Power Association
NIST	National Institute of Standards and Technology
NLMA	National Lumber Manufacturers Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
PCI	Prestressed Concrete Institute
PDI	Plumbing and Drainage Institute
SAE	Society of Automotive Engineers
SCPRF	Structural Clay Products Research Foundation
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPI	Society of the Plastics Industry

SSPC	Steel Structures Painting Council
STI	Steel Tank Institute
TCA	Tile Council of American
TIMA	Thermal Insulation Manufacturers' Association
UL	Underwriters' Laboratories, Inc.
USBR	U. S. Bureau of Reclamation
USBS	U. S. Bureau of Standards, See NIST

1.4 REFERENCE STANDARDS

- A. Latest Edition: Construe references to furnishing materials or testing, which conform to the standards of a particular technical society, organization, or body, to mean the latest standard, code, or specification of that body, adopted and published as of the date of bidding this Contract. Standards referred to herein are made a part of these Specifications to the extent which is indicated or intended.
- B. Precedence: The duties and responsibilities of the OWNER, CONTRACTOR or ENGINEER, or any of their consultants, agents or employees are set forth in the Contract Documents, and are not changed or altered by any provision of any referenced standard specifications, manuals or code, whether such standard manual or code is or is not specifically incorporated by reference in the Contract Documents. Any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority, to undertake responsibility contrary to the powers of the ENGINEER as set forth in the Contract Documents cannot be assigned to the ENGINEER or any of the ENGINEER's consultants, agents or employees.

1.5 DEFINITIONS

- A. In these Contract Documents the words furnish, install and provide are defined as follows:
 - 1. Furnish (Materials): to supply and deliver to the project ready for installation and in operable condition.
 - 2. Install (services or labor): to place in final position, complete, anchored, connected in operable condition.
 - 3. Provide: to furnish and install complete. Includes the supply of specified services. When neither furnish, install or provide is stated, provided is implied.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of Requirements
- B. Submittal Procedures
- C. Specific Submittal Requirements
- D. Action on Submittals
- E. Repetitive Review

1.2 DESCRIPTION OF REQUIREMENTS

- A. This section specifies procedural requirements for Shop Drawings, product data, samples, and other miscellaneous Work-related submittals.
- B. Procedures concerning items such as listing of manufacturers, suppliers, subcontractors, construction progress schedule, schedule of Shop Drawing submissions, bonds, payment applications, insurance certificates, and schedule of values are specified elsewhere.
- C. Work-Related Submittals:
 - 1. Substitution or "Or Equal" Items:
 - a. Includes material or equipment CONTRACTOR requests ENGINEER to accept, after Bids are received, as substitute for items specified or described in Specifications by using name of a proprietary item or name of particular supplier.
 - 2. Shop Drawings:
 - a. Includes technical data and drawings specially prepared for this Project, including fabrication and installation drawings, diagrams, actual performance curves, data sheets, schedules, templates, patterns, reports, instructions, design mix formulas, measurements, and similar information not in standard printed form.
 - b. Standard information prepared without specific reference to the Project is not considered a Shop Drawing.

3. Product Data:
 - a. Includes standard printed information on manufactured products, and systems that has not been specially prepared for this Project, including manufacturer's product specifications and installation instructions, catalog cuts, standard wiring diagrams, printed performance curves, mill reports, and standard color charts.
4. Samples:
 - a. Includes both fabricated and manufactured physical examples of materials, products, and units of work, partial cuts of manufactured or fabricated work, swatches showing color, texture, and pattern, and units of work to be used for independent inspection and testing.
 - b. Mock-ups are special forms of samples which are too large or otherwise inconvenient for handling in manner specified for transmittal of sample submittals.
5. Working Drawings:
 - a. When used in the Contract Documents, the term "working drawings" shall be considered to mean the CONTRACTOR'S plans for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities control systems, forming and falsework for underpinning; temporary by-pass pumping and for such other work as may be required for construction but does not become an integral part of the project.
 - b. Copies of working drawings shall be submitted to the ENGINEER at least fourteen (14) calendar days (unless otherwise specified by the ENGINEER) in advance of the required work.
 - c. Working drawings shall be signed by a registered Professional Engineer currently licensed to practice in the State of Florida and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use.
6. Miscellaneous Submittals:
 - a. Work-related submittals that do not fit in the previous categories, such as guarantees, warranties, certifications, experience records, maintenance agreements, Operating and Maintenance Manuals, workmanship bonds, survey data and reports, physical work records,

quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, and similar information, devices, and materials applicable to the Work.

1.3 SUBMITTAL PROCEDURES

A. Scheduling:

1. Submit for approval, a preliminary schedule of shop drawings and samples submittals, in duplicate, and in accordance with the General Conditions.
2. Prepare and transmit each submittal to ENGINEER sufficiently in advance of scheduled performance of related work and other applicable activities.

B. Coordination:

1. Coordinate preparation and processing of submittals with performance of work. Coordinate each submittal with other submittals and related activities such as substitution requests, testing, purchasing, fabrication, delivery, and similar activities that require sequential activity.
2. Coordinate submission of different units of interrelated work so that one submittal will not be delayed by ENGINEER's need to review a related submittal. ENGINEER may withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

C. Submittal Preparation:

1. Stamp and sign each submittal certifying to review of submittal, verification of products, field measurement, field construction criteria, coordination of information within submittal with requirements of the Work and the Contract Documents, coordination with all trades, and verification that product will fit in space provided.
2. Transmittal Form: In the transmittal form forwarding each specific submittal to the ENGINEER include the following information as a minimum.
 - a. Date of submittal and dates of previous submittals containing the same material.
 - b. Project title and number.
 - c. Submittal and transmittal number.
 - d. Contract identification.

- e. Names of:
 - (1) Contractor
 - (2) Supplier
 - (3) Manufacturer
- f. Identification of equipment and material with equipment identification numbers, model numbers, and Specification section number.
- g. Variations from Contract Documents and any limitations which may impact the Work.
- h. Drawing sheer and detail number as appropriate.

D. Resubmittal Preparation:

- 1. Comply with the requirements described in Submittal Preparation. In addition:
 - a. Identify on transmittal form that submittal is a resubmission.
 - b. Make any corrections or changes in submittals required by ENGINEER's notations on returned submittal.
 - c. Respond to ENGINEER's notations:
 - (1) On the transmittal or on a separate page attached to CONTRACTOR's resubmission transmittal, answer or acknowledge in writing all notations or questions indicated by ENGINEER on ENGINEER's transmittal form returning review submission to CONTRACTOR.
 - (2) Identify each response by question or notation number established by ENGINEER.
 - (3) If CONTRACTOR does not respond to each notation or question, resubmission will be returned without action by ENGINEER until CONTRACTOR provides a written response to all ENGINEER's notations or questions.
 - d. CONTRACTOR initiated revisions or variations:
 - (1) On transmittal form identify variations or revisions from previously reviewed submittal, other than those called for by ENGINEER.

- (2) ENGINEER's responsibility for variations or revisions is established in the General Conditions.

1.4 SPECIFIC SUBMITTAL REQUIREMENTS

- A. Specific submittals required for individual elements of work are specified in the individual Specification sections. Except as otherwise indicated in Specification sections, comply with requirements specified herein for each indicated type of submittal.
- B. Requests for Substitution or "Or Equal"
 1. Collect data for items to be submitted for review as substitution into one submittal for each item of material or equipment in accordance with the General Conditions.
 2. Submit with other scheduled submittals for the material or equipment allowing time for ENGINEER to evaluate the additional information required to be submitted.
 3. If CONTRACTOR requests to substitute for material or equipment specified but not identified in Specifications as requiring submittals, schedule substitution submittal request in Submittal schedule and submit as scheduled.
- C. Shop Drawings:
 1. Check all drawings, data and samples before submitting to the ENGINEER for review. Each and every copy of the drawings and data shall bear CONTRACTOR's stamp showing that they have been so checked. Shop drawings submitted to the ENGINEER without the CONTRACTOR's stamp will be returned to the CONTRACTOR for conformance with this requirement. All shop drawings shall be submitted through the CONTRACTOR, including those from any subcontractors.
 2. Submit newly prepared information, with graphic information at accurate scale. Indicate name of manufacturer or supplier (firm name). Show dimensions and clearly note which are based on field measurement; identify materials and products which are included in the Work; identify revisions. Indicate compliance with standards and notation of coordination requirements with other work. Highlight, encircle or otherwise indicate variations from Contract Documents or previous submittals.
 3. Include on each drawing or page:
 - a. Submittal date and revision dates.

- b. Project name, division number and descriptions.
 - c. Detailed specifications section number and page number.
 - d. Identification of equipment, product or material.
 - e. Name of CONTRACTOR and Subcontractor.
 - f. Name of Supplier and Manufacturer.
 - g. Relation to adjacent structure or material.
 - h. Field dimensions, clearly identified.
 - i. Standards or Industry Specification references.
 - j. Identification of deviations from the Contract Documents.
 - k. CONTRACTOR's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
 - l. Physical location and location relative to other connected or attached material at which the equipment or materials are to be installed.
4. Provide 8-inch by 3-inch blank space for CONTRACTOR and ENGINEER stamps.
5. Submittals:
- a. Submit 3 blue line or black line prints, or 2 reverse sepia reproducible and 1 blue or black line print. One reproducible or one print will be returned.
6. Distribution:
- a. Do not proceed with installation of materials, products or systems until copy of applicable product data showing only approved information is in possession of installer.
 - b. Maintain one set of product data (for each submittal) at Project site.
 - c. Mark 5 additional copies with the date of approval and forward to the ENGINEER for use in field and for OWNER's records.

D. Product Data:

1. Preparation:

- a. Collect required data into single submittal for each element of work or system. Where product data has been printed to include information on several similar products, some of which are not required for use on Project or are not included in submittal, mark copies to clearly show such information is not applicable.
- b. Where product data must be specially prepared for required products, materials or systems, because standard printed data are not suitable for use, submit data as a Shop Drawing and not as product data.

2. Submittal:

- a. Submittal is for information and record, and to determine that products, materials, and systems comply with Contract Documents. Submittal is final when returned by ENGINEER marked "Approved" or "Approved as Noted".
- b. Submit 3 copies.

3. Distribution:

- a. Do not proceed with installation of materials, products or systems until copy of applicable product data showing only approval information is in possession of installer.
- b. Maintain one set of product data (for each submittal) at Project site, available for reference by ENGINEER and others.
- c. Mark 5 additional copies with the date of approval and forward to the ENGINEER for use in field and for OWNER records.

E. Samples:

1. Preparation:

- a. Where possible, provide samples that are physically identical with proposed materials or products to be incorporated into the Work. Where variations in color, pattern or texture are inherent in material or product represented by sample, submit multiple units (not less than 3 units) showing approximate limits of variations.

- b. Provide full set of optional samples where ENGINEER's selection required. Prepare samples to match ENGINEER's selection where so indicated.
 - c. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards.
 - d. Submit samples for ENGINEER's visual review of general generic kind, color, pattern, texture, and for final check of coordination of these characteristics with other related elements of work.
2. Submittals:
- a. At CONTRACTOR's option, and depending upon nature of anticipated response from ENGINEER, initial submittal of samples may be either preliminary or final submittal.
 - b. A preliminary submittal, consisting of a single set of samples, is required where specifications indicate ENGINEER's selection of color, pattern, texture or similar characteristics from manufacturer's range of standard choices is necessary. Preliminary submittals will be reviewed and returned with ENGINEER's "Action" marking.
 - c. Final Submittals: Submit 3 sets of samples in final submittal, 1 set will be returned.
3. Distribution:
- a. Maintain returned final set of samples at Project site, in suitable condition and available for quality control comparisons throughout course of performing work.
 - b. Returned samples intended or permitted to be incorporated in the Work are indicated in Specification sections, and shall be in undamaged condition at time of use.
- F. Mock-ups:
- 1. Mock-ups and similar samples specified in Specification sections are recognized as special type of samples. Comply with samples submittal requirements to greatest extent possible. Process transmittal forms to provide record of activity.
- G. Miscellaneous Submittals:
- 1. Inspection and Test Reports:

- a. Classify each inspection and test report as being either "Shop Drawings" or "product data", depending on whether report is specially prepared for Project or standard publication of workmanship control testing at point of production. Process inspection and test reports accordingly.
2. Guarantees, Warranties, Maintenance Agreements, and Workmanship Bonds:
 - a. Refer to Specification sections for specific requirements. Submittal is final when returned by ENGINEER marked "Approved" or "Approved as Noted".
 - b. In addition to copies desired for CONTRACTOR's use, furnish 2 executed copies. Provide 2 additional copies where required for maintenance data.
3. Survey Data:
 - a. Refer to Specification sections for specific requirements on property surveys, building or structure condition surveys, field measurements, quantitative records of actual Work, damage surveys, photographs, and similar data required by Specification sections. Copies will not be returned.
 - (1) Survey Copies: Furnish 2 copies. Provide 2 copies of final property survey (if any).
 - (2) Condition Surveys: Furnish 2 copies.
4. Certifications:
 - a. Refer to Specification sections for specific requirement on submittal of certifications. Submit 7 copies. Certifications are submitted for review of conformance with specified requirements and information. Submittal is final when returned by ENGINEER marked "Approved".
5. Closeout Submittals:
 - a. Refer to Specification Section 01720 for specific requirements on submittal of closeout information, materials, tools, and similar items.
 - (1) Record Documents: Section 01720.

(2) Materials and Tools: Spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

(3) Operating and maintenance data.

H. Operation and Maintenance Manuals:

1. Submit Operation and Maintenance Manuals in accordance with Section 01730.

I. General Distribution:

1. Unless required elsewhere, provide distribution of submittals to subcontractors, suppliers, governing authorities, and others as necessary for proper performance of work.

1.5 ACTION OF SUBMITTALS

A. ENGINEER's Action:

1. General:

- a. Except for submittals for record and similar purposes, where action and return on submittals are required or requested, ENGINEER will review each submittal, mark with appropriate action, and return. Where submittal must be held for coordination, ENGINEER will also advise CONTRACTOR without delay.
- b. ENGINEER will stamp each submittal with uniform, self-explanatory action stamp, appropriately marked with submittal action.

B. Action Stamp:

1. Approved:

- a. Final Unrestricted Release: Where submittals are marked "Approved", Work covered by submittal may proceed PROVIDED IT COMPLIES WITH CONTRACT DOCUMENTS. Acceptance of Work will depend upon that compliance.

2. Approved As Noted:

- a. When submittals are marked "Approved as Noted", Work covered by submittal may proceed PROVIDED IT COMPLIES WITH BOTH

ENGINEER'S NOTATIONS OR CORRECTIONS ON SUBMITTAL AND WITH Contract Documents. Acceptance of Work will depend on that compliance. Re-submittal is not required.

3. Comments Attached – Confirm or Resubmit:
 - a. When submittals are marked "Examined and Returned for Correction", do not proceed with Work covered by submittal. Do not permit Work covered by submittal to be used at Project site or elsewhere where Work is in progress.
 - b. Revise submittal or prepare new submittal in accordance with ENGINEER's notations in accordance with Paragraph 1.3D of this section. Resubmit submittal without delay. Repeat if necessary to obtain different action marking.

1.6 RE-SUBMITTAL REVIEW

- A. Cost of Subsequent Reviews: Shop Drawings and Operation and Maintenance Manuals submitted for each item will be reviewed no more than twice at the OWNER's expense. All subsequent reviews will be performed at times convenient to the ENGINEER and at the CONTRACTOR's expense based on the ENGINEER's then prevailing rates including all direct and indirect costs and fees. Reimburse the OWNER for all such fees invoiced to the OWNER by the ENGINEER.
- B. Time Extension: Any need for more than one resubmission, or any other delay in ENGINEER's review of submittals, will not entitle CONTRACTOR to extension of the Contract Time.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 01310
PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Form of Schedules
- B. Content of Schedules: Submit for approval, a preliminary progress schedule in accordance with the General Conditions.
- C. Schedule Revisions
- D. Submittal Requirements

1.2 FORM OF SCHEDULES

- A. Prepare schedules in the form of a horizontal bar chart using MS Project.
 - 1. Provide separate horizontal bar for each trade or operation.
 - 2. Utilize a horizontal time scale and identify first work day of each week.
 - 3. Utilize scale and spacing to allow space for notations and future revisions.
- B. Utilize a listing format which chronologically indicates the order of start of each item of work.
- C. Identify each listing by major specification section numbers.

1.3 CONTENT OF SCHEDULES

- A. Completion Dates: Show the beginning and ending contract dates stated in documents. Schedules showing completion prior to the contract completion date will be accepted but in no event will they be considered basis for a claim for delay against the OWNER by the CONTRACTOR for the period between the early completion date and the completion date provided in the Contract Documents.

- B. Show complete sequence of construction by activity.
- C. Show dates for beginning and completion of each major element of construction and installation dates for major items of equipment. Elements shall include, but not be limited to, the following:
 - 1. Shop drawing receipt from supplier/manufacturer submitted to ENGINEER, review and return to supplier/manufacturer
 - 2. Material and equipment order, manufacturer, delivery, installation, and checkouts
 - 3. Performance tests and supervisory services activity
 - 4. Construction of various facilities
 - 5. Demolition
 - 6. Excavation, sheeting, shoring, dewatering
 - 7. Concrete placement sequence
 - 8. Piping and equipment installation
 - 9. Sewer installation
 - 10. Connection to existing sewers
 - 11. Miscellaneous concrete placement
 - 12. Subcontractor's items of work
 - 13. Backfilling, grading, seeding, sodding, landscaping, and paving
 - 14. Final cleanup
 - 15. Allowance for inclement weather
 - 16. Coordination with concurrent Work on site
- D. Show projected percentage of completion for each item as of first day of each month.
- E. The initial schedule approved by the ENGINEER and the OWNER shall become the baseline schedule. The baseline schedule shall be shown on all subsequent schedules.

1.4 SCHEDULE REVISIONS

- A. As a minimum, revise construction schedule every 30 calendar days to reflect changes in progress of Work for duration of Contract. The baseline schedule must be shown.
- B. Indicate progress of each activity at date of submittal.
- C. Show changes occurring since previous submittal of schedule.
 - 1. Major change in scope
 - 2. Activities modified since previous submittal
 - 3. Revised projections of progress and completion
 - 4. Other identifiable changes
- D. Provide a written report as needed to define:
 - 1. Problem areas, anticipated delays, and impact on schedule
 - 2. Corrective action recommended and its effect
 - 3. Effect of changes on schedules of other Contractors

1.5 SUBMITTAL REQUIREMENTS

- A. Schedule: Submit final progress schedule in accordance with the General and Supplementary Conditions.
- B. For preliminary and final submittal of construction progress schedule and subsequent revisions thereof furnish three copies to ENGINEER.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 01340

SHOP DRAWINGS, WORKING DRAWINGS, AND SAMPLES

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. The Contractor shall submit to the Engineer for review and approval, such Shop Drawings, Test Reports, and Product Data on materials and equipment (hereinafter in this Section called Data), and material samples (hereinafter in this Section called Samples) as are required for the proper control of work, including but not limited to those Shop Drawings, Data, and Samples for materials and equipment specified elsewhere in the Specifications and in the Drawings.
2. Within fourteen (14) calendar days after the Notice to Proceed, the Contractor shall submit to the Engineer a complete list of preliminary Data on items for which Shop Drawings are to be submitted. Included in this list shall be the names of all proposed manufacturers furnishing specified items. Review of this list by the Engineer shall in no way be expressed or implied relieve the Contractor from submitting complete Shop Drawings and providing materials, equipment, etc., fully in accordance with the Contract Documents. This procedure is required in order to expedite final review of Shop Drawings.
3. The Contractor is to maintain an accurate updated submittal log and will bring this log to each scheduled progress meeting with the Owner and the Engineer. This log should include the following items:
 - a. Submittal description and number assigned.
 - b. Date to Engineer.
 - c. Date returned to Contractor (from Engineer).
 - d. Status of submittal (Approved, Approved as Noted, Amend and Resubmit, and Rejected).
 - e. Date of resubmittal and return (as applicable).
 - f. Date material release (for fabrication).
 - g. Projected date of fabrication.

- h. Projected date of delivery to site.
- i. Status of O&M manuals submittal.
- j. Specification Section.
- k. Drawings sheet number.

B. Related Requirements Described Elsewhere:

- 1. Construction Progress Schedules: Section 01310.
- 2. Material and Equipment: Section 01600.
- 3. Operating and Maintenance Data: Section 01730.

1.02 CONTRACTOR'S RESPONSIBILITY

- A. It is the responsibility of the Contractor to check all drawings, data and samples prepared before submitting them to the Engineer for review. Each and every copy of the Drawings and data shall bear the Contractor's stamp showing that they have been so checked. Shop drawings submitted to the Engineer without the Contractor's stamp will be returned to the Contractor for conformance with this requirement. Shop drawings shall indicate any deviations in the submittal from requirements of the Contract Documents. If the Contractor takes exception to the specifications, the Contractor shall note the exception in the letter of transmittal to the Engineer.
- B. Determine and verify:
 - 1. Field measurements.
 - 2. Field construction criteria.
 - 3. Catalog numbers and similar data.
 - 4. Conformance with Specifications.
- C. The Contractor shall furnish the Engineer a schedule of Shop Drawing submittals fixing the respective dates for the submission of shop and working drawings, the beginning and ending of manufacture, testing, and installation of materials, supplies, and equipment. This schedule shall indicate those that are critical to the progress schedule.

- D. The Contractor shall not begin any of the work covered by a Shop Drawing, Data, or a Sample returned for correction until a revision or correction thereof has been reviewed and returned to him, by the Engineer, with approval.
- E. The Contractor shall submit to the Engineer all drawings and schedules sufficiently in advance of construction requirements to provide no less than thirty (30) calendar days for checking and appropriate action from the time the Engineer receives them.
- F. All submittals shall be accompanied with a transmittal letter prepared in duplicate containing the following information:
 - 1. Date.
 - 2. Project Title and Number.
 - 3. Contractor's name and address.
 - 4. The number of each Shop Drawings, Project Data, and Sample submitted.
 - 5. Notification of Deviations from Contract Documents.
 - a. The Contractor shall indicate in **bold type** at the top of the shop drawing submittal cover sheet if there is a deviation from the Drawings, Specifications, or referenced specifications or codes.
 - b. The Contractor shall also list any deviations from the Drawings, Specifications, or referenced specifications or codes and identify in green ink prominently on the applicable Shop Drawings.
 - 6. Submittal Log Number conforming to Specification Section Number.
- G. The Contractor shall submit seven (7) copies of descriptive or product data information and Shop Drawings to the Engineer plus the number of copies which the Contractor requires returned. All blueprint Shop Drawings shall be submitted with one (1) set of mylar reproducibles and the same number of prints as Shop Drawings, plus the number of copies which the Contractor requires returned. The Engineer will review the blueprints and return to the Contractor the set of marked-up mylar reproducibles with appropriate review comments.
- H. The Contractor shall be responsible for and bear all costs of damages which may result from the ordering of any material or from proceeding with any part of Work prior to the completion of the review by the Engineer of the necessary Shop Drawings.

- I. The Contractor shall be fully responsible for observing the need for and making any changes in the arrangement of piping, connections, wiring, manner of installation, etc., which may be required by the materials/equipment he proposes to supply both as pertains to his own work and any work affected under other parts, headings, or divisions of the Drawings and Specifications.
- J. The Contractor shall not use Shop Drawings as a means of proposing alternate items to demonstrate compliance with the Drawings and Specifications.
- K. Each submittal will bear a stamp indicating that Contractor has satisfied Contractor's obligations under the Contract Documents with respect to Contractor's review and approval of that submittal as illustrated below.

<p>(OWNER'S NAME) (PROJECT NAME) (PROJECT NUMBER)</p> <p>SHOP DRAWING NO.: _____</p> <p>SPECIFICATION SECTION: _____ DRAWING NO. _____</p> <p>WITH RESPECT TO THIS SHOP DRAWING OR SAMPLE, I HAVE DETERMINED AND VERIFIED ALL QUANTITIES, DIMENSIONS, SPECIFIED PERFORMANCE CRITERIA, INSTALLATION REQUIREMENTS, MATERIALS, CATALOG NUMBERS, AND SIMILAR DATA WITH RESPECT THERETO AND REVIEWED OR COORDINATED THIS SHOP DRAWING OR SAMPLE WITH OTHER SHOP DRAWINGS AND SAMPLES AND WITH THE REQUIREMENTS OF THE WORK AND THE CONTRACT DOCUMENTS.</p> <p>_____ NO VARIATION FROM CONTRACT DOCUMENTS</p> <p>_____ VARIATION FROM CONTRACT DOCUMENTS AS SHOWN</p> <p>(CONTRACTOR'S NAME) (CONTRACTOR'S ADDRESS)</p> <p>BY: _____ DATE: _____</p> <p>_____ AUTHORIZED SIGNATURE</p>

- L. Drawings and schedules shall be checked and coordinated with the work of all trades and sub-contractors involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval shall be returned to the Contractor for resubmission.

1.03 ENGINEER'S REVIEW OF SHOP DRAWINGS

- A. The Engineer's review of Shop Drawings, Data, and Samples as submitted by the Contractor will be to determine if the items(s) generally conforms to the information in the Contract Documents and is compatible with the design concept. The Engineer's review and exceptions, if any, will not constitute an approval of dimensions, connections, quantities, and details of the material, equipment, device, or item shown.
- B. The review of drawings and schedules will be general, and shall not be construed:
 - 1. As permitting any departure from the Contract Documents.
 - 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.
- C. If the drawings or schedules as submitted describe variations and show a departure from the Contract Documents which the Engineer finds to be in the interest of the Owner and to be 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. "Approved As Noted" - Contractor shall incorporate Engineer's comments into the submittal before release to manufacturer. The Contractor shall send a letter to the Engineer acknowledging the comments and their incorporation into the Shop Drawing.
- E. "Amend And Resubmit" - Contractor shall resubmit the Shop Drawing to the Engineer. The resubmittal shall incorporate the Engineer's comments highlighted on the Shop Drawing.
- F. "Rejected" - Contractor shall correct, revise and resubmit Shop Drawing for review by Engineer.
- G. Resubmittals will be handled in the same manner as first submittals. On resubmittals the Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, to revisions other than the corrections requested

by the Engineer on previous submissions. The Contractor shall make any corrections required by the Engineer.

- H. If the Contractor considers any correction indicated on the drawings to constitute a change to the Drawings or Specifications, the Contractor shall give written notice thereof to the Engineer.
- I. When the Shop Drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.
- J. No partial submittals will be reviewed. Submittals not deemed complete will be stamped "Rejected" and returned to the Contractor for resubmittal. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items for:
 - 1. Systems.
 - 2. Processes.
 - 3. As indicated in specific Specifications Sections.

All drawings, schematics, manufacturer's product Data, certifications, and other Shop Drawing submittals required by a system specification shall be submitted at one time as a package to facilitate interface review.

- K. Only the Engineer shall utilize the color "red" in marking Shop Drawing submittals.
- L. Shop drawing and submittal data shall be reviewed by the Engineer for each original submittal and first resubmittal; thereafter review time for subsequent resubmittals shall be charged to the Contractor and the Contractor shall reimburse the Owner for services rendered by the Engineer as specified in the Supplementary Conditions.

1.04 SHOP DRAWINGS

- A. When used in the Contract Documents, the term "Shop Drawing" shall be considered to mean Contractor's plans for materials and equipment which become an integral part of the Project. Shop Drawings shall be complete and detailed and shall consist of fabrication, erection, setting and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Catalogs cuts, catalogs, pamphlets, descriptive literature, and performance and test data shall be considered only as supportive information to required Shop Drawings as defined above. As used herein, the term "manufactured" applies to standard units usually mass-produced; and "fabricated" means

items specifically assembled or made out of selected materials to meet individual design requirements.

- B. Manufacturer's catalog sheets, brochures, diagrams, illustrations, and other standard descriptive data shall be clearly marked to identify pertinent materials, products, or models. Delete information which is not applicable to the Work by striking or cross-hatching.
- C. Each Shop Drawing shall be submitted with an 8-1/2" by 11" cover sheet which shall include a title block for the submittal. Each Shop Drawing cover sheet shall have a blank area 3-1/2 inches high by 4-1/2 inches wide, located adjacent to the title block. The title block/cover sheet shall display the following:
 - 1. Project Title and Number.
 - 2. Name of project building or structure.
 - 3. Number and title of the Shop Drawing.
 - 4. Date of Shop Drawing or revision.
 - 5. Name of Contractor and subcontractor submitting drawing.
 - 6. Supplier/manufacturer.
 - 7. Separate detailer when pertinent.
 - 8. Specification title and Section number.
 - 9. Applicable Drawing number.
- D. Data on materials and equipment shall include, without limitation, materials and equipment lists, catalog data sheets, catalog cuts, performance curves, diagrams, verification of conformance with applicable standards or codes, materials of construction, and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish, and all other pertinent Data.
- E. For all mechanical and electrical equipment furnished, the Contractor shall provide a list including the equipment name, and address, and telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.
- F. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, the Contractor shall describe such variations in his letter of transmittal. If acceptable, proper adjustment in the

Contract shall be implemented where appropriate. If the Contractor fails to describe such variations, he shall not be relieved of the responsibility for executing the Work in accordance with the Contract, even though such drawings have been reviewed.

- G. All manufacturers or equipment suppliers who propose to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five (5) installations where identical equipment has been installed and has been in operation for a period of at least two (2) years unless specified otherwise in the Specification Section applicable.

1.05 WORKING DRAWINGS

- A. When used in the Contract Documents, the term "Working Drawings" shall be considered to mean the Contractor's plan for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities, ground water control systems, forming and falsework for underpinning, and for such other work as may be required for construction but does not become an integral part of the Project.
- B. Copies of working drawings as noted in paragraph 1.05 A. above, shall be submitted to the Engineer where required by the Contract Documents or requested by the Engineer, and shall be submitted at least thirty (30) calendar days (unless otherwise specified by the Engineer) in advance of their being required for the Work.
- C. Working Drawings shall be signed by a registered Professional Engineer, currently licensed to practice in the State of Florida, and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use. Prior to commencing such work, working drawings must have been reviewed without specific exceptions by the Engineer, which review will be for general conformance and will not relieve the Contractor in any way from his responsibility with regard to the fulfillment of the terms of the Contract. All risks to new or existing work are assumed by the Contractor; the Owner and Engineer shall have no responsibility therefor.

1.06 SAMPLES

- A. The Contractor shall furnish, for the approval of the Engineer, samples required by the Contract Documents or requested by the Engineer. Samples shall be delivered to the Engineer as specified or directed. The Contractor shall prepay all shipping charges on samples. Materials or equipment for which samples are required shall not be used in the Work until approved by the Engineer.

- B. Samples shall be of sufficient size and quantity to clearly illustrate:
1. Functional characteristics of the product, with integrally related parts and attachment devices.
 2. Full range of color, texture, and pattern.
 3. A minimum of three (3) samples of each item shall be submitted.
- C. Each sample shall have a label indicating:
1. Name of Project.
 2. Name of Contractor and subcontractor.
 3. Material or equipment represented.
 4. Place of origin.
 5. Name of producer/supplier and brand (if any).
 6. Location in Project.
 7. Submittal and specification numbers.
- (Samples of finished materials shall have additional marking that will identify them under the finished schedules.)
- D. The Contractor shall prepare a transmittal letter and a description sheet for each shipment of samples. The description sheet shall contain the information required in Paragraphs 1.06B and C above. He shall enclose a copy of the letter and description sheet with the shipment and send a copy of the letter and description sheet to the Engineer. 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 any Contract requirements.
- E. 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 the Work shall match the approved Samples. Samples which failed testing or were not approved will be returned to the Contractor at his expense, if so requested at time of submission.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

SECTION 01400
QUALITY CONTROL

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Submittals
- B. Inspection Services
- C. Inspection of Materials
- D. Quality Assurance
- E. Sampling and Testing
- F. Quality Control
- G. Watertightness of Structures
- H. Hydraulic Uplift on Structures
- I. Cutting and Patching
- J. Costs of Inspection
- K. Observation of the Work
- L. Acceptance Tests
- M. Failure to Comply with Contract

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals
- B. Section 02676 – Leakage Tests

1.3 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Certificate Submittals: Furnish the ENGINEER authoritative evidence in the form of Certificates of Manufacture that the materials and equipment to be used in the Work have been manufactured and tested in conformity with the Contract

Documents. Include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

1.4 INSPECTION SERVICES

- A. OWNER's Access: At all times during the progress of the Work and until the date of final completion, afford the OWNER and ENGINEER every reasonable, safe, and proper facility for inspecting the Work at the site. The observation and inspection of any work will not relieve the CONTRACTOR of any obligations to perform proper and satisfactory work as specified. Replace work rejected due to faulty design, inferior, or defective materials, poor workmanship, improper installation, excessive wear, or nonconformity with the requirements of the Contract Documents, with satisfactory work at no additional cost to the OWNER. Replace as directed, finished or unfinished work found not to be in strict accordance with the Contract, even though such work may have been previously approved and payment made therefor.
- B. Rejection: If the OWNER, through an oversight or otherwise, has accepted materials or Work which is defective or which is contrary to the Contract Documents, such materials, not matter in what stage or condition of manufacture, delivery, or erection, may be subsequently rejected by the OWNER. The OWNER and the OWNER's Authorized Representatives have the right, at all times and places, to reject any articles or materials to be furnished hereunder which, in any respect, fail to meet the requirements of the Contract Documents, regardless of whether the defect in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. The CONTRACTOR shall promptly remove rejected articles or materials from the site of the Work after notification or rejection. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the CONTRACTOR.
- C. Inferior Work Discoveries: Failure or neglect on the part of the OWNER or the OWNER's Authorized Representatives to condemn or reject bad or inferior work or materials does not imply an acceptance of such work or materials. Neither is it to be construed as barring the OWNER or the OWNER's Authorized Representatives at any subsequent time from recovering damages or a sum of money needed to build anew all portions of the Work in which inferior work or improper materials were used.
- D. Removal for Examination: Should it be considered necessary or advisable by the OWNER or the OWNER's Authorized Representatives, at any time before final acceptance of the Work, to make examinations of portions of the Work already completed, by removing or tearing out such portions, promptly furnish all necessary facilities, labor, and material, to make such an examination. If such Work is found to be defective in any respect, defray all expenses of such examination and of satisfactory reconstruction. If, however, such work is found to

meet the requirements of the Contract, the cost of examination and restoration of the Work will be considered a change in the Work to be paid for in accordance with applicable provisions of the Contract.

- E. Operation Responsibility: Assume full responsibility for the proper operation of equipment during tests and instruction periods. Make no claim for damage which may occur to equipment prior to the time when the OWNER accepts the Work.
- F. Rejection Prior to Warranty Expiration: If at anytime prior to the expiration of any applicable warranties or guarantees, equipment is rejected by the OWNER, repay to the OWNER all sums of money received for the rejected equipment on progress certificates or otherwise on account of the Contract lump sum prices, and upon the receipt of the sum of money, OWNER will execute and deliver a bill of sale of all its rights, title, and interest in and to the rejected equipment. Do not remove the equipment from the premises of the OWNER until the OWNER obtains from other sources, equipment to take the place of that rejected. The OWNER hereby agrees to obtain other equipment within a reasonable time and the CONTRACTOR agrees that the OWNER may use the equipment furnished by the CONTRACTOR without rental or other charge until the other new equipment is obtained.

1.5 INSPECTION OF MATERIALS

- A. Premanufacture Notification: Give notice in writing to the ENGINEER sufficiently in advance of the commencement of manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. When required, notice to include a request for inspection, the date of commencement, and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, ENGINEER will arrange to have a representative present at such times during the manufacture or testing as may be necessary to inspect the materials, or will notify CONTRACTOR that the inspection will be made at a point other than the point of manufacture or testing, or that the inspection will be waived. Comply with these provisions before shipping any materials. Such inspection will not constitute a release from the responsibility for furnishing materials meeting the requirements of the Contract Documents.
- B. The CONTRACTOR shall verify all dimensions in the field and shall check field conditions continuously during construction. The CONTRACTOR shall be solely responsible for an inaccuracies built into the Work due to its failure to comply with this requirement.
- C. The CONTRACTOR shall inspect related and appurtenant Work and shall report in writing to the OWNER any conditions which prevent proper completion of the Work. Failure to report any such conditions shall constitute acceptance of all site conditions, and any required removal, repair, or replacement caused by unsuitable conditions shall be performed by the CONTRACTOR at its sole cost and expense.

- D. **Testing Standards:** Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized, applicable test codes except as may otherwise be stated herein.

1.6 QUALITY ASSURANCE

- A. **Quality:** All materials shall be new and correctly designed, and shall conform to the requirements of Section 01090, "Reference Standards" and Section 01600, "Materials". They shall be standard first-grade quality produced by expert workmen and be intended for the use for which they are offered. Materials which, in the opinion of the OWNER, are inferior or of a lower grade than indicated, specified or required will not be acceptable.
- B. **Source Limitations:** To the greatest extent possible for each unit of Work, the CONTRACTOR shall provide products, materials, or equipment of a singular generic kind from a single source.
- C. **Compatibility of Options:** Where more than one choice is available as options for CONTRACTOR's selection of a product, material, or equipment, the CONTRACTOR shall select an option which is compatible with other products and materials already selected. Compatibility is a basic general requirement of product/material selections.

1.7 SAMPLING AND TESTING

- A. Unless otherwise specified, all sampling and testing shall be in accordance with the methods prescribed in the current standards of the ASTM, as applicable to the class and nature of the article or materials considered; however, the OWNER reserves the right to use any generally-accepted system of sampling and testing which, in the opinion of the OWNER will insure the OWNER that the quality of the workmanship is in full accord with the Contract Documents.
- B. Any waiver by the OWNER of any specific testing or other quality assurance measures, whether or not such waiver is accompanied by a guarantee of substantial performance as a relief from the specified testing or other quality assurance requirements as originally specified, and whether or not such guarantee is accompanied by a performance bond to assure execution of any necessary corrective or remedial Work, shall not be construed as a waiver of any requirements of the Contract Documents.
- C. Notwithstanding the existence of such waiver, the OWNER reserves the right to make independent investigations and tests and failure of any portion of the Work to meet any of the requirements of the Contract Documents, shall be reasonable cause for the OWNER to require the removal or correction and reconstruction of any such work in accordance with the General Conditions.

- D. In addition to any other evaluation, observation or quality assurance provisions that may be specified, the OWNER shall have the right to independently select, test, and analyze, at the expense of the OWNER, additional test specimens or any or all of the materials to be used. Results of such tests and analyses shall be considered along with the tests or analyses made by the CONTRACTOR to determine compliance with the applicable specifications for the materials so tested or analyzed; provided, however, that where testing or investigation by the OWNER reveals failure to meet the requirements of the Contract Documents, all costs of such independent inspection and investigation, and all costs of removal, correction, and reconstruction or repair of any such Work shall be borne by the Contractor

1.8 QUALITY CONTROL

A. Testing

1. Field and Laboratory

- a. Provide personnel to assist the ENGINEER and/or OWNER's representative in performing the following periodic observation and associated services.
- (1) Soils: Observe and test excavations, placement and compaction of soils. Determine suitability of excavated material. Observe subgrade soils and foundations.
 - (2) Concrete: Observe forms and reinforcement; observe concrete placement; witness air entrainment tests, facilitate concrete cylinder preparation and assist with other tests performed by ENGINEER.
 - (3) Masonry: Sample and test mortar, bricks, blocks and grout; inspect brick and block samples and sample panels; inspect placement of reinforcement and grouting.
 - (4) Sewer Rehab: Observe rehabilitation of gravity sewer and test gravity sewer sections via low pressure air test.
 - (5) Manhole Repairs: Observe repairs and installations of coatings of manholes. Test manholes via vacuum test. Test coatings for holidays and adhesion.
- b. When specified in Divisions 2 through 16 of the Contract Documents, provide an independent laboratory testing facility to perform required

testing. Qualify the laboratory as having performed previous satisfactory work. Prior to use, submit to the ENGINEER for approval.

- c. Cooperate with the ENGINEER and laboratory testing representatives. Provide at least 24 hours notice prior to when specified testing is required. Provide labor and materials, and necessary facilities at the site as required by the ENGINEER and the testing laboratory.
2. Equipment: Coordinate and demonstrate test procedures as specified in the Contract Documents or as otherwise required during the formal tests.
 3. Pipeline and Other Testing: Conform to test procedures and requirements specified in the appropriate Specification Section.

B. Reports

1. Certified Test Reports: Where transcripts or certified test reports are required by the Contract Documents, meet the following requirements:
 - a. Before delivery of materials or equipment submit and obtain approval of the ENGINEER for all required transcripts, certified test reports, certified copies of the reports of all tests required in referenced specifications or specified in the Contract Documents. Perform all testing in an approved independent laboratory or the manufacturer's laboratory. Submit for approval reports of shop equipment tests within thirty days of testing. Transcripts or test reports are to be accompanied by a notarized certificate in the form of a letter from the manufacturer or supplier certifying that tested material or equipment meets the specified requirements and the same type, quality, manufacture and make as specified. The certificate shall be signed by an officer of the manufacturer or the manufacturer's plant manager.
2. Certificate of Compliance: At the option of the ENGINEER, or where not otherwise specified, submit for approval a notarized Certificate of Compliance. The Certificates may be in the form of a letter stating the following:
 - a. Manufacturer has performed all required tests
 - b. Materials to be supplied meet all test requirements
 - c. Tests were performed not more than one year prior to submittal of the certificate
 - d. Materials and equipment subjected to the tests are of the same quality, manufacture and make as those specified

- e. Identification of the materials

1.9 WATERTIGHTNESS OF STRUCTURES

- A. It is the intent of these specifications that all concrete work, sealing work around built-in items and penetrations be performed as required to ensure that groundwater and/or rainwater will not leak into any repaired collection line, service lateral, or manhole.
- B. The required watertightness shall be achieved by quality construction and proper sealing of all pipes and manhole.
- C. The CONTRACTOR shall provide at its own expense all labor, material, temporary bulkheads, pumps, water, measuring devices, etc., necessary to perform the required tests.

1.10 HYDRAULIC UPLIFT ON STRUCTURES

- A. The CONTRACTOR shall be completely responsible for any pipelines or manholes that may become buoyant during the construction operations due to the groundwater or floods and before the structure is put into operation. Should there be any possibility of buoyancy of a structure, the CONTRACTOR shall take the necessary steps to prevent its buoyancy. Damage to any structures due to floating or flooding shall be repaired or the structures replaced at the CONTRACTOR's expense.

1.11 CUTTING AND PATCHING

- A. The CONTRACTOR shall perform all cutting and patching of the Work that may be required to make its several parts come together properly and fit it to receive or be received by such other work. The CONTRACTOR shall not endanger any work of others by cutting, excavating or otherwise altering their work and shall only cut or alter work with the written consent of the OWNER and of the other contractors whose work will be affected.

1.12 COSTS OF INSPECTION

- A. OWNER's Obligation: Initial inspection and testing of materials furnished under this Contract will be performed by the OWNER or his authorized Representatives or inspection bureaus without cost to the CONTRACTOR, unless otherwise expressly specified. If subsequent testing is necessary due to failure of the initial tests or because of rejection for noncompliance, reimburse the OWNER for expenditures incurred in making such tests.

- B. CONTRACTOR's Obligation: Include in the Contract Price, the cost of all shop and field tests of equipment and other tests specifically called for in the Contract Documents.
- C. Reimbursements to OWNER:
 - 1. Materials and equipment submitted by the CONTRACTOR as the equivalent to those specifically named in the Contract may be tested by the OWNER for compliance. Reimburse the OWNER for expenditures incurred in making such tests on materials and equipment which are rejected for noncompliance.
 - 2. Reimburse OWNER for the costs of any jobsite inspection between the hours of 7:00 p.m. and 6:00 a.m.
 - 3. Reimburse OWNER for all costs associated with Witness Tests which exceed 5 Calendar Days per kind of equipment.

1.13 OBSERVATION OF THE WORK

- A. The Work shall be conducted under the general observation of the OWNER and shall be subject to observation by representatives of the OWNER acting on behalf of the OWNER to ensure strict compliance with the requirements of the Contract Documents. Such observation may include mill, plant, shop or field observation, as required. The OWNER shall be permitted access to all parts of the Work, including plants where materials are manufactured or fabricated.
- B. The presence of the OWNER or any observer, however, shall not relieve the CONTRACTOR of the responsibility for the proper execution of the Work in accordance with all requirements of the Contract Documents. Compliance is a duty of the CONTRACTOR, and said duty shall not be avoided by any act or omission on the part of the OWNER or any observer.
- C. All materials and articles furnished by the CONTRACTOR shall be subject to rigid inspection, and no materials or articles shall be used in the Work until they have been inspected and accepted by the OWNER or its representative. No Work shall be backfilled, buried, cast in concrete, hidden or otherwise covered until it has been inspected by the OWNER or its authorized representative. Any Work so covered in the absence of inspection shall be subject to uncovering. Where uninspected Work cannot be uncovered, such as in concrete cast over reinforcing steel, all such Work shall be subject to demolition, removal, and reconstruction under proper inspection and no additional payment will be allowed therefore.

1.14 ACCEPTANCE TESTS

- A. Preliminary Field Tests: As soon as conditions permit, furnish all labor and materials and services to perform preliminary field tests of all materials and equipment provided under this Contract. If the preliminary field tests disclose that any item furnished and installed under this Contract does not meet the requirements of the Contract Documents, make all changes, adjustments and replacements required prior to the acceptance tests.
- B. Final Field Tests: Upon completion of the Work and prior to final payment, subject all equipment, piping and appliances installed under this Contract to specified acceptance tests to demonstrate compliance with the Contract Documents.
 - 1. Furnish all labor, fuel, energy, water and other materials, equipment, instruments and services necessary for all acceptance tests.
 - 2. Conduct field tests in the presence of the ENGINEER and/or OWNER's representative. Perform the field tests to demonstrate that under all conditions of operation each item:
 - a. Has not been damaged by transportation or installation
 - b. Has been properly installed
 - c. Has been properly lubricated
 - d. Has no electrical or mechanical defects
 - e. Is in proper alignment
 - f. Has been properly connected
 - g. Operates as intended
- C. Failure of Tests: If the acceptance tests reveal defects in material or equipment, or if the material or equipment in any way fails to comply with the requirements of the Contract Documents, then promptly correct such deficiencies. Failure or refusal to correct the deficiencies, or if the improved materials or equipment, when tested again, fail to meet the guarantees or specified requirements, the OWNER, notwithstanding its partial payment for work and materials or equipment, may reject said materials or equipment and may order the CONTRACTOR to remove the defective work from the site at no addition to the Contract Price, and replace it with material or equipment which meets the Contract Documents.

1.15 FAILURE TO COMPLY WITH CONTRACT

- A. Unacceptable Materials: If it is ascertained by testing or inspection that the material or equipment does not comply with the Contract, do not deliver said material or equipment, or if delivered remove it promptly from the site or from the Work and replace it with acceptable material without additional cost to the OWNER. Fulfill all obligations under the terms and conditions of the Contract

even though the OWNER or the OWNER's Authorized Representatives fail to ascertain noncompliance or notify the CONTRACTOR of noncompliance.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General Requirements
- B. Temporary Utilities
- C. Temporary Construction
- D. Barricades and Enclosures
- E. Fences
- F. Security
- G. Temporary Controls
- H. Traffic Regulation

1.2 GENERAL REQUIREMENTS

- A. Plant and Facilities: Furnish, install, maintain and remove all false work, scaffolding, ladders, hoistways, braces, pumping plants, shields, trestles, roadways, sheeting, centering forms, barricades, drains, flumes, and the like, any of which may be needed in the construction of any part of the Work and which are not herein described or specified in detail. The CONTRACTOR shall accept responsibility for the safety and efficiency of such works and for any damage that may result from their failure or from their improper construction, maintenance or operation.
- B. First Aid: Maintain a readily accessible, completely equipped first aid kit at each location where work is in progress.
- C. Safety Responsibility: Accept sole responsibility for safety and security at the site. Indemnify and hold harmless the OWNER and the OWNER's Authorized Representatives, including the ENGINEER, for any safety violation, or noncompliance with governing bodies and their regulations, and for accidents, deaths, injuries, or damage at the site during occupancy or partial occupancy of the site by CONTRACTOR's forces while performing any part of the Work.

- D. Hazard Communication: Furnish two copies of the CONTRACTOR's Hazard Communication Program required under OSHA regulations before beginning on site activities. Furnish two copies of amendments to Hazard Communications Program as they are prepared.

1.3 TEMPORARY UTILITIES

- A. Water: Provide all necessary and required water without additional cost, unless otherwise specified. If necessary, provide and lay water lines to the place of use; secure all necessary permits; pay for all taps to water mains and hydrants and for all water used at the established rates.
- B. Light and Power: Provide without additional cost to the OWNER temporary lighting and power facilities required for the proper construction and inspection of the Work. If, in the ENGINEER's opinion, these facilities are inadequate, do NOT proceed with any portion of the Work affected thereby. Maintain temporary lighting and power until the Work is accepted.
- C. Heat: Provide temporary heat, whenever required, for work being performed during cold weather to prevent freezing of concrete, water pipes, and other damage to the Work or existing facilities.
- D. Sanitary Facilities: Provide sufficient fixed or portable sanitary facilities for construction personnel such that facilities shall be made available when the first employee arrives on the Work. Sanitary facilities shall be properly secluded from public observation. Prohibit and prevent nuisances on the site of the Work or on adjoining property. Discharge any employee who violates this rule. Abide by all environmental regulations or laws applicable to the Work. The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes in accordance with all laws and regulations.
- E. Connections to Existing Utilities:
 - 1. Unless otherwise specified or indicated, make all necessary connections to existing facilities including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electricity. In each case, obtain permission from the OWNER or the owning utility prior to undertaking connections. Protect facilities against deleterious substances and damage.
 - 2. Thoroughly plan in advance all connections to existing facilities. Have on hand at the time of undertaking the connections, all material, labor and required equipment. Proceed continuously to complete connections in minimum time. Arrange for the operation of valves or other appurtenances on existing utilities, under the direct supervision of the owning utility.

1.4 TEMPORARY CONSTRUCTION

- A. Bridges: Design and place suitable temporary bridges where necessary for the maintenance of vehicular and pedestrian traffic. Assume responsibility for the sufficiency and safety of all such temporary work or bridges and for any damage which may result from their failure or their improper construction, maintenance, or operation. Indemnify and save harmless the OWNER and the OWNER's representatives from all claims, suits or actions, and damages or costs of every description arising by reason of failure to comply with the above provisions.

1.5 BARRICADES AND ENCLOSURES

- A. Protection of Workmen and Public: Effect and maintain at all times during the prosecution of the Work, barriers and lights necessary for the protection of Workmen and the Public. Provide suitable barricades, lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the Work causes obstructions to normal traffic, excavation sites, or constitutes in any way a hazard to the public.
- B. Barricades and Lights:
 - 1. Protect all streets, roads, highways, excavations and other public thoroughfares which are closed to traffic; use effective barricades which display acceptable warning signs. Locate barricades at the nearest public highway or street on each side of the blocked section.
 - 2. Statutory Requirements: Install and maintain all barricades, signs, lights, and other protective devices within highway rights-of-way in strict conformity with applicable statutory requirements by the authority having jurisdiction.

1.6 FENCES

- A. Existing Fences: Obtain written permission from the OWNER prior to relocating or dismantling fences which interfere with construction operations. Reach agreements with the fence owner as to the period the fence may be left relocated or dismantled. Install adequate gates where fencing must be maintained. Keep gates closed and locked at all times when not in use.
- B. Restoration: Restore all fences to their original or better condition and to their original location on completion of the Work.

1.7 SECURITY

- A. Preservation of Property:

1. Preserve from damage, all property along the line of the Work, in the vicinity of or in any way affected by the Work, the removal or destruction of which is not called for by the Drawings. Preserve from damage, public utilities, trees, lawn areas, building monuments, fences, pipe and underground structures, and public streets. Note: Normal wear and tear of streets resulting from legitimate use by the CONTRACTOR are not considered as damage. Whenever damages occur to such property, immediately restore to its original condition. Costs for such repairs are incidental to the Contract.
2. In case of failure on the part of the CONTRACTOR to restore property or make good on damage or injury, the OWNER may, upon 24 hours written notice, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof will be deducted from any moneys due or which may become due the CONTRACTOR under this Contract. If removal, repair or replacement of public or private property is made necessary by alteration of grade or alignment authorized by the OWNER and not contemplated by the Contract Documents, the CONTRACTOR will be compensated, in accordance with the General Conditions, provided that such property has not been damaged through fault of the CONTRACTOR or the CONTRACTOR's employees.

B. Public Utility Installations and Structures:

1. Public utility installations and structures include all poles, tracks, pipes, wires, conduits, vaults, manholes, and other appurtenances and facilities, whether owned or controlled by public bodies or privately owned individuals, firms or corporations, used to serve the public with transportation, gas, electricity, telephone, storm and sanitary sewers, water, or other public or private utility services. Facilities appurtenant to public or private property which may be affected by the Work are deemed included hereunder.
2. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. Existing public utility installations and structures are indicated on the Drawings only to the extent such information was made available to, or found by, the ENGINEER in preparing the Drawings. These data are not guaranteed for completeness or accuracy, and the CONTRACTOR is responsible for making necessary investigations to become fully informed as to the character, condition, and extent of all public utility installations and structures that may be encountered and that may affect the construction operations.
3. Contact utility locating service sufficiently in advance of the start of construction to avoid damage to the utilities and delays to the completion date.

4. Remove, replace, relocate, repair, rebuild, and secure any public utility installations and structures damaged as a direct or indirect result of the Work under this Contract. Costs for such work are incidental to the Contract. Be responsible and liable for any consequential damages done to or suffered by any public utility installations or structures. Assume and accept responsibility for any injury, damage, or loss which may result from or be consequent to interference with, or interruption or discontinuance of, any public utility service.
 5. Repair or replace any water, electric, sewer, gas, or other service connection damaged during the Work with no addition to the Contract price.
 6. At all times in performance of the Work, employ proven methods and exercise reasonable care and skill to avoid unnecessary delay, injury, damage, or destruction to public utility installations and structures. Avoid unnecessary interference with, or interruption of, public utility services. Cooperate fully with the owners thereof to that end.
 7. Give written notice to the owners of all public utility installations and structures affected by proposed construction operations, sufficiently in advance of breaking ground in any area or on any unit of the Work, to obtain their permission before disrupting the lines and to allow them to take measures necessary to protect their interests. Advise the Chiefs of Police, Fire and Rescue Services of any excavation in public streets or the temporary shut-off of any water main. Provide at least 24 hours notice to all affected property owners whenever service connections are taken out of service.
- C. Miscellaneous Structures: Assume and accept responsibility for all injuries or damage to culverts, building foundations and walls, retaining walls, or other structures of any kind met with during the prosecution of the Work. Assume and accept liability for damages to public or private property resulting therefrom. Adequately protect against freezing all pipes carrying liquid.
- D. Protection of Trees and Lawn Areas:
1. Protect with boxes, trees and shrubs, except those ordered to be removed. Do not place excavated material so as to cause injury to such trees or shrubs. Replace trees or shrubs destroyed by accident or negligence of the CONTRACTOR or CONTRACTOR's employees with new stock of similar size and age, at the proper season, at no additional cost to the OWNER.
 2. Leave lawn areas in as good condition as before the start of the Work. Restore areas where sod has been removed.

1.8 TEMPORARY CONTROLS

A. During Construction:

1. Keep the site of the Work and adjacent premises free from construction materials, debris, and rubbish. Remove this material from any portion of the site if such material, debris, or rubbish constitutes a nuisance or is objectionable.
2. Remove from the site all surplus materials and temporary structures when they are no longer needed.
3. Neatly stack construction materials such as concrete forms and scaffolding when not in use. Promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.
4. Properly store volatile wastes in covered metal containers and remove from the site daily.
5. Do not bury or burn on the site or dispose of into storm drains, sanitary sewers, streams, or waterways, any waste material. Remove all wastes from the site and dispose of in a manner complying with applicable ordinances and laws.
6. The CONTRACTOR shall dispose of all rubbish and waste materials of any nature occurring at the Work site, and shall establish regular intervals of collection and disposal of such materials and waste. The CONTRACTOR shall also keep its haul roads free from dirt, rubbish, and unnecessary obstructions resulting from its operations. Disposal of all rubbish and surplus materials shall be off the site of construction in accordance with local codes and ordinances governing locations and methods of disposal, and in conformance with all applicable safety laws, and to the particular requirements of Part 1926 of the OSHA Safety and Health Standards for Construction.

B. Smoke Prevention:

1. Strictly observe all air pollution control regulations.
2. Open fires will not be allowed.

C. Noises:

1. Maintain acceptable noise levels in the vicinity of the Work. Limit noise production to acceptable levels by using special mufflers, barriers, enclosures, equipment positioning, and other approved methods.
2. Supply written notification to the OWNER sufficiently in advance of the start of any work which violates this provision. Proceed only when all applicable authorizations and variances have been obtained in writing.

D. Hours of Operation:

1. Operation of construction equipment between the hours of 7:00 p.m. and 6:00 a.m. the following day is prohibited. For operation of this equipment during this period obtain written consent from the OWNER.
2. Do not carry out nonemergency work, including equipment moves, on Sundays without prior written authorization by the OWNER.

E. Cleanup and Restoration:

1. During construction, the CONTRACTOR shall regularly remove from the site all accumulated debris and surplus materials of any kind which results from its operations. Unused equipment and tools shall be stored at the CONTRACTOR's yard or base of operations for the project
2. The CONTRACTOR shall perform the cleanup work on a regular basis and as frequently as ordered by the OWNER. Basic site restoration in a particular area shall be accomplished immediately following the installation or completion of the required facilities in that area. Furthermore, such work shall also be accomplished, when ordered by the OWNER, if partially completed facilities must remain incomplete for some time period due to unforeseen circumstances.
3. Upon failure of the CONTRACTOR to perform periodic clean-up and basic restoration of the site to the OWNER's satisfaction, the OWNER may, upon 5 days prior written notice to the CONTRACTOR, employ such labor and equipment as it deems necessary for the purpose, and all costs resulting therefrom shall be charged to the CONTRACTOR and deducted from amounts of money that it may be due.

F. Dust Control:

1. Take measures to prevent unnecessary dust. Keep exposed earth surfaces moist with water or a chemical dust suppressant. Cover materials in piles or while in transit to prevent blowing or spreading dust.

2. Adequately protect buildings or operating facilities which may be affected adversely by dust. Protect machinery, motors, instrument panels, or similar equipment by suitable dust screens. Include proper ventilation with dust screens.
3. The CONTRACTOR shall furnish all labor, equipment, and means required and shall carry out effective measures wherever and as often as necessary to prevent its operation from producing dust in amounts damaging to property, cultivated vegetation, or domestic animals, or causing a nuisance to persons living in or occupying buildings in the vicinity. The CONTRACTOR shall be responsible for any damage resulting from any dust originating from its operations. The dust abatement measures shall be continued until the CONTRACTOR is relieved of further responsibility by the OWNER. No separate payment will be allowed for dust abatement measures and all costs thereof shall be included in the CONTRACTOR's bid price

G. Temporary Drainage Provisions:

1. Provide for the drainage of stormwater and any water applied or discharged on the site in performance of the Work. Provide adequate drainage facilities to prevent damage to the Work, the site, and adjacent property.
2. Supplement existing drainage channels and conduits as necessary to carry all increased runoff from construction operations. Construct dikes as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect the OWNER's facilities and the Work, and to direct water to drainage channels or conduits. Provide ponding as necessary to prevent downstream flooding.
3. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

H. Pollution: Prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. Do not permit sanitary wastes to enter any drain or watercourse other than sanitary sewers. Do not permit sediment, debris, or other substances to enter sanitary sewers. Take reasonable measures to prevent such materials from entering any drain or watercourse.

I. Erosion Abatement and Water Pollution:

1. It is imperative that any CONTRACTOR dewatering operation should not contaminate or disturb the environment of the properties adjacent to the work. The CONTRACTOR shall, therefore, schedule and control his operations to confine all runoff water from disturbed surfaces, water from

dewatering operations that becomes contaminated with lime silt, muck and other deleterious matter, fuels, oils, bitumens, calcium chloride, chemicals and other polluting materials.

2. The CONTRACTOR shall construct temporary silting basin(s) of adequate size and provide all necessary temporary materials, operations and controls including, but not limited to, filters, coagulants, screens, and other means necessary to attain the required discharge water quality.
 3. The CONTRACTOR shall be responsible for providing, operating and maintaining materials and equipment used for conveying the clear water to the point of discharge. All pollution prevention procedures, materials, equipment and related items shall be operated and maintained until such time as the dewatering operation is discontinued. Upon the removal of the materials, equipment and related items, the CONTRACTOR shall restore the area to the condition prior to its commencing work.
- J. Chemicals: All chemicals used during project construction or furnished for project operation, whether defoliant, soil sterilant, herbicide, pesticide, disinfectant, polymer, paint, fuel, solvent or reactant of other classification, shall show approval of either the U.S. Environmental Protection Agency or the U.S. Department of Agriculture. The handling, storage, use and disposal of all such chemicals and disposal of residues shall be in strict accordance with all applicable rules and regulations of Federal, State and local jurisdictional agencies and the printed instructions of the manufacturer and all regulatory requirements. Copies of antidote literature shall be kept at the storage site and at the CONTRACTOR's job site office. A supply of antidotes shall be kept at the CONTRACTOR's office.
- K. Adverse Weather:
1. During adverse weather, and against the possibility thereof, the CONTRACTOR shall take all necessary precautions so that the work may be properly done and satisfactory in all respects. When required, protection shall be provided by use of tarpaulins, wood and building paper shelters, or other acceptable means. The CONTRACTOR shall be responsible for all changes caused by adverse weather.
 2. The OWNER may suspend construction operations at any time when, in his judgment, the conditions are unsuitable or the proper precautions are not being taken, whatever the weather conditions may be, in any season.
 3. During such periods of time as are designated by the United States Weather Bureau as being a hurricane alert, watch or warning, the CONTRACTOR shall perform all precautions as necessary to safeguard the work and property, including the removal of all small equipment and materials from the

site, lashing all other equipment and materials to each other and to rigid construction, and any other safety measures.

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1.9 TRAFFIC REGULATION

- A. Parking: Provide and maintain suitable parking areas for the use of all construction workers and others performing work or furnishing services in connection with the Contract, to avoid any need for parking personal vehicles where they may interfere with public traffic or construction activities.

- B. Access: Conduct Work to interfere as little as possible with public travel, whether vehicular or pedestrian. Provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, give reasonable notice to owners of private drives before interfering with them. Such maintenance of traffic will not be required when the CONTRACTOR has obtained permission from the owner or tenant of private property, or from the authority having jurisdiction over the public property involved, to obstruct traffic at the designated point.

PART 2 PRODUCTS

Not Used

PART 2 EXECUTION

Not Used

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 01530

PROTECTION OF EXISTING FACILITIES

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. The Requirement
- B. Right-of-Way
- C. Protection of Street or Roadway Markers
- D. Restoration of Facilities
- E. Existing Utilities and Improvements
- F. Trees within Street Right-of-Way and Project Limits
- G. Notification by the Contractor

1.2 THE REQUIREMENT

- A. The CONTRACTOR shall protect all existing utilities and improvements not designated for removal and shall restore damaged or temporarily relocated utilities and improvements to a condition equal to or better than they were prior to such damage or temporary relocation, all in accordance with requirements of the Contract Documents.
- B. The CONTRACTOR shall verify the exact locations and depths of all utilities shown and the CONTRACTOR shall make exploratory excavations of all utilities that may interfere with the Work. All such exploratory excavations shall be performed as soon as practicable after award of Contract and, in any event, a sufficient time in advance of construction to avoid possible delays to the CONTRACTOR's Work. When such exploratory excavations show the utility location as shown to be in error, the CONTRACTOR shall so notify the OWNER.
- C. The number of exploratory excavations required shall be that number which is sufficient to determine the alignment and grade of the utility.

1.3 RIGHTS-OF-WAY

- A. The CONTRACTOR shall not do any Work that would affect any oil, gas, sewer, or water pipeline; any telephone, telegraph, or electric transmission line; any fence; or any other structure, nor shall the CONTRACTOR enter upon any rights-of-way involved until notified that the OWNER has secured authority therefore from the proper party. After authority has been obtained, the CONTRACTOR shall give said party due notice of its intention to begin Work, and shall give said party convenient access and every opportunity for removing, shoring, supporting, or otherwise protecting such pipeline, transmission line, ditch, fence, or structure, and for replacing same. When two or more contracts are being executed at one time on the same or adjacent land in such manner that Work on one contract may interfere with that on another, the OWNER shall determine the sequence and order of the Work. When the territory of one contract is the necessary or convenient means of access for the execution of another contract, such privilege of access or any other reasonable privilege may be granted by the OWNER to the CONTRACTOR so desiring, to the extent, amount, in the manner, and at the times permitted. No such decision as to the method or time of conducting the Work or the use of territory shall be made the basis of any claim for delay or damage.

1.4 PROTECTION OF STREET OR ROADWAY MARKERS

- A. The CONTRACTOR shall not destroy, remove, or otherwise disturb any existing survey markers or other existing street or roadway markers without proper authorization. No pavement breaking or excavation shall be started until all survey or other permanent marker points that will be disturbed by the construction operations have been properly referenced for easy and accurate restoration. It shall be the CONTRACTOR's responsibility to notify the proper representatives of the OWNER of the time and location that Work will be done. Such notification shall be sufficiently in advance of construction so that there will be no delay due to waiting for survey points to be satisfactorily referenced for restoration. All survey markers or points disturbed by the CONTRACTOR without proper authorization by the OWNER, will be accurately restored by the Owner at the CONTRACTOR's expense after all street or roadway resurfacing has been completed.

1.5 RESTORATION OF FACILITIES

- A. General: All paved areas including asphaltic concrete berms cut or damaged during construction shall be replaced with similar materials and of equal thickness to match the existing adjacent undisturbed areas, except where specific resurfacing requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit. All temporary and permanent pavement shall conform to the requirements of the affected pavement owner. All pavements which are subject to partial removal shall be

neatly saw cut in straight lines. Within five working days of the pipe installation, temporary restoration shall be completed.

- B. Temporary Restoration: Temporary restoration includes repair to all driveways, sidewalks and roadways. They shall be swept clean and be maintained free of dirt and dust. All areas disturbed by the construction activities shall be restored to proper grade, cleaned up, including the removal of debris, trash, and deleterious materials. All construction materials, supplies, or equipment, including piles of debris shall be removed from the area. All temporarily restored areas shall be maintained by the CONTRACTOR. These areas shall be kept clean and neat, free of dust and dirt, until final restoration operations are completed. The CONTRACTOR is responsible to utilize dust abatement operations in the temporarily restored areas as required, to the satisfaction of the OWNER.
- C. Temporary Resurfacing: Wherever required by the public authorities having jurisdiction, the CONTRACTOR shall place temporary surfacing promptly after backfilling and shall maintain such surfacing for the period of time fixed by said authorities before proceeding with the final restoration of improvements.
- D. Permanent Resurfacing: In order to obtain a satisfactory junction with adjacent surfaces, the CONTRACTOR shall saw cut back and trim the edge so as to provide a clean, sound, vertical joint before permanent replacement of an excavated or damaged portion of pavement. Damaged edges of pavement along excavations and elsewhere shall be trimmed back by saw cutting in straight lines. All pavement restoration and other facilities restoration shall be constructed to finish grades compatible with adjacent undisturbed pavement, unless otherwise directed by the OWNER.
- E. Temporary Restoration of Sidewalks or Private Driveways: Wherever sidewalks or private driveways have been removed for purposes of construction, the CONTRACTOR shall place suitable temporary sidewalks or driveways promptly after backfilling and shall maintain them in satisfactory condition for the period of time fixed by the authorities having jurisdiction over the affected portions before proceeding with the final restoration or, if no such period of times is so fixed, the CONTRACTOR shall maintain said temporary sidewalks or driveways until the final restoration thereof has been made.
- F. Final Restoration: Final restoration shall include the completion of all required pavement replacement of roadways, driveways, curbs, gutters, sidewalks and other existing improvements disturbed by the construction: final grading, placement of sod, installation or replacement of any trees or shrubs, repair of irrigation systems, pavement marking, etc., all complete and finished, acceptable to the OWNER.

1.6 EXISTING UTILITIES AND IMPROVEMENTS

- A. General: The CONTRACTOR shall protect all underground utilities and other improvements which may be impaired during construction operations. It shall be the CONTRACTOR's responsibility to ascertain the actual location of all existing utilities and other improvements that will be encountered in its construction operations, and to see that such utilities or other improvements are adequately protected from damage due to such operations. The CONTRACTOR shall take all possible precautions for the protection of unforeseen utility lines to provide for uninterrupted service and to provide such special protection as may be necessary.
- B. Utilities to be Moved: In case it shall be necessary to move the property of any public utility or franchise holder, such utility company or franchise holder will, upon request of the CONTRACTOR, be notified by the OWNER to move such property within a specified reasonable time. When utility lines that are to be removed are encountered within the area of operations, the CONTRACTOR shall notify the OWNER a sufficient time in advance for the necessary measures to be taken to prevent interruption of service.
- C. Where the proper completion of the Work requires the temporary or permanent removal and/or relocation of an existing utility or other improvement which is shown, the CONTRACTOR shall remove and temporarily replace or relocate such utility or improvement in a manner satisfactory to the OWNER and the OWNER of the facility. In all cases of such temporary removal or relocation, restoration to former location shall be accomplished by the CONTRACTOR in a manner that will restore or replace the utility or improvement as nearly as possible to its former locations and to as good or better condition than found prior to removal.
- D. OWNER's Right of Access: The right is reserved to the OWNER and to the owners of public utilities and franchises to enter at any time upon any public street, alley, right-of-way, or easement for the purpose of making changes in their property made necessary by the Work of this Contract.
- E. Underground Utilities Shown or Indicated: Existing utility lines that are shown or the locations of which are made known to the CONTRACTOR prior to excavation and that are to be retained, and all utility lines that are constructed during excavation operations shall be protected from damage during excavation and backfilling and, if damaged, shall be immediately repaired by the CONTRACTOR.
- F. Underground Utilities Not Shown or Indicated: In the event that the CONTRACTOR damages any existing utility lines that are not shown or the

locations of which are not made known to the CONTRACTOR prior to excavation, a written report thereof shall be made immediately to the OWNER. If directed by the OWNER, repairs shall be made by the CONTRACTOR under the provisions for changes and extra Work contained in the General Conditions.

- G. All costs of locating, repairing damage not due to failure of the CONTRACTOR to exercise reasonable care, and removing or relocating such utility facilities not shown in the Contract Documents with reasonable accuracy, and for equipment on the project which was actually working on that portion of the Work which was interrupted or idled by removal or relocation of such utility facilities, and which was necessarily idled during such Work will be paid for as extra Work in accordance with the provisions of the General Conditions. Compensation shall not include CONTRACTOR's costs for the coordination of his activities with the utility company affected. CONTRACTOR shall schedule his work in such a manner that he is not delayed by the utilities companies relocating or supporting their facilities. No compensation will be paid the CONTRACTOR for any loss of time or delay.
- H. Approval of Repairs: All repairs to a damaged improvement are subject to inspection and approval by an authorized representative of the improvement owner before being concealed by backfill or other Work.
- I. Maintaining in Service: All oil and gasoline pipelines, power, and telephone or other communication cable ducts, gas and water mains, irrigation lines, sewer lines, storm drain lines, poles, and overhead power and communication wires and cables encountered along the line of the Work shall remain continuously in service during all the operations under the Contract, unless other arrangements satisfactory to the OWNER are made with the owner of said pipelines, duct, main, irrigation line, sewer, storm drain, pole, or wire or cable. The CONTRACTOR shall be responsible for and shall repair all damage due to its operations, and the provisions of this Section shall not be abated even in the event such damage occurs after backfilling or is not discovered until after completion of the backfilling.
- J. The CONTRACTOR shall be solely and directly responsible to the OWNER and operators of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions or claims of any character brought because of any injuries or damage which may result from the construction operations under this Contract.
- K. Neither the OWNER nor its officers or agents shall be responsible to the CONTRACTOR for damages as a result of the CONTRACTOR's failure to protect utilities encountered in the work.

- L. In the event of interruption to domestic water, sewer, storm drain or other utility services as a result of accidental breakage due to construction operations, promptly notify the proper authority. Cooperate with said authority in restoration of service as promptly as possible and bear all costs of repair. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval is granted.

1.7 TREES WITHIN STREET RIGHTS-OF-WAY AND PROJECT LIMITS

- A. General: The CONTRACTOR shall exercise all necessary precautions so as not to damage or destroy any trees or shrubs, including those lying within street rights-of-way and project limits, and shall not trim, relocate or remove any trees unless such trees have been approved for trimming or removal by the jurisdictional agency or OWNER. All existing trees and shrubs which are damaged during construction shall be trimmed or replaced by the CONTRACTOR or a certified tree company under permit from the jurisdictional agency or OWNER and to the satisfaction of said agency and/or the OWNER.
- B. Replacement: The CONTRACTOR shall immediately notify the jurisdictional agency and/or the OWNER if any tree is damaged by the CONTRACTOR's operations. If, in the opinion of said agency or the OWNER, the damage is such that replacement is necessary, the CONTRACTOR shall replace the tree at his own expense. The tree shall be of a like size and variety as the tree damaged, or, if of a smaller size, the CONTRACTOR shall pay to the OWNER of said tree compensatory payment acceptable to the tree owner, subject to the approval of the jurisdictional agency or OWNER.

1.8 NOTIFICATION BY THE CONTRACTOR

- A. Prior to any excavation in the vicinity of any existing underground facilities, including all water, sewer, storm drain, gas, petroleum products, or other pipelines; all buried electric power, communications, or television cables; all traffic signal and street lighting facilities; and all roadway and state highway rights-of-way the CONTRACTOR shall notify the respective authorities representing the owners or agencies responsible for such facilities not less than three days nor more than seven days prior to excavation, so that a representative of said owners or agencies can be present during such Work if they so desire. The CONTRACTOR shall also notify Sunshine State One-Call of Florida, Inc. at 1-800-432-4770 at least two days, but no more than fourteen days prior to such excavation.
- B. The CONTRACTOR shall prepare a written notice to property owners adjacent to the project work site notifying them of the schedule of work affecting them and anticipated inconveniences they may expect. The notice shall meet the approval

of the OWNER and be delivered to property owners at least 72 hours prior to construction adjacent to their property.

- END OF SECTION -

SECTION 01550

SITE ACCESS AND STORAGE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Site Access
- B. Temporary Crossings
- C. Storage

1.2 SITE ACCESS

- A. The CONTRACTOR shall make its own investigation of the condition of available public and private roads and of clearances, restrictions, bridge load limits, and other limitations affecting transportation and ingress and egress to the site of the Work. It shall be the CONTRACTOR's responsibility to construct and maintain any haul roads required for its construction operations.

1.3 TEMPORARY CROSSINGS

- A. Street Use: Nothing herein shall be construed to entitle the CONTRACTOR to the exclusive use of any public street, alleyway, or parking area during the performance of the Work hereunder, and he shall so conduct his operations as not to interfere unnecessarily with the authorized work of utility companies or other agencies in such streets, alleys, ways, or parking areas. No street shall be closed to the public without first obtaining permission of the OWNER and proper governmental authority. Where excavation is being performed in primary streets or highways, one lane in each direction shall be kept open to traffic at all times unless otherwise provided or shown. Toe boards shall be provided to retain excavated material if required by the OWNER or the agency having jurisdiction over the street or highway. Fire hydrants on or adjacent to the Work shall be kept accessible to fire-fighting equipment at all times. Temporary provisions shall be made by the CONTRACTOR to assure the use of sidewalks and the proper functioning of all gutters, sewer inlets, and other drainage facilities.
- B. Traffic Control: For the protection of traffic in public or private streets and ways, the CONTRACTOR shall provide, place, and maintain all necessary barricades, traffic cones, warning signs, lights, and other safety devices in accordance with the requirements of the "Manual of Uniform Traffic Control Devices, Part VI - Traffic Controls for Street and Highway Construction and Maintenance

Operations," published by U.S. Department of transportation, Federal Highway Administration (ANSI D6.1).

- C. The CONTRACTOR shall take all necessary precautions for the protection of the Work and the safety of the public. All barricades and obstructions shall be illuminated at night, and all lights shall be kept burning from sunset until sunrise. The CONTRACTOR shall station such guards or flaggers and shall conform to such special safety regulations relating to traffic control as may be required by the public authorities within their respective jurisdictions. All signs, signals, and barricades shall conform to the requirements of Subpart G, Part 1926, of the OSHA Safety and Health Standards for Construction.
- D. The CONTRACTOR shall remove traffic control devices when no longer needed, repair all damage caused by installation of the devices, and shall remove post settings and backfill the resulting holes to match grade.
- E. Temporary Street Closure: If closure of any street is required during construction, a formal application for a street closure shall be made to the authority having jurisdiction at least 30 days prior to the required street closure in order to determine necessary sign and detour requirements.
- F. Temporary Driveway Closure: The CONTRACTOR shall notify the OWNER or occupant (if not owner-occupied) of the closure of the driveways to be closed more than one eight-hour work day, at least three working days prior to the closure. The CONTRACTOR shall minimize the inconvenience and minimize the time period that the driveways will be closed. The CONTRACTOR shall fully explain to the owner/occupant how long the work will take and when closure is to start.

1.4 STORAGE

- A. The CONTRACTOR shall store his equipment and materials at the CONTRACTOR's base of operations in accordance with the manufacturer's recommendations and as indicated by the OWNER. No storage facility is provided by the OWNER.
- B. Responsibility for protection and safekeeping of equipment and materials will be solely that of the CONTRACTOR, and no claim shall be made against the OWNER by reason of any act of an employee or trespasser. Should an occasion arise necessitating access to an area occupied by stored equipment and/or materials, the CONTRACTOR shall immediately move them.
- C. Upon completion of the Contract, the CONTRACTOR shall remove from the storage areas all of their equipment, temporary fencing, surplus materials, rubbish, etc., and restore the area to its original or better conditions.

- D. The CONTRACTOR's storage shall be limited to on-site storage only. Additional off-site storage of materials, if required, shall be arranged for by the CONTRACTOR at no additional cost to the OWNER and a copy of an agreement for use of other property shall be furnished to the OWNER.

- END OF SECTION -

SECTION 01570

TRAFFIC REGULATION

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. General Requirements
- B. Traffic Control

1.2 RELATED SECTIONS

- A. Section 01041 – Project Coordination
- B. Section 01500 – Construction Facilities and Temporary Controls

1.3 GENERAL REQUIREMENTS

- A. The CONTRACTOR shall be responsible for providing safe and expeditious movement of traffic through construction zones. A construction zone is defined as the immediate areas of actual construction and all abutting areas which are used by the CONTRACTOR and which interfere with the driving or walking public.
- B. Remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.
- C. The requirements specified herein are in addition to the plan for Maintenance of Traffic as specified in Section 01500.

1.4 TRAFFIC CONTROL

- A. CONTRACTOR shall obey all traffic laws and comply with all the requirements, rules and regulations of the Florida State Department of Transportation, the County, and other local authorities having jurisdiction, to maintain adequate warning signs, lights, barriers, etc., for the protection of traffic on public roadways.
- B. The CONTRACTOR shall maintain traffic and protect the public from all damage to persons and property within the Contract Limits, in accordance with the Contract Documents and all applicable state, county and local regulation. The CONTRACTOR shall conduct operations so as to maintain and protect access, for vehicular and pedestrian traffic, to and from all properties and business establishments adjoining or adjacent to those streets affected by construction

operations, and to subject the public to a minimum of delay and inconvenience. The necessary precautions shall include, but not be limited to, such items as proper construction warning signs, signals, lighting devices, marking, barricades, channelization, and hand signaling devices. Danger lights shall be provided as required. Watchmen and flagmen shall be provided as may be necessary for the protection of traffic. The CONTRACTOR shall be responsible for installation and maintenance of all devices and requirements for the duration of the Construction period.

- C. The CONTRACTOR shall provide at least 72 hours notification to the State or County Department of Transportation of the necessity to close any portion of a roadway carrying vehicles or pedestrians so that the final approval of such closings can be obtained at least 48 hours in advanced. At no time will more than one (1) lane of roadway be closed to vehicles and pedestrians. With any such closings adequate provision shall be made for the safe expeditious movement of each.
- D. Maintenance of Traffic Plans (M.O.T.): When required for specific repairs, the CONTRACTOR shall immediately prepare and submit Maintenance of Traffic (M.O.T.) Plans for approval by authorities having jurisdiction. The traffic maintenance plan must meet the requirements of such authorities. Said M.O.T. Plans shall be in written form with sketches or drawings as necessary and shall comply with the State of Florida Department of Transportation standards for M.O.T. in construction areas. The Plans shall be submitted as soon as possible and not later than two weeks prior to any applicable construction work. A copy of the approval shall be provided to the OWNER.
- E. The CONTRACTOR shall maintain one copy of the approved M.O.T. plan at the construction site for inspection. The OWNER reserves the right to observe the M.O.T. plan in use and to make any changes as field conditions warrant. Any changes shall supersede the plan and be done at the CONTRACTOR's expense.
- F. The CONTRACTOR shall also be responsible for notifying Police, Fire, and other Emergency Departments whenever construction is within roadways and of the alternate routes. Monthly status reports shall be provided to these Departments, as a minimum.
- G. The CONTRACTOR shall be responsible for removal, relocation, or replacement of any traffic control device in the construction area which exists as part of the normal pre-construction traffic control scheme. Any such actions shall be performed by the CONTRACTOR under the supervision, and in accordance with the Specifications, of the Owner, unless otherwise specified.

- H. The CONTRACTOR and his personnel are cautioned against parking vehicles in the business zones for any extended period of time. If necessary, the CONTRACTOR shall obtain offsite parking areas for his personnel.
- I. All dirt spilled from the CONTRACTOR's trucks on existing pavements shall be removed by the CONTRACTOR whenever in the opinion of the OWNER the accumulation is sufficient to cause the formation of mud, dust, interference with traffic or create a traffic hazard.
- J. The CONTRACTOR shall comply with all traffic regulations and perform maintenance of traffic as part of his site operation. No separate payment item shall be made.
- K. The CONTRACTOR shall immediately notify the Owner of any vehicular or pedestrian safety or efficiency problems incurred as a result of the construction of the project.
- L. The CONTRACTOR shall be responsible for notifying all residents of any road construction and limited access at least 72 hours in advance.

PART 2 PRODUCTS

NOT USED.

PART 3 EXECUTION

NOT USED.

END OF SECTION

SECTION 01600

MATERIALS & EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. The Requirement
- B. Quality Assurance
- C. Description
- D. Substitutions
- E. Manufacturer's Written Instructions
- F. Product Transportation and Handling
- G. Storage, Protection and Maintenance
- H. Fasteners
- I. Salvaged and Excavated Materials
- J. Manufacturer's Field Quality Control Services
- K. Post Startup Services
- L. Special Tools and Lubricating Equipment
- M. Lubrication

1.2 THE REQUIREMENT

- A. The word "Products", as used herein, is defined to include purchased items for incorporation into the Work, regardless of whether specifically purchased for the project or taken from CONTRACTOR's stock of previously purchased products. The word "Materials," is defined as products which must be substantially cut, shaped, worked, mixed, finished, refined, or otherwise fabricated, processed, installed, or applied to form units of Work. Definitions in this paragraph are not intended to negate the meaning of other terms used in Contract Documents, including "specialties", "systems", "structure", "finishes", "accessories", "furnishings", "special construction", and similar terms, which are self-explanatory and have recognized meanings in the construction industry.

- B. All equipment, materials, instruments or devices incorporated in this project shall be new and unused, unless indicated otherwise in the Contract Documents.

1.3 QUALITY ASSURANCE

- A. All materials and equipment shall conform to Section 01400, "Quality Control".

1.4 DESCRIPTION

- A. Proposed Manufacturers List: Within 15 calendar days of the date of the Notice to Proceed, submit to the OWNER a list of the names of proposed manufacturers, material men, suppliers and subcontractors, obtain approval of this list by OWNER prior to submission of any working drawings. Upon request submit evidence to OWNER that each proposed manufacturer has manufactured a similar product to the one specified and that it has previously been used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.

- B. Furnish and install Material and Equipment which meets the following:

- a. Conforms to applicable specifications and standards.
- b. Complies with size, make, type, and quality specified or as specifically approved, in writing, by OWNER or OWNER's Authorized Representatives.
- c. Will fit into the space provided with sufficient room for operation and maintenance access and for properly connecting piping, ducts and services, as applicable. Make the clear spaces that will be available for operation and maintenance access and connections equal to or greater than those shown and meeting all the manufacturers' requirements. Make all provisions for installing equipment furnished at no increase in Contract Price.
- d. Manufactured and fabricated in accordance with the following:
 - i. Design, fabricate, and assemble in accordance with best engineering and shop practices.
 - ii. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - iii. Provide two or more items of same kind identical, by same manufacturer.
 - iv. Provide materials and equipment suitable for service conditions.

- v. Adhere to equipment capabilities, sizes, and dimensions shown or specified unless variations are specifically approved, in writing, in accordance with the Contract Documents.
 - vi. Adapt equipment to best economy in power consumption and maintenance. Proportion parts and components for stresses that may occur during continuous or intermittent operation, and for any additional stresses that may occur during fabrication or installation.
 - vii. Working parts are readily accessible for inspection and repair, easily duplicated and replaced.
- e. Use material or equipment only for the purpose for which it is designed or specified.

1.5 SUBSTITUTIONS

A. Substitutions:

- a. CONTRACTOR's requests for changes in equipment and materials from those required by the Contract Documents are considered requests for substitutions and are subject to CONTRACTOR's representations and review provisions of the Contract Documents when one of following conditions are satisfied:
 - i. Where request is directly related to an "or equal" clause or other language of same effect in Specifications.
 - ii. Where required equipment or material cannot be provided within Contract Time, but not as result of CONTRACTOR's failure to pursue Work promptly or to coordinate various activities properly.
 - iii. Where required equipment or material cannot be provided in manner compatible with other materials of Work, or cannot be properly coordinated therewith.
- b. CONTRACTOR'S Options:
 - i. Where more than one choice is available as options for CONTRACTOR's selection of equipment or material, select option compatible with other equipment and materials already selected (which may have been from among options for other equipment and materials).

- ii. Where compliance with specified standard, code or regulation is required, select from among products which comply with requirements of those standards, codes, and regulations.
- iii. "Or Equal": For equipment or materials specified by naming one or more equipment manufacturer and "or equal", submit request for substitution for any equipment or manufacturer not specifically named.

B. Conditions Which are Not Substitution:

- a. Requirements for substitutions do not apply to CONTRACTOR options on materials and equipment provided for in the Specifications.
- b. Revisions to Contract Documents, where requested by OWNER or OWNER, are "changes" not "substitutions".
- c. CONTRACTOR's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute substitutions and do not constitute basis for a Change Order, except as provided for in Contract Documents.

1.6 MANUFACTURER'S WRITTEN INSTRUCTIONS

- A. Instruction Distribution: When the Contract Documents require that installation, storage, maintenance and handling of equipment and materials comply with manufacturer's written instruction's, obtain and distribute printed copies of such instructions to parties involved in installation, including six copies to ENGINEER.
 - a. Maintain one set of complete instructions at jobsite during storage and installation, and until completion of work.
- B. Manufacturer's Requirements: Store, maintain, handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's written instructions and in conformity with Specifications.
 - a. Should job conditions or specified requirements conflict with manufacturer's instructions, consult ENGINEER for further instructions.
 - b. Do not proceed with work without written instructions.
- C. Performance Procedures: Perform work in accordance with manufacturer's written instructions. Do not omit preparatory steps or installation procedures, unless specifically modified or exempted by Contract Documents.

1.7 PRODUCT TRANSPORTATION AND HANDLING

- A. The CONTRACTOR shall deliver, handle, and store products in accordance with supplier's written recommendations and as directed by the OWNER, and by methods and means which will prevent damage, deterioration, and loss including theft. Delivery schedules shall be controlled to minimize long-term storage of products at site and overcrowding of construction spaces. In particular, the CONTRACTOR shall provide delivery/installation coordination to ensure minimum holding or storage times for products recognized to be flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other sources of loss.
- B. Equipment and materials to be incorporated in the Work shall be delivered sufficiently in advance of their installation and use to prevent delay in the execution of the Work, and they shall be delivered as nearly as feasible in the order required for executing the Work.
- C. The CONTRACTOR shall protect all equipment and materials from deterioration and damage. The equipment and materials shall be handled and stored by the manufacturer, fabricator supplier and CONTRACTOR before, during, and after shipment to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, damage or theft of any kind whatsoever. Any equipment exhibiting any of the above shall be removed and replaced at the CONTRACTOR's expense for both labor and materials.
- D. Products shall be transported by methods to avoid product damage and shall be delivered in undamaged condition in supplier's unopened containers or packaging, dry.
- E. The CONTRACTOR shall provide equipment and personnel to handle products and materials by methods to prevent soiling and damage.
- F. The CONTRACTOR shall provide additional protection during handling to prevent marring and otherwise damaging products, packaging, and surrounding surfaces.

1.8 STORAGE, PROTECTION, AND MAINTENANCE

- A. General: Products shall be stored in accordance with supplier's written instructions, with seals and labels intact and legible. Sensitive products shall be stored in weather-tight enclosures and temperature and humidity ranges shall be maintained within tolerances required by supplier's written instructions.
- B. For exterior storage of fabricated products, they shall be placed on sloped supports above ground. Products subject to deterioration shall be covered with impervious sheet covering; ventilation shall be provided to avoid condensation.

Loose granular materials shall be stored on solid surfaces in a well-drained area and shall be prevented from mixing with foreign matter.

- C. Storage shall be arranged to provide access for maintenance of stored items and for inspection. The CONTRACTOR shall periodically inspect to assure products are undamaged and are maintained under required conditions. The CONTRACTOR shall maintain a log of inspections and shall make said log available to the OWNER on request.
- D. The CONTRACTOR shall verify that storage facilities comply with supplier's product storage requirements and verify that supplier-required environmental conditions are maintained continually.
- E. The CONTRACTOR shall verify that surfaces of products exposed to the elements are not adversely affected and that any weathering of finishes is acceptable under requirements of Contract Documents. Store materials such as pipe, reinforcing and structural steel, and equipment on pallets, blocks or racks, off ground. PVC Pipe may be damaged by prolonged exposure to direct sunlight and the CONTRACTOR shall take necessary precautions during storage and installation to avoid this damage. Pipe shall be stored under cover, and installed with sufficient backfill to shield it from the sun.
- F. OWNER's Responsibility: OWNER assumes no responsibility for materials or equipment stored in buildings or on-site. CONTRACTOR assumes full responsibility for damage due to storage of materials or equipment.
- G. CONTRACTOR's Responsibility: CONTRACTOR assumes full responsibility for protection of completed construction. Repair and restore damage to completed Work equal to its original condition.
- H. Special Equipment: Use only rubber tired wheelbarrows, buggies, trucks, or dollies to wheel loads over finished floors, regardless if the floor has been protected or not. This applies to finished floors and to exposed concrete floors as well as those covered with composition tile or other applied surfacing.
- I. Surface Damage: Where structural concrete is also the finished surface, take care to avoid marking or damaging surface.
- J. Weather Conditions: Work that may be affected by inclement weather shall be suspended until proper conditions prevail. In the event of impending storms, the CONTRACTOR shall take necessary precautions to protect all work, materials and equipment from exposure.
- K. Fire Protection: The CONTRACTOR shall take all necessary precautions to prevent fires at or adjacent to the Work, including its own buildings and trailers.

Adequate fire extinguisher and hose line stations shall be provided throughout the work area.

1.9 FASTENERS

- A. All necessary bolts, anchor bolts, nuts, washers, plates and bolt sleeves shall be furnished by the CONTRACTOR in accordance herewith. Bolts shall have suitable washers and, where so required, their nuts shall be hexagonal.
- B. All anchor bolts and other types of anchors embedded, drilled, inserted or driven in concrete, including nuts, washers, plates, and bolt sleeves, shall be Type 316 stainless steel unless otherwise specifically specified as another material.
- C. Unless otherwise specified, stud, tap, and machine bolts shall be of the best quality refined bar iron. Hexagonal nuts of the same quality of metal as the bolts shall be used.

1.10 SALVAGED AND EXCAVATED MATERIALS

- A. In the absence of special provisions in other Sections of the Specifications, salvage materials, equipment or supplies that occur are the property of the OWNER and shall be cleaned and stored as directed by the OWNER.
- B. All materials, including excavated materials needed for backfilling operation, shall be stored on site. Where additional area is needed for stockpiling, off-site storage of any materials shall be arranged for by the CONTRACTOR and a copy of an agreement for use of other property shall be furnished to the OWNER.

1.11 MANUFACTURER'S FIELD QUALITY CONTROL SERVICES

A. General:

- a. Provide manufacturer's field services in accordance with this subsection for those tasks specified in other sections.
- b. Include and pay all costs for suppliers' and manufacturers' services, including, but not limited to, those specified.

- B. Installation Instruction: Provide instruction by competent and experienced technical representatives of equipment manufacturers or system suppliers as necessary to resolve assembly or installation procedures which are attributable to, or associated with, the equipment furnished.

C. Installation Inspection, Adjustments and Startup Participation:

- a. Provide competent and experienced technical representatives of equipment manufacturers or system suppliers to inspect the completed installation as follows.
 - i. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or for other conditions which may cause damage.
 - ii. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
 - iii. Verify that wiring and support components for equipment are complete.
 - iv. Verify that equipment or system is installed in accordance with the manufacturer's recommendations, approved shop drawings and the Contract Documents.
 - v. Verify that nothing in the installation voids any warranty.
- b. Provide manufacturer's representatives to perform initial equipment and system adjustment and calibration conforming to the manufacturer's recommendations and instructions, approved shop drawings and the Contract Documents.
- c. Obtain ENGINEER's approval before start-up of equipment. Execute start-up under supervision of applicable manufacturer's representative in accordance with manufacturers' instructions.
- d. Furnish ENGINEER with three copies of the following. When training is specified, furnish the copies at least 24 hours prior to training.
 - i. "Certificate of Installation, Inspection and Start-up Services" by manufacturers' representatives for each piece of equipment and each system specified, certifying:
 1. That equipment is installed in accordance with the manufacturers' recommendations, approved shop drawings and the Contract Documents.
 2. That nothing in the installation voids any warranty.

3. That equipment has been operated in the presence of the manufacturer's representative.
 4. That equipment, as installed, is ready to be operated by others.
- ii. Detailed report by manufacturers' representatives, for review by ENGINEER of the installation, inspection and start-up services performed, including:
1. Description of calibration and adjustments if made; if not in Operation and Maintenance Manuals, attach copy.
 2. Description of any parts replaced and why replaced.
 3. Type, brand name, and quantity of lubrication used, if any.
 4. General condition of equipment.
 5. Description of problems encountered, and corrective action taken.
 6. Any special instructions left with CONTRACTOR or ENGINEER.

D. Field Test Participation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to participate in field testing of the equipment specified in Section 01400.

E. Trouble-Free Operation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to place the equipment in trouble-free operation after completion of start-up and field tests.

1.12 POST START-UP SERVICES

A. General: Provide Post Start-up Services in accordance with this subsection for equipment specified in other sections.

B. Site Visit: Provide the services of an authorized service representative for each equipment manufacturer or system supplier to make a final site visit after the equipment or system has been in operation for at least 6 months, but no longer than 11 months. Furnish assistance to OWNER's operating personnel in making adjustments and calibrations required to determine that the equipment and system is operating in conformance with design, manufacturer's, and

specification requirements. Instruct the personnel in a review of proper operation and maintenance procedures.

- C. Certificate: Furnish "Certificate of Post Start-up Services" cosigned by ENGINEER and the manufacturer's representative, certifying that this service has been performed.

1.13 SPECIAL TOOLS AND LUBRICATING EQUIPMENT

- A. General: Furnish, per manufacturer's recommendations, special tools required for checking, testing, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics.)
- B. Time of Delivery: Deliver special tools and lubricating equipment to OWNER when unit is placed into operation and after operating personnel have been properly instructed in operation, repair, and maintenance of equipment.
- C. Quality: Provide tools and lubricating equipment of a quality meeting equipment manufacturer's requirements.

1.14 LUBRICATION

- A. General: Where lubrication is required for proper operation of equipment, incorporate in the equipment the necessary and proper provisions in accordance with manufacturer's requirements. Where possible, make lubrication automated and positive.
- B. Oil Reservoirs: Where oil is used, supply reservoir of sufficient capacity to lubricate unit for a 24-hour period.

PART 2 PRODUCTS

Not Used

PART3 EXECUTION

Not Used

- END OF SECTION -

SECTION 01610

MATERIALS FOR SEWER REHABILITATION METHODS

PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- A. All materials or devices incorporated in this project shall be new and unused, unless indicated otherwise in the Contract Documents.
- B. Materials to be incorporated in the work shall be delivered sufficiently in advance of their installation and use to prevent delay in the execution of the work, and they shall be delivered as nearly as feasible in the order required for executing the work.
- C. The CONTRACTOR shall protect all devices and materials from deterioration and damage. The materials shall be handled and stored by the manufacturer, fabricator supplier and CONTRACTOR before, during, and after shipment to prevent warping. Any material exhibiting any of the above shall be removed and replaced at the CONTRACTOR's expense for both labor and materials.
- D. Storage – The CONTRACTOR shall store his equipment and materials at the CONTRACTOR's base of operations in accordance with the manufacturer's recommendations. No storage facility shall be provided by the COUNTY.
- E. Material Certifications – Only materials that meet the applicable ASTM or AWWA material standards are acceptable for this work.
- F. The pipe liner producer's certification, in accordance with ASTM specifications shall be furnished with the liner materials. The CONTRACTOR shall turn the pipe liner producer's certification over to the COUNTY prior to installation.
- G. The CONTRACTOR shall submit with this bid, the manufacturer's material certification that the material complies with the ASTM or AWWA requirements as stated above. Bids containing exceptions to the material requirements shall be considered non-responsive.

1.2 RELATED SECTIONS

- A. Section 02624 – Cured in place pipe liner
- B. Section 02625 – Fold and form pipe liner (HDPE)
- C. Section 02626 – Fold and form pipe liner (PVC)
- D. Section 02627 – Pressurized Wastewater Pipe (Force Main) Rehabilitation
- E. Section 02654 – Manhole Lining (Structural)

- F. Section 02655 – Manhole Lining (Non-Structural)
- G. Section 02656 – Manhole Repairs for Inflow Protection

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 01700
PROJECT CLOSEOUT

PART 1 GENERAL

1.1 SECTIONS INCLUDES:

- A. Final Cleanup
- B. Closeout Timetable
- C. Final Submittals
- D. Punch List
- E. Touch-Up and Repair
- F. Maintenance and Guarantee

1.2 FINAL CLEANUP

- A. The CONTRACTOR shall promptly remove from the vicinity of the completed Work, all rubbish, unused materials, concrete forms, construction equipment, temporary structures and facilities, construction signs, tools, scaffolding, materials, supplies and equipment which may have been used in the performance of the work. The CONTRACTOR shall broom clean paved surfaces and rake clean other surfaces of grounds. Final acceptance of the Work by the OWNER will be withheld until the CONTRACTOR has satisfactorily complied with the foregoing requirements for final cleanup of the project site.
- B. The CONTRACTOR shall thoroughly clean all materials, equipment and structures; all marred surfaces shall be touched up to match adjacent surfaces.
- C. The CONTRACTOR shall remove spatter, grease, stains, fingerprints, dirt, dust, labels, tags, packing materials and other foreign items or substances from interior and exterior surfaces, equipment, signs and lettering.
- D. The CONTRACTOR shall remove paint, clean and restore all equipment and material nameplates, labels and other identification markings.
- E. The CONTRACTOR shall maintain cleaning until project, or portion thereof, is accepted by the OWNER.
- F. The CONTRACTOR shall:

1. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
2. Use each type of cleaning material on only those surfaces recommended by the cleaning material manufacturer.
3. Use only materials which will not create hazards to health or property.

1.3 CLOSEOUT TIMETABLE

- A. The CONTRACTOR shall establish dates for testing, acceptance periods, and on-site instructional periods (as required under the Contract). Such dates shall be established not less than one week prior to beginning any of the foregoing items, to allow the OWNER and its authorized representatives sufficient time to schedule attendance at such activities.

1.4 FINAL SUBMITTALS

- A. Before the final acceptance of the project, the CONTRACTOR shall submit to the OWNER certain records, certifications, etc., which are specified elsewhere in the Contract Documents. Missing, incomplete or unacceptable items, as determined by the OWNER, shall constitute grounds for withholding final payment to the CONTRACTOR. A list of such items appears below, but it shall be the CONTRACTOR's responsibility to submit any other items which are required in the Contract Documents:

1. Written Test results of project components.
2. Written guarantees, where required.
3. Certificates of inspection and acceptance by local governing agencies having jurisdiction.
4. Video recordings and logs of all lines televised.
5. Pre-construction photos.
6. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.5 PUNCH LISTS

- A. Final cleaning shall be scheduled upon completion of the project.

- B. The OWNER will make his final inspection whenever the CONTRACTOR has notified the OWNER that the work is ready for the inspection. Any work not found acceptable and requiring cleaning, repair and/or replacement will be noted on the "Punch" list. Work that has been inspected and accepted by the OWNER shall be maintained by the CONTRACTOR, until final acceptance of the entire project.
- C. Whenever the CONTRACTOR has completed the items on the punch list, he shall again notify the OWNER that it is ready for final inspection. This procedure will continue until the entire project is accepted by the OWNER. The "Final Payment" will not be processed until the entire project has been accepted by the OWNER and all of the requirements in previous Article 1.03 "Final Submittals" have been satisfied.

1.6 TOUCH-UP AND REPAIR

- A. The CONTRACTOR shall touch-up and repair damage to all existing facilities and surfaces. If in the opinion of the OWNER the touch-up work is not satisfactory, the CONTRACTOR shall repeat the item.

1.7 MAINTENANCE AND GUARANTEE

- A. The CONTRACTOR shall comply with all maintenance and guarantee requirements of the Contract Documents.
- B. Replacement of earth fill or backfill, where it has settled below the required finish elevations, shall be considered as a part of such required repair work, and any repair or resurfacing constructed by the CONTRACTOR which becomes necessary by reason of such settlement shall likewise be considered as a part of such required repair work unless the CONTRACTOR shall have obtained a statement in writing from the affected private OWNER or public agency releasing the OWNER from further responsibility in connection with such repair or resurfacing.

- END OF SECTION -

SECTION 01710

CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. General Requirements
- B. Disposal Requirements

1.2 GENERAL REQUIREMENTS

- A. Execute cleaning during progress of the work and at completion of the work.

1.3 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations.
- B. Provide onsite containers for the collection of waste materials, debris and rubbish. All waste materials including containers, food debris and other miscellaneous materials must be disposed of daily in onsite containers.
- C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.2 FINAL CLEANING

- A. Requirements: At the completion of work and immediately prior to final inspection, clean the entire project as follows:

1. Thoroughly clean and sweep the project area. Leave the structures and site in a complete and finished condition to the satisfaction of the ENGINEER and/or OWNER's representative.
 2. Direct all subcontractors to similarly perform, at the same time, an equivalent thorough cleaning of all work provided under their contracts.
 3. Remove all temporary structures and all debris, including dirt, sand, gravel, rubbish and waste material.
 4. Should the CONTRACTOR not remove rubbish or debris or not clean the buildings and site as specified above, the OWNER reserves the right to have the cleaning done at the expense of the CONTRACTOR.
- B. Employ only experienced workers for final cleaning.
- C. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- D. In preparation for substantial completion, conduct final inspection of site.
- E. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.
- F. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly-painted surfaces.
- G. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- H. Remove erection plant, tools, temporary structures and other materials.
- I. Remove and dispose of all water, dirt, rubbish or any other foreign substances.

3.3 FINAL INSPECTION

- A. After cleaning is complete the final inspection may be scheduled. The inspection will be done with the OWNER and ENGINEER.

END OF SECTION

SECTION 01720
CONTRACT CLOSE OUT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Warranties and Bonds
- B. Record Drawings
- C. Post-Installation Videos

1.2 WARRANTIES AND BONDS

Prior to final payment deliver to the OWNER the original and one copy of all bonds, warranties, guarantees and similar documents, including those customarily provided by manufacturers and suppliers which cover a period greater than the one year correction period. Show OWNER as beneficiary of these documents.

1.3 RECORD DRAWINGS

Record drawings shall indicate the actual length of liner pipe for each sewer run, actual diameter and depth of manholes lined, locations of point repairs made, materials utilized, date of installation, and date of final acceptance.

1.4 POST INSTALLATION VIDEOS

Post-installation videos shall be in accordance with specification section 13511 - TELEVISIONING AND INSPECTION. Post-installation videos shall be submitted prior to final acceptance of each section of work.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 01730

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description
- B. Quality Assurance
- C. Submittals
- D. Format and Contents

1.2 DESCRIPTION

- A. Scope: Furnish to the ENGINEER 10 copies of an Operation and Maintenance Manual for all equipment and associated control systems furnished and installed.

1.3 QUALITY ASSURANCE

- A. Reference Codes and Specifications: No current government or commercial specifications or documents apply.

1.4 SUBMITTALS

- A. Prior to the Work Reaching 50 Percent Completion, submit to the ENGINEER for approval two copies of the manual with all specified material. Submit the approval copies with the partial payment request for the specified completion. Within 30 days after the ENGINEER's approval of the two-copy submittal, furnish to the ENGINEER the remaining 8 copies of the manual. Provide space in the manual for additional material. Submit any missing material for the manual prior to requesting certification of substantial completion.

1.5 FORMAT AND CONTENTS

- A. Prepare and arrange each copy of the manual as follows:
 - 1. One copy of an equipment data summary (see sample form) for each item of equipment.
 - 2. One copy of an equipment preventive maintenance data summary (see sample form) for each item of equipment.

3. One copy of the manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment, preventive and repair maintenance, lubrication, troubleshooting, parts list and recommended spare parts.
4. List of electrical relay settings and control and alarm contact settings.
5. Electrical interconnection wiring diagram for equipment furnished including all control and lighting systems.

NOTE: Edit if valves are not to be numbered.

6. One valve schedule giving valve number, location, fluid, and fluid destination for each valve installed. Group all valves in same piping systems together in the schedule. Obtain a sample of the valve numbering system from the ENGINEER.
 7. Furnish all O&M Manual material on 8-1/2 by 11 commercially printed or typed forms or an acceptable alternative format.
- B. Organize each manual into sections paralleling the equipment specifications. Identify each section using heavy section dividers with reinforced holes and numbered plastic index tabs. Use 3-ring, hard-back binders Type No. VS11 as manufactured by K&M Company, Torrance, CA, or equal. Punch all loose data for binding. Arrange composition and printing so that punching does not obliterate any data. Print on the cover and binding edge of each manual the project title, and manual title, as furnished and approved by the ENGINEER.
- C. Leave all operating and maintenance material that comes bound by the equipment manufacturer in its original bound state. Cross-reference the appropriate sections of the CONTRACTOR's O&M manual to the manufacturers' bound manuals.
- D. Label binders Volume 1, 2, and so on, where more than one binder is required. Include the table of contents for the entire set, identified by volume number, in each binder.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

NOTE: Fill in name of Project.

Lee County Utilities

Equipment Data Summary

Equipment Name:

Specification Reference:

Manufacturer:

Name:

Address:

Telephone:

Number Supplied:

Location/Service:

Model No:

Serial No:

Type:

Size/Speed/Capacity/Range (as applicable):

Power Requirement (Phase/Volts/Hertz):

Local Representative:

Name:

Address:

Telephone:

NOTES:

NOTE: Fill in name of Project.

Lee County Utilities

Preventive Maintenance Summary

Equipment Name:

Location:

Manufacturer:

Name:

Address:

Telephone:

Model No:

Serial No:

Maintenance
Task

Lubricant/Part

D W M Q SA A

O&M Manual
Reference

NOTES:

*D-Daily W-Weekly M-Monthly Q-Quarterly SA-Semi-Annual A-Annual

SECTION 01740

WARRANTIES AND BONDS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds, as in Articles 6 and 13 of the General Conditions.
- B. Co-execute submittals when so specified.
- C. Review submittals to verify compliance with Contract Documents.
- D. Submit to the ENGINEER for review and transmittal to OWNER.

1.2 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Two original signed copies are required.
- C. Table of Contents. Neatly typed in orderly sequence. Provide complete information for each items.
 - 1. Product or work item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service maintenance contract.
 - 6. Provide information for OWNER's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 7. CONTRACTOR, name of responsible principal, address and telephone number.

1.3 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.
- B. Format:
 - 1. Size 8-1/2" x 11", punch sheets for standard 3-post binder.
 - a. Fold larger sheets to fit into binders.

2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS" list:
 - a. Title of Project
 - b. Name of CONTRACTOR
- C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of 2 inches.

1.4 WARRANTY SUBMITTAL REQUIREMENTS

- A. For all sewer rehabilitation products, submit a two (2) year warranty from the manufacturer. For all manhole rehabilitation products, submit a ten (10) year warranty from the manufacturer. The manufacturer's warranty period shall commence at the time of Final Acceptance.
- B. The CONTRACTOR shall provide to the owner a one (1) year warranty guaranteeing that the finished project will be free of defects in material and workmanship commencing from the time of Final Acceptance. The CONTRACTOR shall still warrant equipment not considered to be "major" in the CONTRACTOR's one-year warranty period even though specific certificates of warranty may not be required.
- C. Any remedial actions required during the warranty period shall be performed by the CONTRACTOR at no cost to the OWNER.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

NOT USED

END OF SECTION

SECTION 02151

SHORING, SHEETING AND BRACING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Work required for protection of an excavation or structure through shoring, sheeting, and bracing.
- B. Related Work Specified In Other Sections Includes:
 - 1. Section 02222 - Excavation - Earth and Rock
 - 2. Section 02223 - Backfilling

1.2 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. CONTRACTOR's Submittals: All sheeting and bracing shall be the responsibility of the CONTRACTOR to retain qualified design services for these systems, and to be completed with strict adherence to OSHA Regulations. Submit complete design calculations and working drawings of proposed shoring, sheeting and bracing which have been prepared, signed and sealed by a Licensed Professional Engineer experienced in Structural Engineering and registered in the State of Florida, before starting excavation for jacking pits and structures. Use the soil pressure diagram shown for shoring, sheeting and bracing design. ENGINEER's review of calculations and working drawings will be limited to confirming that the design was prepared by a licensed professional engineer and that the soil pressure diagram shown was used.

1.3 REFERENCES

- A. Design: Comply with all Federal and State laws and regulations applying to the design and construction of shoring, sheeting and bracing.
- B. N.B.S. Building Science Series 127 "Recommended Technical Provisions for Construction Practice in Shoring and Sloping Trenches and Excavations.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Do work in accordance with the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety Act of 1970 (PL 91-596) and under Section 107 of the Contract Work Hours and Safety Standards Act (PL 91-54), and the Florida

Trench Safety Act. The CONTRACTOR shall also observe 29 CFR 1910.46 OSHA's regulation for Confined Space Entry.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND MATERIALS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
- B. Material Recommendations: Use manufacturers and materials for shoring, sheeting and bracing as recommended by the Licensed Professional Engineer who designed the shoring, sheeting, and bracing.

PART 3 EXECUTION

3.1 SHORING, SHEETING AND BRACING INSTALLATION

- A. General: Provide safe working conditions, to prevent shifting of material, to prevent damage to structures or other work, to avoid delay to the work, all in accordance with applicable safety and health regulations. Properly shore, sheet, and brace all excavations which are not cut back to the proper slope and where shown. Meet the general trenching requirements of the applicable safety and health regulations for the minimum shoring, sheeting and bracing for trench excavations.
 - 1. CONTRACTOR's Responsibility: Sole responsibility for the design, methods of installation, and adequacy of the shoring, sheeting and bracing.
- B. Arrange shoring, sheeting and bracing so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.
- C. If ENGINEER is of the opinion that at any point the shoring, sheeting or bracing are inadequate or unsuited for the purpose, resubmission of design calculations and working drawings for that point may be ordered, taking into consideration the observed field conditions. If the new calculations show the need for additional shoring, sheeting and bracing, it should be installed immediately.
- D. Monitoring: Periodically monitor horizontal and vertical deflections of sheeting. Submit these measurements for review.
- E. Accurately locate all underground utilities and take the required measures necessary to protect them from damage. All underground utilities shall be kept in service at all times as specified in Division 1.

- F. Driven Sheet piling: Drive tight sheet piling in that portion of any excavation in paved or surface streets City collector and arterial streets and in State and County highways below the intersection of a one-on-one slope line from the nearest face of the excavation to the edge of the existing pavement or surface.
- G. Sheet piling Depth: In general drive or place sheet piling for pipelines to a depth at elevation equal to the top of the pipe as approved.
 - 1. If it is necessary to drive sheet piling below that elevation in order to obtain a dry trench or satisfactory working conditions, cut the sheet piling off at the top of the pipe and leave in place sheet piling below the top of the pipe.
 - 2. Do not cut the sheet piling until backfill has been placed and compacted to the top of the pipe.
- H. Sheet piling Removal: In general, remove sheet piling and bracing above the top of the pipe as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures. Sheet piling shall be removed as backfilling progresses so that the sides are always supported or when removal would not endanger the construction of adjacent structures. When required to eliminate excessive trench width or other damages, shoring or bracing shall be left in place and the top cut off at an elevation 2.5 feet below finished grade, unless otherwise directed.
 - 1. Carefully fill voids left by the withdrawal of the sheet piling by jetting, ramming or otherwise.
 - 2. No separate payment will be made for filling of such voids.
- I. Permission for Removal: Obtain permission before the removal of any shoring, sheet piling or bracing. Retain the responsibility for injury to structures or to other property or persons from failure to leave such shoring, sheet piling and bracing in place even though permission for removal has been obtained.
- J. Preload internal braces to 50 percent of the design loads.
- K. Proof test tie backs to 133 percent of the design loads and lock off tie backs at 75 percent of the design loads.

3.2 SHEETING LEFT IN PLACE FOR PROTECTION

- A. Ordered Left in Place: In addition to sheet piling specified or shown to be left in place, the ENGINEER may order, in writing, any or all other shoring, sheet piling or bracing to be left in place for the purpose of preventing injury to the structures, pipelines or to other property or to persons.

1. Cutoff sheeting left in place at the elevation shown or ordered, but, in general, at least 2.5 feet below the final ground surface.
 2. Drive up tight any bracing remaining in place.
- B. Right to Order: Do not construe the right to order shoring, sheeting and bracing left in place as creating any obligation to issue such orders.
- C. Payment: Shoring, sheeting and bracing left in place, by written order, will be paid for under the appropriate Contract Items or where no such items exist, as changes in the work.

END OF SECTION

SECTION 02222

EXCAVATION - EARTH AND ROCK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for performing opencut excavations to the widths and depths necessary for constructing structures, pipelines and conduits including excavation of any material necessary for any purpose pertinent to the construction of the Work.
- B. Related Work Specified In Other Sections Includes:
 - 1. Section 02151 - Shoring, Sheet piling and Bracing
 - 2. Section 02223 - Backfilling

1.2 DEFINITIONS

- A. Earth: "Earth" includes all materials which, in the opinion of the ENGINEER, do not require blasting, barring, wedging or special impact tools for their removal from their original beds, and removal of which can be completed using standard excavating equipment. Specifically excluded are all ledge and bedrock and boulders or pieces of masonry larger than one cubic yard in volume.
- B. Rock: "Rock" includes all materials which, in the opinion of the ENGINEER, require blasting, barring, wedging and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Boulders or masonry larger than one cubic yard in volume are classed as rock excavation.

1.3 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Dewatering Excavation Plan: Develop an excavation dewatering plan that considers site ground and groundwater conditions, the type and arrangement of the equipment to be used and the proper method of groundwater disposal. Prepare the dewatering plan before beginning excavations below groundwater. Maintain one copy of the dewatering plan at the project site to be available for inspection while all dewatering operations are underway.

- C. CONTRACTOR is responsible for obtaining any necessary permits for dewatering.

1.4 SITE CONDITIONS

- A. Geotechnical Investigation: The CONTRACTOR is advised that a geotechnical investigation has not been preformed for this project.
- B. Actual Conditions: The CONTRACTOR shall make any geotechnical investigations deemed necessary to determine actual site conditions prior to bidding.
- C. Underground Utilities: Locate and identify all existing underground utilities prior to the commencement of Work.
- D. Quality and Quantity: Make any other investigations and determinations necessary to determine the quality and quantities of earth and rock and the methods to be used to excavate these materials.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 GENERAL

- A. Clearing: Clear opencut excavation sites of obstructions preparatory to excavation. Clearing includes removal and disposal of vegetation, trees, stumps, roots and bushes, except those specified to be protected during trench excavation.
- B. Banks: Shore or slope banks to the angle of repose to prevent slides or cave-ins in accordance with Section 02151.
- C. Safety: Whenever an excavation site or trench is left unattended by the CONTRACTOR or when an area is not within 100 feet of observation by the CONTRACTOR, the excavation site or trench shall be filled and/or, at the OWNER's discretion, protected by other means to prevent accidental or unauthorized entry. Such protection shall include barricades and other protection devices requested by the ENGINEER or OWNER, including temporary fencing, snow fencing, or temporary "structure" tape. Such safety items shall not relieve the CONTRACTOR of any site safety requirements or liabilities established by Federal, State and local laws and agencies, including OSHA, but is intended as additional safety measures to protect the general public.

- D. Hazardous Materials: If encountered, take care of hazardous materials not specifically shown or noted in accordance with Section 01500.
- E. During excavation and any site work, storm water pollution prevention measures shall be taken to ensure that water quality criteria are not violated in the receiving water body and all state and local regulatory requirements are met.

3.2 EXCAVATION FOR MANHOLE REPAIRS

- A. Excavation Size: Provide excavations of sufficient size and only of sufficient size to permit the Work to be economically and properly constructed in the manner and of the size specified.
- B. Excavation Depth: It is the intent of these specifications that most of the manhole repairs be accomplished from inside the structure. However, installation of external chimney seals will require excavation to elevation slightly below the top of the cone section.
- C. Compaction: Before placing foundation slabs, footings or backfill, proof roll the bottom of the excavations to detect soft spots.
 - 1. For small areas, proof roll with a smooth-faced steel roller filled with water or sand, or compact with a mechanical tamper.
 - 2. Make one complete coverage, with overlap, of the area.
 - 3. Overexcavate soft zones and replace with compacted select fill in accordance with Part 3, Section 3.9.

3.3 EXCAVATION FOR JACKING AND AUGERING

- A. Jacking and Augering Requirements: Allow adequate length in jacking pits to provide room for the jacking frame, the jacking head, the reaction blocks, the jacks, auger rig, and the jacking pipe. Provide sufficient pit width to allow ample working space on each side of the jacking frame. Allow sufficient pit depth such that the invert of the pipe, when placed on the guide frame, will be at the elevation desired for the completed line. Tightly sheet the pit and keep it dry at all times.

3.4 ROCK EXCAVATION

- A. Rock Excavation is not anticipated due to the nature of the work being performed under this project. However, if rock excavation is required to complete jacking pits the following shall apply:

1. Rock removed from the excavation becomes the property of the CONTRACTOR. Transport and dispose of excavated rock at an off site disposal location. Obtain the off site disposal location.
 2. Remove all shattered rock and loose pieces.
- B. Payment: Rock excavation, including placing, compacting and shaping of the select fill material, will be paid for under the appropriate Contract Items or where no such items exist, as a change in the Work.
- C. Blasting: Blasting will not be allowed.

3.5 FINISHED EXCAVATION

- A. Finish: Provide a reasonably smooth finished surface for all excavations, which is uniformly compacted and free from irregular surface changes.
- B. Finish Methods: Provide a degree of finish which is ordinarily obtainable from blade-grade operations, except as otherwise specified in Section 02223.

3.6 PROTECTION

- A. Traffic and Erosion: Protect newly graded areas from traffic and from erosion.
- B. Repair: Repair any settlement or washing away that may occur from any cause, prior to acceptance. Re-establish grades to the required elevations and slopes.
- C. It shall be the CONTRACTOR's responsibility to acquaint himself with all existing conditions and to locate all structures and utilities along the proposed utility alignment in order to avoid conflicts. Where actual conflicts are unavoidable, work shall be coordinated with the facility owner and performed so as to cause as little interference as possible with the service rendered by the facility disturbed. Facilities or structures damaged in the prosecution of the work shall be repaired and/or replaced immediately, in conformance with current standard practices of the industry, or according to the direction of the owner of such facility, at the CONTRACTOR's expense.
- D. Other Requirements: Conduct all Work in accordance with the environmental protection requirements specified in Division 1.

3.7 AUTHORIZED ADDITIONAL EXCAVATION

- A. Additional Excavation: Carry the excavation to such additional depth and width as authorized in writing, for the following reasons:

1. In case the materials encountered at the elevations shown are not suitable.
 2. In case it is found desirable or necessary to go to an additional depth, or to an additional depth and width.
- B. Refill Materials: Refill such excavated space with either authorized 2500 psi concrete or compacted select fill material, in compliance with the applicable provisions of Section 02223.
- C. Compaction: Where necessary, compact fill materials to avoid future settlement. As a minimum, unless otherwise specified or directed, backfill layers shall not exceed 6-inches in thickness for the full trench width and compaction shall equal 95% of maximum density, or 98% if under paved area of roadway, as determined by using ASTM D 1557. Compaction density tests shall be made at all such backfill areas with spacing not to exceed 100 feet apart and on each 6-inch compacted layer.
- D. Payment: Additional earth excavations so authorized and concrete or select fill materials authorized for filling such additional excavation and compaction of select fill materials will be paid for under the appropriate Contract Items or where no such items exist, as a change in the Work.
- E. Refill for unauthorized additional will not be measured and no payment will be made therefore.

3.8 SEGREGATION STORAGE AND DISPOSAL OF MATERIAL

- A. Stockpiling Suitable Materials: Stockpile topsoil suitable for final grading and landscaping and excavated material suitable for backfilling or embankments separately on the site in approved locations.
- B. Stockpile Locations: Store excavated and other material a sufficient distance away from the edge of any excavation to prevent its falling or sliding back into the excavation and to prevent collapse of the wall of the excavation. Provide not less than 2 feet clear space between the top of any stockpile and other material and the edge of any excavation.
- C. Excess Materials: CONTRACTOR shall be responsible to transport and dispose of surplus excavated material and excavated material unsuitable for backfilling or embankments at an off site disposal location secured by the CONTRACTOR.

3.9 REMOVAL OF WATER

- A. Water Removal: At all times during the excavation period and until completion and acceptance of the WORK at final inspection, provide ample means and equipment with which to remove promptly and dispose of properly all water entering any excavation or other parts of the WORK.
- B. Dry Excavations: Keep the excavation dry.
- C. Water Contact: Allow no water to rise over or come in contact with masonry and concrete until the concrete and mortar have attained a set and, in any event, not sooner than 12 hours after placing the masonry or concrete.
- D. Discharge of Water: Dispose of water pumped or drained from the Work in a safe and suitable manner without damage to adjacent property or streets or to other work under construction.
- E. Sanitary Sewers: Discharge no water into sanitary sewers.
- F. Storm Sewers: Discharge no water containing settleable solids into storm sewers.
- G. Repair: Promptly repair any and all damage caused by dewatering the Work.

END OF SECTION

SECTION 02223

BACKFILLING

PART 1 GENERAL

1.1 SUMMARY

- A. General Requirements: Backfill all excavation to the original surface of the ground or to such other grades as may be shown or required. For areas to be covered by topsoil, leave or stop backfill (12) inches below the finished grade or as shown. Obtain approval for the time elapsing before backfilling against structures. Remove from all backfill, any compressible, putrescible, or destructible rubbish and refuse and all lumber and braces from the excavated space before backfilling is started. Leave sheeting and bracing in place or remove as the work progresses.
- B. Equipment Limitations: Do not permit construction equipment used to backfill to travel against and over existing structures.
- C. Related Work Specified In Other Sections Includes:
 - 1. Section 02151 – Shoring, sheeting and Bracing
 - 2. Section 02222 – Excavation – Earth and Rock

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ASTM D 1557 - Standard Test Methods for Moisture-Density Relations of Soil and Soil-Aggregate Mixtures Using 10 lb Rammer and 18 in Drop

PART 2 PRODUCTS

2.1 BACKFILL MATERIAL - GENERAL

- A. General: Backfill with sound materials, free from waste, organic matter, rubbish, boggy or other unsuitable materials.
- B. General Materials Requirements: Conform materials used for backfilling to the requirements specified. Follow common fill requirements whenever drainage or select fill is not specified. Determine and obtain the approval of the appropriate test method where more than one compaction test method is specified.
- C. Frozen Materials: Do not use frozen material for backfilling.

2.2 SELECT FILL

A. Materials for Select Fill: Use clean gravel, crushed stone, washed shell, or other granular or similar material as approved which can be readily and thoroughly compacted to 95 percent of the maximum dry density obtainable by ASTM D 1557.

1. Allowed Materials: Grade select fill between the following limits:

U.S. Standard Sieve	Percent Passing By Weight
2 inch	100
1-1/2 inch	90-100
1 inch	75-95
1/2 inch	45-70
#4	25-50
#10	15-40
#200	5-15

2. Unallowed Materials: Very fine sand, uniformly graded sands and gravels, sand and silt, soft earth, or other materials that have a tendency to flow under pressure when wet are unacceptable as select fill.

2.3 COMMON FILL

A. Materials for Common Fill: Material from on-site excavation may be used as common fill provided that it can be readily compacted to 90 percent of the maximum dry density obtainable by ASTM D 1557, and does not contain unsuitable material. Select fill may be used as common fill at no change in the Contract Price.

B. Granular Materials On-Site: Granular on-site material, which is fairly well graded between the following limits may be used as granular common fill:

U.S. Standard Sieve	Percent Passing by Weight
3 inch	100
#10	50-100
#60	20-90

- C. Cohesive Materials On-Site: Cohesive site material may be used as common fill.
 - 1. The gradation requirements do not apply to cohesive common fill.
 - 2. Use material having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20.
- D. Material Approval: All material used as common fill is subject to approval. If there is insufficient on-site material, import whatever additional off-site material is required which conforms to the specifications and at no additional cost.

PART 3 EXECUTION

3.1 PIPE BEDDING AND INITIAL BACKFILL

- A. Hand Placement: Place select fill by hand for initial pipe backfill from top of bedding to 1 foot over top of pipes in uniform layers not greater than 6 inches in loose thickness. Tamp under pipe haunches and thoroughly compact in place the select fill with suitable mechanical or pneumatic tools to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.
- B. Stone Placement: Do not place large stone fragments in the pipe bedding or backfill to 1 foot over the top of pipes, nor nearer than 2 feet at any point from any pipe, conduit or concrete wall.
- C. Unallowed Materials: Pipe bedding containing very fine sand, uniformly graded sands and gravels, sand and silt, soft earth, or other materials that have a tendency to flow under pressure when wet is unacceptable.

3.2 JACKING PIT BACKFILL

- A. General: Backfill material shall be clean earth fill composed of sand, clay and sand, sand and stone, crushed stone, or an approved combination thereof. Backfilling shall be accomplished under two specified requirements: First Lift, from bottom of excavation to a point 12 inches above the top of the utility, and, Second Lift, from the top of the First Lift to the ground surface. Where thrust blocks, encasements, or other below-grade concrete work have been installed, backfilling shall not proceed until the concrete has obtained sufficient strength to support the backfill load.
- B. First Lift: Fine material shall be carefully placed and tamped around the lower half of the utility. Backfilling shall be carefully continued in compacted and tested layers not exceeding 6 inches in thickness for the full width of the excavation, until the fill is 12 inches above the top of the utility, using the best available material from the excavation, if approved. The material for these first layers of backfill shall

be lowered to within 2 feet above the top of pipes before it is allowed to fall, unless the material is placed with approved devices that protect the pipes from impact. The "First Lift" shall be thoroughly compacted and tested before the "Second Lift" is placed.

Unless otherwise specified, compaction shall equal 98% of maximum density, as determined by ASTM D 1557. The "First Lift" backfill shall exclude stones, or rock fragments larger than the following:

<u>Pipe Type</u>	<u>(Greatest Dimension-Inches) Fragment Size (Inches)</u>
Steel	2
Concrete	2
Ductile Iron	2
Plastic	1
Fiberglass	1

- C. Second Lift: The remainder of the excavation, above the "First Lift", shall be backfilled and tested in layers not exceeding 6 inches. The maximum dimension of a stone, rock, or pavement fragment shall be 6 inches. Compaction, as determined by ASTM D 1557, shall be equal to 98% of maximum density in paved areas, and not less than 95% of maximum density in unpaved portions of the Rights-of-Way or 90% of maximum density in other areas.

As an alternative, or if required under roadways, Flowable Fill may be substituted. If Flowable Fill is to be used, a fabric mesh shall be installed between the "first lift" and the Flowable Fill. Flowable Fill shall be in accordance with Section 4.7.AH of the Lee County Utilities Operations Manual.

- D. Compaction Methods: The above specified compaction shall be accomplished using accepted standard methods (powered tampers, vibrators, etc.), with exception that the first two feet of backfilling over the pipe shall be compacted by hand-operated tamping devices. Flooding or puddling with water to consolidate backfill is not acceptable, except where sand is the only material utilized and encountered and the operation has been approved by the OWNER.
- E. Density Tests: Density tests for determination of the above specified compaction shall be made by an independent testing laboratory and certified by a Florida Registered, Professional ENGINEER at the expense of the CONTRACTOR. Test locations will be determined by the ENGINEER. If any test results are unsatisfactory, the CONTRACTOR shall re-excavate and re-compact the backfill at his expense until the desired compaction is obtained. Additional compaction tests shall be made to each site of an unsatisfactory test, as directed, to determine the extent of re-excavation and re-compaction if necessary.

Copies of all density test results shall be furnished on a regular basis by the CONTRACTOR to both the ENGINEER and Lee County Utilities. Failure to furnish these results will result in the project not being recommended for acceptance by Lee County

- F. Dropping of Material on Work: Do backfilling work in such a way as to prevent dropping material directly on top of any conduit or pipe through any great vertical distance. Do not allow backfilling material from a bucket to fall directly on a structure or pipe and, in all cases, lower the bucket so that the shock of falling earth will not cause damage.
- G. Distribution of Large Materials: Break lumps up and distribute any stones, pieces of crushed rock or lumps which cannot be readily broken up, throughout the mass so that all interstices are solidly filled with fine material.

3.3 STRUCTURE BACKFILL

- A. Use of Select Fill: Use select fill adjacent to structures located in pavements and walkways and extend to the bottom of pavement base course.
 - 1. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable approved mechanical or pneumatic equipment.
 - 2. Compact backfill to not less than 95 percent of the maximum dry density as determined by ASTM D 1557.
- B. Use of Common Fill: Use common granular fill adjacent to structures in all areas not specified above, unless otherwise shown or specified. Select fill may be used in place of common granular fill at no additional cost.
 - 1. Extend such backfill from the bottom of the excavation to a point 12 inches below existing ground in grassed locations to allow for topsoil placement.
 - 2. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable equipment, as specified above.
 - 3. Compact backfill to not less than 90 percent of the maximum dry density as determined by ASTM D 1557.

3.4 COMPACTION EQUIPMENT

- A. Equipment and Methods: Carry out all compaction with suitable approved equipment and methods.

1. Compact clay and other cohesive material with sheep's-foot rollers or similar equipment where practicable. Use hand held pneumatic tampers elsewhere for compaction of cohesive fill material.
2. Compact low cohesive soils with pneumatic-tire rollers or large vibratory equipment where practicable. Use small vibratory equipment elsewhere for compaction of cohesionless fill material.
3. Do not use heavy compaction equipment over pipelines or other structures, unless the depth of fill is sufficient to adequately distribute the load.

3.5 BORROW

- A. Should there be insufficient material from the excavations to meet the requirements for fill material, borrow shall be obtained from pits secured and tested by the CONTRACTOR and approved by the OWNER. Copies of all test results shall be submitted to Lee County Utilities.

3.6 FINISH GRADING

- A. Final Contours: Perform finish grading to blend into conformation with remaining natural ground surfaces.
 1. Leave all finished grading surfaces smooth and firm to drain.
 2. Bring finish grades to elevations within plus or minus 0.10 foot of existing ground.
- B. Surface Drainage: Perform grading to prevent accumulation of water within the project area. Where necessary or where shown, extend finish grading to ensure that water will be carried to drainage ditches, and the site area left smooth and free from depressions holding water.

3.7 RESPONSIBILITY FOR AFTERSETTLEMENT

- A. Aftersettlement Responsibility: The CONTRACTOR shall take responsibility for correcting any depression which may develop in backfilled areas from settlement within one year after the work is fully completed. Provide as needed, backfill material, pavement base replacement, permanent pavement, sidewalk, curb and driveway repair or replacement, and lawn replacement, and perform the necessary reconditioning and restoration work to bring such depressed areas to proper grade as approved.

3.8 INSPECTION AND TESTING OF BACKFILLING

- A. Sampling and Testing: Provide sampling, testing, and laboratory methods in accordance with the appropriate ASTM Standard Specification. Subject all backfill to these tests.
- B. Compaction density tests shall be made at all such backfill areas with spacing not to exceed 100 feet apart and on each 6-inch compacted layer.
- C. Correction of Work: Correct any areas of unsatisfactory compaction by removal and replacement, or by scarifying, aerating or sprinkling as needed and recompaction in place prior to placement of a new lift.

END OF SECTION

SECTION 02276

TEMPORARY EROSION AND SEDIMENTATION CONTROL

PART 1 GENERAL

1.1 DESCRIPTION

- A. The work specified in this Section consists of designing, providing, maintaining and removing temporary erosion and sedimentation controls as necessary.
- B. Temporary erosion controls include, but are not limited to, grassing, mulching, setting, watering, and reseeding onsite surfaces and spoil and borrow area surfaces and providing interceptor ditches at ends of berms and at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the OWNER.
- C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, and appurtenances at the foot of sloped surfaces which will ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the OWNER.
- D. CONTRACTOR is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

PART 2 PRODUCTS

2.1 EROSION CONTROL

- A. Seeding and Sodding is specified in Section 02400.
- B. Netting - fabricated of material acceptable to the OWNER.

2.2 SEDIMENTATION CONTROL

- A. Bales - clean, seed free cereal hay type.
- B. Netting - fabricated of material acceptable to the OWNER.
- C. Filter Stone - crushed stone conforming to Florida Department of Transportation specifications.

PART 3 EXECUTION

3.1 EROSION CONTROL

A. Minimum procedures for grassing are:

1. Scarify slopes to a depth of not less than six inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter and debris.
2. Sow seed within twenty-four (24) hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
3. Apply mulch loosely and to a thickness of between 3/4 inch and 1-1/2 inches.
4. Apply netting over mulched areas on sloped surfaces.
5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.2 SEDIMENTATION CONTROL

- #### A. Install and maintain silt dams, traps, barriers, and appurtenances as shown on the approved descriptions and working drawings, hay bales which deteriorate and filter stone which is dislodged shall be replaced.

3.3 PERFORMANCE

- #### A. Should any of the temporary erosion and sediment control measures employed by the CONTRACTOR fail to produce results which comply with the requirements of the State of Florida, CONTRACTOR shall immediately take whatever steps are necessary to correct the deficiency at his own expense.

END OF SECTION

SECTION 02400
LAWN RESTORATION

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. The work in this section consists of furnishing all labor, material and equipment to replace and maintain all areas disturbed during construction by establishing a stand of grass, within the areas called for by the furnishing and placing grass sod, or seeding, or seeding and mulching.

1.2 REFERENCE DOCUMENTS

- A. The materials used in this work shall conform to the requirements of Florida Department of Transportation Standard Specifications for Road and Bridge Construction as follows:
 - 1. Grassing and sodding materials – Section 981
 - 2. Fertilizer - Section 982
 - 3. Water - Section 983

1.3 SUBMITTALS

- A. Submit certifications and identification labels for all sodding supplied as specified in Section 01300.

PART 2 PRODUCTS

2.1 SODDING

- A. Types: Sod may be of either St. Augustine or Argentine Bahia grass or as that disturbed, as established prior to construction. It shall be well matted with roots. When replacing sod in areas that are already sodded, the sod shall be the same type as the existing sod.
- B. Sod shall be provided as required in accordance with Florida Department of Transportation Specifications 575 and 981. The CONTRACTOR shall furnish sod equal to and similar in type as that disturbed. Placement and watering requirements shall be in accordance with FDOT Specifications Section 575.
- C. The sod shall be taken up in commercial-size rectangles, preferably 12-inch by 24-inch or larger, except where 6-inch strip sodding is called for.

- D. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh and uninjured at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses. It shall be planted as soon as possible after being dug and shall be shaded and kept moist from the time it is dug until it is planted.
- E. Sod should be handled in a manner to prevent breaking or other damage. Sod shall not be handled by pitch forks or by dumping from trucks or other vehicles. Care shall be taken at all times to retain the native soil on the roots of each sod roll during stripping and handling. Sod that has been damaged by handling during delivery, storage or installation will be rejected.

2.2 FERTILIZER

- A. Chemical fertilizer shall be supplied in suitable bags with the net weight certification of the shipment. Fertilizer shall be 12-8-8 and comply with Section 982 of the FDOT Standard Specification for Road and Bridge Construction.
- B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water soluble potash, contained in the fertilizer.
- C. The chemical designation of the fertilizer shall be 12-8-8, with at least 50 percent of the nitrogen from a nonwater-soluble organic source. The nitrogen source may be a unreaformaldehyde source provided it is not derived from a waste product of the plastic industry.

2.3 EQUIPMENT

- A. The device for spreading fertilizer shall be capable of uniformly distributing the material at the specified rate.

2.4 NETTING

- A. Netting is fabricated of material similar to Geoscope Landscape Fabric or approved equal.

2.5 GRASSING

- A. The CONTRACTOR shall grass all unpaved areas disturbed during construction which do not require sod. All grassing shall be completed in conformance with FDOT Specifications Sections 570 and 981. The grassed areas shall be mulched and fertilized in accordance with FDOT Specifications.

- B. Grass seed shall be Argentine Bahia, 60 #/acre March 1 to November 1, 50 #/acre with 20 #/acre of rye grass seed November 1 to March 1. Argentine Bahia seed shall be a scarified seed having a minimum active germination of 40% and total of 85%.
- C. Mulch material shall be free of weeds and shall be oat straw or rye, Pangola, peanut, Coastal Bermuda, or Bahia grass hay.

2.6 TOPSOIL

- A. Topsoil stockpiled during excavation may be used. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the OWNER. Topsoil shall be fertile, natural surface soil, capable of producing all trees, plants, and grassing specified herein.

2.7 MULCH

- A. Mulch shall be fresh cypress mulch. Rate of application specified herein shall correspond to depth not less than 1-inch or more than 3-inches according to texture and moisture content of mulch material.

2.8 WATER

- A. It is the CONTRACTOR'S responsibility to supply all water to the site, as required during seeding and sodding operations and through the maintenance period and until the work is accepted. The CONTRACTOR shall make whatever arrangements may be necessary to ensure an adequate supply of water to meet the needs for his work. He shall also furnish all necessary hose, equipment, attachments, and accessories for the adequate irrigation of lawns and planted areas as may be required. Water shall be suitable for irrigation and free from ingredients harmful to plant life.

PART 3 EXECUTION

3.1 SOD BED PREPARATION

- A. Areas to be sodded and/or seeded shall be cleared of all rough grass, weeds, and debris, and brought to an even grade.
- B. The soil shall then be thoroughly tilled to a minimum 8-inch depth.
- C. The areas shall then be brought to proper grade, free of sticks, stones, or other foreign matter over 1-inch in diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.2 INSPECTION

- A. Verify that soil preparation and related preceding work has been completed.
- B. Do not start work until conditions are satisfactory.

3.3 SOD HANDLING AND INSTALLATION

- A. During delivery, prior to planting, and during the planting of sod areas, the sod panels shall at all times be protected from excessive drying and unnecessary exposure of the roots to the sun. All sod shall be stacked during construction and planting so as not to be damaged by sweating or excessive heat and moisture.
- B. After completion of soil conditioning as specified above, sod panels shall be laid tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope. Immediately following sod laying the lawn areas shall be rolled with a lawn roller customarily used for such purposes, and then thoroughly watered.
- C. Sod shall be placed at all areas where sod existed prior to construction, on slopes of 3 horizontal on 1 vertical (3:1) or greater, in areas where erosion of soils will occur, and as directed by the ENGINEER. On areas where the sod may slide, due to height and slope, the ENGINEER may direct that the sod be pegged, with pegs driven through the sod blocks into firm earth, at suitable intervals.

3.4 SOD MAINTENANCE

- A. The sod shall produce a dense, well established growth. The CONTRACTOR shall be responsible for the repair and re-sodding of all eroded or bare spots until project acceptance. Repair to sodding shall be accomplished as in the original work.
- B. Sufficient watering shall be done by the CONTRACTOR to maintain adequate moisture for optimum development of the seeded and sodded areas. Sodded areas shall receive no less than 1.5 inches of water per week for at least 2 weeks. Thereafter, the CONTRACTOR shall apply water for a minimum of 60 days as needed until the sod takes root and starts to grow or until final acceptance, whichever is latest.

3.5 CLEANING

- A. Remove debris and excess materials from the project site.

END OF SECTION

SECTION 02530

GROUNDWATER CONTROL FOR OPEN CUT EXCAVATION

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. This section provides for furnishing all labor, materials, equipment, power and incidentals for performing all operations necessary to dewater, depressurize, drain and maintain excavations as described herein and as necessary for installation of pipeline and appurtenances. Included are installing, maintaining, operating and removing dewatering systems and other approved devices for the control of surface and groundwater during the construction of open cut excavations, directional drilling, pipelines and appurtenances, and protecting work against rising waters and repair of any resulting damage.

1.2 CONTRACTOR'S RESPONSIBILITY

- A. It is the sole responsibility of the CONTRACTOR to identify groundwater conditions and to provide any and all labor, material, equipment, techniques and methods to lower, control and handle the groundwater as necessary for his construction methods and to monitor the effectiveness of this installed system and its effect on adjacent facilities.
- B. Operate, maintain and modify the system(s) as required to conform to these Specifications. Upon completion of the Construction, CONTRACTOR shall remove the system(s). The development, drilling and abandonment of all wells used in the dewatering system shall comply with regulations of the Florida Department of Environmental Protection and the governing Water Management District.
- C. Assume sole responsibility for dewatering systems and for all loss or damage resulting from partial or complete failure of protective measures and any settlement or resultant damage caused by the dewatering operation.
- D. It is the CONTRACTOR's responsibility to obtain any necessary dewatering permits.

1.3 PLANS AND OTHER DATA TO BE SUBMITTED

- A. Prior to commencement of work, submit complete drawings, details and layouts showing the proposed dewatering plans in accordance with Section 01300. The submittals shall be sufficiently detailed (i.e., general arrangements, procedures to be used, etc.) to allow the ENGINEER to evaluate the proposed dewatering

systems. Include the following, as required by the CONTRACTOR's proposed operation:

1. Names of equipment suppliers.
2. Names of installation subcontractors.
3. Plan for dewatering at access shafts and control of surface drainage.
4. Plan for dewatering for cut-and-cover excavations, or otherwise controlling groundwater.
5. Eductor system layout and details.
6. Deep well locations and details.
7. Well point system layout and details.
8. Installation reports for eductors, deep wells and well points.
9. Water level readings from piezometers or observation wells, and method of maintenance.
10. As part of his request for approval of a dewatering system, demonstrate the adequacy of the proposed system and well point filler sand by means of a test installation.

PART 2 PRODUCTS

- A. Select equipment including but not limited to pumps, eductors, well points and piping and other material desired.

PART 3 EXECUTION

3.1 DEWATERING EXCAVATIONS

- A. Furnish, install, operate and maintain all necessary equipment for dewatering the various parts of the Work and for maintaining free of water the excavations and such other parts of the Work as required for Construction operations. Dewatering system should provide for continuous operation including nights, weekends, holidays, etc. Appropriate backup shall be provided if electrical power is primary energy source for dewatering system.

- B. Continue dewatering in all required areas, until the involved work is completed, including the placing and compaction of backfill materials in the dry.
- C. Provide a uniform diameter for each pipe drain run constructed for dewatering. Remove the pipe drain when it has served its purpose. If removal of the pipe is impractical, provide grout connections at 50-foot intervals, and fill the pipe with clay grout or cement and sand grout when the pipe has served its purpose.

3.2 DEWATERING TRENCH

- A. No pipeline shall be laid in a trench in the presence of water. All water shall be removed from the trench sufficiently ahead of the pipeline placing operation. The ENGINEER shall have full and final authority to require dewatering of the trench to ensure a dry, firm bed on which to place the pipeline. As a minimum, water levels shall be maintained at least 6 inches below the bottom of the trench. Trench shall continue to be dewatered until trench backfilling operations have been completed.
- B. Removal of water may be accomplished by pumping or pumping in connection with well point installation as the particular situation may warrant.
- C. If the soils encountered at the trench grade are suitable for the passage of water, without destroying the sides or utility foundation of the trench, sumps may be provided at intervals at the side of the main trench excavation. Pumps shall be used to lower the water level by taking their suction from said sumps.

3.3 REQUIREMENTS FOR EDUCTOR, WELL POINTS OR DEEP WELLS

- A. Eductor, well points or deep wells, where used, must be furnished, installed and operated by a reputable CONTRACTOR regularly engaged in this business, and approved.
- B. Submit the design criteria of the dewatering system and a certification that the system was designed according to that criteria.
- C. Install sufficient piezometers or observation wells to show that all trench excavation in sandy material is predrained prior to excavation. Install piezometers or observation wells not less than 1 week in advance of beginning of nearest excavation.
- D. Dewatering may be omitted for portions of underdrains or other trenches, only where auger borings and piezometers or observation wells show that the soil is predrained by an exterior system.

3.4 MAINTENANCE AND OBSERVATION

- A. Maintenance and observation of piezometers or observation wells is the responsibility of the CONTRACTOR and shall consist of keeping them in good condition and observing and recording the elevation of the water level daily, as long as the dewatering system is in operation, and weekly thereafter until the work is completed or the piezometers or wells are removed.
- B. Submit a record of the water level to the ENGINEER each day.
- C. Replace damaged and destroyed piezometers or observation wells, unless otherwise accepted by the ENGINEER, with new piezometers or wells within 48 hours, at no additional cost to the County.
- D. Cut off piezometers or observation wells in excavation areas, where exposed, as excavation proceeds, and continue to maintain and make observations as specified.
- E. Remove, backfill or grout piezometers or observation wells inside or outside the excavation area, as approved by the ENGINEER.

3.5 DURATION OF DRAINAGE

- A. In areas where concrete is to be placed, carry out the foundation drainage so that the required lowering of the water table will be effected prior to placing reinforcing steel. Keep foundation beds free from water to the same levels for 3 days after placing concrete.

3.6 PROTECTION OF STRUCTURES

- A. Provide adequate protection for all structures to avoid damage to concrete.
- B. Operate construction equipment over completed concrete slabs or structures only with approval. Rubber tire equipment heavier than 5 tons and crawlers heavier than 7 tons will require adequate load spreading by sand fill or other means.

3.7 DISCHARGE OF WATER

- A. Do not discharge pumped drainage water into the sanitary sewer system or inhibit pedestrian or vehicular traffic with the groundwater control system.
- B. Discharge pumped drainage water into the storm sewer system or drainage ditch by direct means (i.e., discharge hose to inlet, burying header, etc.). Monitor the discharged water to determine that soil particles are not being removed.

- C. All discharge shall be in conformance with regulatory permits and if discharged into receiving waters, shall not exceed 29 NTU's above background.

3.8 REPAIR OF DAMAGE

- A. Assume full responsibility for all loss and damage due to flooding, rising water or seepage resulting from dewatering operations in any part of the work. Repair any damage to partially completed work from these or other causes, including the removal of slides, repair of foundation beds and performance of any other work necessitated by lack of adequate dewatering or drainage facilities.

END OF SECTION

SECTION 02575

PAVEMENT REPAIR AND RESTORATION

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required and remove and replace pavements due to repairs to existing manholes or sanitary sewer lines as shown on the drawings and/or specified herein.

1.2 GENERAL

- A. All damage, as a result of work under this project, done to existing pavement, driveways, paved areas, curbs and gutters, sidewalks, shrubbery, grass, trees, utility poles, utility pipe lines, conduits, drains, catch basins, or stabilized areas or driveways and including all obstructions not specifically named herein, shall be repaired in a manner satisfactory to the ENGINEER. Bid prices shall include the furnishing of all labor, materials, equipment, and incidentals necessary for the cutting, repair, and restoration of the damaged areas unless pay items for specific types of repair are included in the Bid Form.
- B. Keep the surface of the backfilled area of excavation in a safe condition and level with the remaining pavement until the pavement is restored in the manner specified herein. All surface irregularities that are dangerous or obstructive to traffic are to be removed. The repair shall conform to applicable OWNER or State requirements for pavement repair and as described herein.
- C. All materials and workmanship shall be first class and nothing herein shall be construed as to relieve the CONTRACTOR from this responsibility. The OWNER reserves the right to require soil bearing or loading tests or materials tests, should the adequacy of the foundation or the quality of materials used be questionable. Costs of these tests shall be borne by the CONTRACTOR, if found acceptable; the costs of all failed tests shall be borne by the CONTRACTOR at no additional cost to the OWNER.
- D. All street and road repair shall be made in accordance with the details indicated on the drawings and in accordance with the applicable requirements of these Specifications and meeting the permit requirements and approval of the governing Department of Transportation agencies.
- E. Pavement or roadway surfaces cut or damaged shall be replaced by the CONTRACTOR in equal or better condition than the original, including stabilization, base course, surface course, curb and gutter or other appurtenances. The CONTRACTOR shall obtain the necessary permits prior to

any roadway work. Additionally, the CONTRACTOR shall provide advance notice to the appropriate authority, as required, prior to construction operations.

1. Roadway Restoration (within Lee County Department of Transportation & Engineering jurisdiction): Restoration shall be in accordance with the requirements set forth in the "Right-of-Way Utility Construction Activities Policy" and these Standards. The materials of construction and method of installation, along with the proposed restoration design for items not referred or specified herein, shall receive prior approval from Lee County DOT.
 - a. Where existing pavement is to be removed, the surface shall be mechanical saw cut prior to excavation, leaving a uniform and straight edge parallel or perpendicular to the roadway centerline with minimum disturbance to the remaining adjacent surfacing. The width of cut for this phase of existing pavement removal shall be minimal.
 - b. Immediately following the specified backfilling and compaction, a temporary sand seal coat surface shall be applied to the cut areas. This temporary surfacing shall provide a smooth traffic surface with the existing roadway and shall be maintained until final restoration. Said surfacing shall remain for a minimum of ten (10) days in order to assure the stability of the backfill under normal traffic conditions. Thirty (30) days following this period and prior to sixty (60) days after application, the temporary surfacing shall be removed and final roadway surface restoration accomplished.
 - c. In advance of final restoration, the temporary surfacing shall be removed and the existing pavement mechanically sawed straight and clean to the stipulated dimensions, if needed. Following the above operation, the CONTRACTOR shall proceed immediately with final pavement restoration in accordance with the requirements set forth by Lee County Department of Transportation.
2. Roadway Restoration (outside Lee County Department of Transportation jurisdiction) – Work within the rights-of-way of public thoroughfares which are not under jurisdiction of Lee County, shall conform to the requirements of the Governmental agency having jurisdiction or the Florida Department of Transportation, if no governmental agencies have jurisdiction. Work within State Highway right-of-way shall be in full compliance with all requirements of the permit drawings, and to the satisfaction of the Florida Department of Transportation.

1.3 QUALITY ASSURANCE

- A. Applicable provisions of the latest version of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", and

Supplemental Specifications hereunder govern the work under this Section. The Florida Department of Transportation will hereafter be referred to as FDOT.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials utilized in flexible base pavement and base course shall be as specified in the latest version of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction".

PART 3 EXECUTION

3.1 CUTTING PAVEMENT

- A. Cut and remove pavement as necessary for installing the new pipelines and appurtenances and for making connections to existing pipelines.
- B. Before removing pavement, the pavement shall be marked for cuts nearly paralleling pipelines and existing street lines. Asphalt pavement shall be cut along the markings with a jackhammer, rotary saw, or other suitable tool, leaving a uniform and straight edge with minimum disturbance to the remaining adjacent surface.
- C. No pavement shall be machine pulled until completely broken and separated along the marked cuts.
- D. The adjacent pavement shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, the CONTRACTOR shall remove the damaged pavement and shall replace it at his own expense.

3.2 GENERAL RESTORATION

- A. The restoration of existing street paving, driveways, etc., shall be restored, replaced or rebuilt using the same type of construction as was in the original. Be responsible for restoring all such work, including sub-grade and base courses where present. Obtain and pay for such local or other governmental permits as may be necessary for the opening of streets. Meet any requirements other than those herein set forth which may effect the type, quality and manner of carrying on the restoration of surfaces by reason of jurisdiction of such governmental bodies.
- B. In all cases, maintain, without additional compensation, all permanent replacement of street paving, done by him under this Contract until accepted by the OWNER, including the removal and replacement of such work wherever surface depressions or underlying cavities result from settlement of trench backfill.

- C. Complete all the final resurfacing or re-paving of streets or roads, over the excavations and relay paving surfaces of roadbed that have failed or been damaged prior to acceptance by the OWNER. Backfilling of trenches and the preparation of sub-grades shall conform to the requirements of Section 02223.
- D. All re-paving or resurfacing shall be done in accordance with Florida Department of Transportation Specifications, to which the following requirement of trench backfill will be added: Where excavations crossed paved areas such as streets, the top 24 inches below the road bases or concrete slabs shall be backfilled with compacted A-4 or better matter that will provide a bearing value of not less than 75 when tested by the Florida Department of Transportation Soil Bearing Test Methods.

3.3 PRIME AND TACK COATS

- A. The work shall consist of the application of bituminous prime and tack coats on the previously prepared base course in accordance with Section 300 of the FDOT Specifications.

3.4 WEARING COURSE

- A. The work shall consist of the construction of plant-mixed hot bituminous pavement conforming to Type III asphaltic concrete in accordance with Section 333 of the FDOT Specifications to match the thickness of the existing pavement, unless otherwise indicated on the drawings. The requirements for plant and equipment are specified in Section 320 and the general construction requirements for asphaltic concrete pavement are contained in Section 330 of the FDOT specifications.

3.5 TESTING

- A. All field testing shall be performed by an independent laboratory employed by the CONTRACTOR. All materials shall be tested and certified by the producer. Tests repeated because sub-grade or base does not meet specified compaction shall be at the CONTRACTOR's expense.

3.6 MISCELLANEOUS RESTORATION

- A. Sidewalks cut or damaged by construction shall be restored in full sections or blocks to a minimum thickness of four inches. Concrete curb or curb gutter shall be restored to the existing height and cross section in full sections or lengths between joints. Concrete shall be as specified on the drawings. Grassed yards, shoulders and parkways shall be restored to match the existing sections with grass seed or sod of a type matching the existing grass.

3.7 CLEANUP

- A. After all repair and restoration or paving has been completed, all excess asphalt, dirt, and other debris shall be removed from the roadways. All existing storm sewers and inlets shall be checked and cleaned of any construction debris.

END OF SECTION

SECTION 02603

SHERFLEX COATING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification covers all labor, materials, equipment and services necessary to complete the manhole rehabilitation work using the SherFlex Elastomeric Polyurethane Coasting System as herein specified.
- B. Related Sections:
 - a. Section 01026 – Measurement and Payment
 - b. Section 01300 – Submittals
 - c. Section 02654 – Manhole Lining

1.2 REFERENCES

- A. SSPC-SP13/NACE6, or ICRI 03732, CSP 3-5 – Surface Preparation of Concrete

1.3 SUBMITTALS

A. Product Data

- a. Technical data sheet on each project used.
- b. Material Safety Data Sheet (MSDS) for each product used.
- c. Copies of independent testing performed on the coating product indicating the product meets the requirements as specified herein.
- d. Technical data sheet and project specific data for repair materials to be topcoated with the coating product(s) including application, cure time and surface preparation procedures.

B. Contractor Data:

- a. Current documentation from coating product manufacturer certifying contractor's training and equipment complies with the Quality assurance requirements specified herein.

- b. Five (5) recent references of Contractor indicating successful application of coating product(s) of the same material type as specified herein, applied by spray application within the municipal wastewater environment.

1.4 QUALITY ASSURANCE

- A. Coating product(s) shall be capable of being installed and curing properly within a manhole environment. Coating product(s) shall be resistant to all forms of chemical or bacteriological attack found in municipal sanitary sewer systems; capable of adhering to the manhole structure substrates.
- B. Repair product(s) shall be fully compatible with coating product(s) including ability to bond effectively forming a composite system.
- C. Contractor shall utilize equipment for the spray application of the coating product(s) which have been approved by the coating product manufacturer; and, Contractor shall have received training on the operation and maintenance of said equipment from the coating product manufacturer.
- D. Contractor shall be certified by the coating product manufacturer for the handling, mixing, application and inspection of the coating product(s) to be used as specified herein.
- E. Contractor shall initiate and enforce quality control procedures consistent with the coating product(s) manufacturer recommendations and applicable NACE or SSPC standards as referenced herein.

1.5 DELIVERY, STORAGE AND HANDLING

- A. Materials are to be stored indoors and kept dry and protected from weather.
- B. Protective coating materials are to be stored between 40° F and 100° F. Do not agitate in air and moisture.
- C. Protective coating materials are to be handled according to their material safety data sheets.

1.6 SITE CONDITIONS

- A. All pipes in service shall be plugged or bypassed before any work is started on the structure. No debris is to be flushed down the line.
- B. Contractor shall conform with all local, state and federal regulations including those set forth by OSHA, RCRA, and the EPA and any other applicable authorities.

- C. Anyone entering the structure must conform to all OSHA requirements for “Confined Space Entry” equipment and permitting.
- D. Surface preparation shall meet the requirements of SherFlex Data Sheets on Concrete Preparation and interior surfaces of manhole shall be sound, porous, dry, and free of dust, dirt, oil, grease and other contaminants prior to application of lining.
- E. Interior surface of structure must be pressure washed at 5,000 psi and must be abrasive-blasted to remove all loose patching, old coatings and any contamination in the concrete. No silica sand shall be used.
 - a. “New” structures shall be abrasive-blasted to remove all oils and patch mud and to open pin holes and expose aggregate.
 - b. “Rehab” structures shall be abrasive-blasted to remove all loose patching, old coatings, and any contamination that penetrated the concrete. The finished interior of the structure shall be gray. The exposed invert/floor shall also be coated. Where there is severe deterioration of the mortar, place new concrete to match the original interior dimensions after abrasive-blasting and removal of all loose material and by-products of corrosion. Restore invert/floor to the original elevation.
 - c. Vacuum to remove all abrasives and debris.
- F. Repair all leaks by injecting grout. Hydraulic cement shall not be used to stop any water leaks.
- G. Clean and remove dust material with pressure washing for maximum adhesion. Blow dry concrete at 250 cfm with 120 psi.

1.7 SPECIAL WARRANTY

- A. Contractor shall warrant all work against defects in materials and workmanship for a period of ten (10) years, unless otherwise noted, from the date of final acceptance of the project. Contractor shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship which may develop during said ten (10) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the owner.

PART 2 PRODUCTS

2.1 EXISTING SURFACE

- A. Standard Portland cement or new concrete (not quick setting high strength cement) must be cured a minimum of 28 days prior to application of the coating product(s).
- B. Remove existing coatings prior to application of the coating product(s) which may affect the performance and adhesion of the coating product(s).
- C. Thoroughly clean and prepare existing products to effect a seal with the coating product(s).

2.2 REPAIR AND RESURFACEING PRODUCTS

- A. Repair products shall be used to fill voids, bugholes, and/or smooth transitions between components prior to the installation of the coating product(s). Repair materials must be compatible with the specified coating product(s) and shall be used and applied in accordance with the manufacturer's recommendations.
- B. Resurfacing products shall be used to fill large voids, lost mortar in masonry structures, smooth deteriorated surfaces and rebuild severely deteriorated structures.
- C. The following products may be accepted and approved as compatible repair and resurfacing products for use within the specifications:
 - a. 100% solids, solvent-free epoxy grout specifically formulated for epoxy topcoating compatibility.
 - b. Factory blended, repair setting, high early strength, fiber reinforced, non-shrink repair mortar that can be trowelled or pneumatically spray applied may be approved if specifically formulated to be suitable for topcoating with the specified coating product(s).

2.3 COATING PRODUCTS

- A. Manufacturer: The Sherwin-Williams Company, Cleveland, OH
- B. Product: SherFlex Elastomeric Polyurethane – 100% solids, spray applied, aromatic polyurethane coating and lining system exhibiting the following characteristics:
 - a. Product Type: Elastomeric Polyurethane coating and lining

- b. VOC Content: 0
- c. Adhesion to Concrete (ASTM D-4541): 350 psi (concrete failure)
- d. Dielectric Strength (ASTM D149-92a, method A): 430 volts/mil
- e. Tensile Strength (ASTM D-638): 1988 psi at 25° C
- f. Chemical Resistant

2.4 COATING APPLICATION EQUIPMENT

- A. Manufacture approved spray application equipment

PART 3 EXECUTION

3.1 EXAMINATION

- A. Appropriate actions shall be taken by contractor to comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety during work.
- B. All structures to be coated shall be readily accessible to Contractor.
- C. New Portland cement concrete structures shall have endured a minimum of 28 days since manufacture prior to commencing coating installation.
- D. Any active flows shall be dammed, plugged or diverted as required to ensure all liquids are maintained below or away from the surfaces to be coated.
- E. Temperature of the surface to be coated should be maintained between -20° F and 120° F.
- F. Maximum Relative Humidity to be 85%.
- G. Specified surfaces should be shielded to avoid exposure of direct sunlight or other intense heat source. Where varying surface temperature do exist, coating installation should be scheduled when the temperature is falling versus rising.
- H. Prior to commencing surface preparation, Contractor shall inspect all surfaces specified to receive the coating and notify Owner, in writing, of any noticeable disparity in the site, structure or surfaces which may interfere with the work, use of materials or procedures as specified herein.

3.2 SURFACE PREPARATION

- A. Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the coating to the substrate shall be removed.
- B. Concrete and/or mortar damaged by corrosion, chemical attack or other means of degradation shall be removed so that the only sound substrate remains.
- C. Choice of surface preparation method(s) should be based upon the condition of the structure and concrete or masonry surface, potential contaminants present, access to perform work, and required cleanliness and profile of the prepared surface to receive the coating product(s).
- D. Surface preparation method, or combination of methods, that may be used include high pressure water cleaning, high pressure water jetting, abrasive blasting, shotblasting, grinding, scarifying, detergent water cleaning, hot water blasting and others described in NACE no. 6/SSPC SP-13. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface suitable for topcoating with the coating product(s).
- E. Infiltration shall be stopped by using a material which is compatible with the repair products and is suitable for topcoating with the coating product(s).
- F. Termination points of the coating product(s) shall be made at the bottom of the manhole frame, and a minimum of 1" interfacing with each pipe penetration. The manhole frame and casting shall not be coated.

3.3 APPLICATION OF REPAIR AND RESURFACING PRODUCTS

- A. Areas where rebar has been exposed and is corroded shall be first prepared in accordance with Section 3.2. The exposed rebar shall then be abrasive blasted and coated with coating product specified.
- B. Repair products shall be used to fill voids, bugholes, and other surface defects which may affect the performance or adhesion of the coating product(s).
- C. Resurfacing products shall be used to repair, smooth or rebuild surfaces with rough profiles to provide a concrete or masonry substrate suitable for the coating product(s) to be applied. These products shall be installed to minimum thickness as recommended within manufacturers published guidelines.
- D. Repair and resurfacing products shall be handled, mixed, installed and cured in accordance with manufacturer guidelines.

- E. All repaired or resurfaces shall be inspected for cleanliness and suitability to receive the coating product(s). Additional surface preparation may be required prior to coating application.

3.4 APPLICATION OF COATING PRODUCT(S)

- A. Application procedures shall conform to the recommendations of the coating product(s) manufacturer, including environmental controls, product handling, mixing, application equipment and methods.
- B. Spray equipment shall be specifically designed to accurately ratio and apply the coating product(s) and shall be in proper working order.
- C. Contractors qualified in accordance with Section 1.4 of these specifications shall perform all aspects of coating product(s) installation.
- D. Prepared surfaces shall be coated by spray application of the coating product(s) described herein to a minimum wet film thickness of 175 mils.
- E. Subsequent topcoating or additional coats of the coating product(s) shall occur within the products recoat window. Additional surface preparation procedures will be required if this recoat window is exceeded.
- F. Coating product(s) shall interface with adjoining construction materials throughout the manhole structure to effectively seal and protect concrete or masonry substrates from infiltration and attack by corrosive elements. Procedures and materials necessary to effect this interface shall be as recommended by the coating product(s) manufacturer.
- G. Termination points of the coating product(s) shall be made at the bottom of the manhole frame, and a minimum of 1" interfacing with each pipe penetration. The manhole frame and casting shall not be coated.
- H. Manhole inverts shall be coated.
- I. Sewage flow shall be stopped, bypassed or diverted for application of the coating product(s) to the invert and interface with pipe material.

3.5 TESTING AND INSPECTION

- A. During application a wet film thickness gauge, meeting ASTM D4414-Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used. Measurements shall be taken, documented and attested to by Contractor for submission to Owner.

- B. After the coating product(s) have set in accordance with manufacturer instructions, all surfaces shall be inspected for holidays with high voltage holiday detection equipment. Reference NACE RPO 188-99 for performing holiday detection. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional coating can be hand applied to the repair area. All touch-up/repair procedures shall follow the coating manufacturer's recommendations. Documentation on areas tested, results and repairs made shall be provided to Owner by Contractor.
- C. Visual inspection shall be made by the project Engineer and/or Inspector. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by contractor.
- D. The municipal sewer system may be returned to full operational service as soon as the final inspection has taken place.

END OF SECTION

SECTION 02604

RAVEN COATING SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

- A. This specification covers all labor, materials, equipment and services necessary to complete the manhole rehabilitation work using the Raven Coating System as herein specified.
- B. Related sections:
 - a. Section 01026 – Measurement and Payment
 - b. Section 01300 – Submittals
 - c. Section 02654 – Manhole Lining

1.2 REFERENCES

- A. SSPC SP-13/Nace No. 6 – Surface Preparation of Concrete
- B. ASTM – The published standards of the American Society for Testing and Materials, West Conshohocken, PA.
- C. NACE – The published standards of National Association of Corrosion Engineers (NACE International) Houston, TX.
- D. SSPC – The published standards of the Society of Protective Coatings, Pittsburgh, PA.

1.3 SUBMITTALS

- A. Product Data
 - a. Technical data sheet on each product used.
 - b. Material Safety Data Sheet (MSDS) for each product used.
 - c. Copies of independent testing performed on the coating product indicating the product meets the requirements as specified herein.
 - d. Technical data sheet and project specific data for repair materials to be topcoated with the coating product(s) including application, cure time and surface preparation procedures.

B. Contractor Data:

- a. Current documentation from coating product manufacturer certifying contractor's training and equipment complies with the Quality assurance requirements specified herein.
- b. Five (5) recent references of Contractor indicating successful application of coating product(s) of the same material type as specified herein, applied by spray application within the municipal wastewater environment.

1.4 QUALITY ASSURANCE

- A. Coating product(s) shall be capable of being installed and curing properly within a manhole environment. Coating product(s) shall be resistant to all forms of chemical or bacteriological attack found in municipal sanitary sewer systems; capable of adhering to the manhole structure substrates.
- B. Repair product(s) shall be fully compatible with coating product(s) including ability to bond effectively forming a composite system.
- C. Contractor shall utilize equipment for the spray application of the coating product(s) which have been approved by the coating product manufacturer; and, Contractor shall have received training on the operation and maintenance of said equipment from the coating product manufacturer.
- D. Contractor shall be certified by the coating product manufacturer for the handling, mixing, application and inspection of the coating product(s) to be used as specified herein.
- E. Inspectors shall be trained in the use of testing or inspection instrumentation and knowledgeable of the proper use, preparation and installation of coating product(s) to be used as specified herein.
- F. Contractor shall initiate and enforce quality control procedures consistent with the coating product(s) manufacturer recommendations and applicable NACE or SSPC standards as referenced herein.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Materials are to be kept dry, protected from weather and stored under cover.
- B. Protective coating materials are to be stored between 50° F and 90° F. Do not store near flame, heat or strong oxidants.

- C. Protective coating materials are to be handled according to their material safety data sheets.

1.6 SITE CONDITIONS

- A. Contractor shall conform with all local, state and federal regulations including those set forth by OSHA, RCRA, and the EPA and any other applicable authorities.
- B. Confined space entry, flow diversion and/or bypass plans shall be presented by Contractor as necessary to perform the specified work.

1.7 SPECIAL WARRANTY

- A. Contractor shall warrant all work against defects in materials and workmanship for a period of ten (10) years, unless otherwise noted, from the date of final acceptance of the project. Contractor shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship which may develop during said ten (10) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the owner.

PART 2 PRODUCTS

2.1 EXISTING PRODUCTS

- A. Standard Portland cement or new concrete (not quick setting high strength cement) must be cured a minimum of 28 days prior to application of the coating product(s).
- B. Remove existing coatings prior to application of the coating product(s) which may affect the performance and adhesion of the coating product(s).
- C. Thoroughly clean and prepare existing products to effect a seal with the coating product(s).

2.2 REPAIR AND RESURFACING PRODUCTS

- A. Repair products shall be used to fill voids, bugholes, and/or smooth transitions between components prior to the installation of the coating product(s). Repair materials must be compatible with the specified coating product(s) and shall be used and applied in accordance with the manufacturer's recommendations.

- B. Resurfacing products shall be used to fill large voids, lost mortar in masonry structures, smooth deteriorated surfaces and rebuild severely deteriorated structures.
- C. The following products may be accepted and approved as compatible repair and resurfacing products for use within the specifications:
 - a. 100% solids, solvent-free epoxy grout specifically formulated for epoxy topcoating compatibility.
 - b. Factory blended, repair setting, high early strength, fiber reinforced, non-shrink repair mortar that can be trowelled or pneumatically spray applied may be approved if specifically formulated to be suitable for topcoating with the specified coating product(s).

2.3 COATING PRODUCTS

- A. Manufacturer: Raven Lining Systems, Broken Arrow, Oklahoma 800-324-2810, 918-615-0020 or FAX 918-615-0140.
- B. Product: Raven 405 – 100% solids, solvent-free ultra high-build epoxy system exhibiting the following characteristics:
 - a. Product Type: amine cured epoxy
 - b. VOC Content (ASTM D2584): 0%
 - c. Compressive Strength, psi (ASTM D695): 18,000 (minimum)
 - d. Tensile Strength, psi (ASTM D638): 7,500 (minimum)
 - e. Flexural Modulus, psi (ASTM D790): 600,000 (minimum)
 - f. Adhesion to Concrete, mode of failure (ASTM D4541): Substrate (concrete) failure
 - g. Chemical Resistance (ASTM D543/G20) all types of service for:
 - i. Municipal sanitary sewer environment
 - ii. Sulfuric acid, 25%
 - iii. Hydrogen Sulfide Gas, All concentrations
 - iv. Sodium hydroxide, 5%

2.4 COATING APPLICATION EQUIPMENT

- A. Manufacturer approved heated plural component spray equipment.

- B. Hard to reach areas, primer application and touch-up may be performed using hand tools.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Appropriate actions shall be taken by contractor to comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety during work.
- B. All structures to be coated shall be readily accessible to Contractor.
- C. New Portland cement concrete structures shall have endured a minimum of 28 days since manufacture prior to commencing coating installation.
- D. Any active flows shall be dammed, plugged or diverted as required to ensure all liquids are maintained below or away from the surfaces to be coated.
- E. Temperature of the surface to be coated should be maintained between 40° F and 120° F.
- F. Specified surfaces should be shielded to avoid exposure of direct sunlight or other intense heat source. Where varying surface temperature do exist, coating installation should be scheduled when the temperature is falling versus rising.
- G. Prior to commencing surface preparation, Contractor shall inspect all surfaces specified to receive the coating and notify Owner, in writing, of any noticeable disparity in the site, structure or surfaces which may interfere with the work, use of materials or procedures as specified herein.

3.2 SURFACE PREPARATION

- A. Oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants which may affect the performance and adhesion of the coating to the substrate shall be removed.
- B. Concrete and/or mortar damaged by corrosion, chemical attack or other means of degradation shall be removed so that the only sound substrate remains.
- C. Choice of surface preparation method(s) should be based upon the condition of the structure and concrete or masonry surface, potential contaminants present, access to perform work, and required cleanliness and profile of the prepared surface to receive the coating product(s).

- D. Surface preparation method, or combination of methods, that may be used include high pressure water cleaning, high pressure water jetting, abrasive blasting, shotblasting, grinding, scarifying, detergent water cleaning, hot water blasting and others described in NACE no. 6/SSPC SP-13. Whichever method(s) are used, they shall be performed in a manner that provides a uniform, sound clean neutralized surface suitable for topcoating with the coating product(s).
- E. Infiltration shall be stopped by using a material which is compatible with the repair products and is suitable for topcoating with the coating product(s).
- F. Termination points of the coating product(s) shall be made at the bottom of the manhole frame, and a minimum of 1" interfacing with each pipe penetration. The manhole frame and casting shall not be coated.

3.3 APPLICATION OF REPAIR AND RESURFACING PRODUCTS

- A. Areas where rebar has been exposed and is corroded shall be first prepared in accordance with Section 3.2. The exposed rebar shall then be abrasive blasted and coated with coating product specified.
- B. Repair products shall be used to fill voids, bugholes, and other surface defects which may affect the performance or adhesion of the coating product(s).
- C. Resurfacing products shall be used to repair, smooth or rebuild surfaces with rough profiles to provide a concrete or masonry substrate suitable for the coating product(s) to be applied. These products shall be installed to minimum thickness as recommended within manufacturers published guidelines.
- D. Repair and resurfacing products shall be handled, mixed, installed and cured in accordance with manufacturer guidelines.
- E. All repaired or resurfaces shall be inspected for cleanliness and suitability to receive the coating product(s). additional surface preparation may be required prior to coating application.

3.4 APPLICATION OF COATING PRODUCT(S)

- A. Application procedures shall conform to the recommendations of the coating product(s) manufacturer, including environmental controls, product handling, mixing, application equipment and methods.
- B. Spray equipment shall be specifically designed to accurately ratio and apply the coating product(s) and shall be in proper working order.
- C. Contractors qualified in accordance with Section 1.4 of these specifications shall perform all aspects of coating product(s) installation.

- D. Prepared surfaces shall be coated by spray application of the coating product(s) described herein to a minimum wet film thickness of 175 mils.
- E. Subsequent topcoating or additional coats of the coating product(s) shall occur within the products recoat window. Additional surface preparation procedures will be required if this recoat window is exceeded.
- F. Coating product(s) shall interface with adjoining construction materials throughout the manhole structure to effectively seal and protect concrete or masonry substrates from infiltration and attack by corrosive elements. Procedures and materials necessary to effect this interface shall be as recommended by the coating product(s) manufacturer.
- G. Termination points of the coating product(s) shall be made at the bottom of the manhole frame, and a minimum of 1" interfacing with each pipe penetration. The manhole frame and casting shall not be coated.
- H. Manhole inverts shall be coated.
- I. Sewage flow shall be stopped, bypassed or diverted for application of the coating product(s) to the invert and interface with pipe material.

3.5 TESTING AND INSPECTION

- A. During application a wet film thickness gauge, meeting ASTM D4414-Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used. Measurements shall be taken, documented and attested to by Contractor for submission to Owner.
- B. After the coating product(s) have set in accordance with manufacturer instructions, all surfaces shall be inspected for holidays with high voltage holiday detection equipment. Reference NACE RPO 188-99 for performing holiday detection. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional coating can be hand applied to the repair area. All touch-up/repair procedures shall follow the coating manufacturer's recommendations. Documentation on areas tested, results and repairs made shall be provided to Owner by Contractor.
- C. Visual inspection shall be made by the project Engineer and/or Inspector. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by contractor.
- D. The municipal sewer system may be returned to full operational service as soon as the final inspection has taken place.

END OF SECTION

SECTION 02606

IET COATING SYSTEM

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. This section provides details for furnishing and installing the Integrated Environmental Technologies (IET) coating system where shown on the drawings for protection of concrete structures against hydrogen sulfide corrosion. Coating materials shall be as manufactured by Integrated Environmental Technologies or approved equal. Installation shall be performed by workers experienced in the application of the coating to be used.

PART 2 PRODUCTS

2.1 IET COATING SYSTEM

- A. The IET Coating System shall be as distributed by Integrated Environmental Technologies, Santa Barbara, CA, or equal.
- B. Polymorphic Resin shall be a 100% solids, two-component, highly modified polyester resin system, exhibiting no adhesion-interfering shrinkage upon curing. Resin shall cure rapidly within fifteen minutes to one hour without the use of heat or cooling at surface temperatures ranging from -30 degrees Fahrenheit to over +150 degrees. Excellent resistance to a broad range of corrosive chemicals, including sulfuric acid created by hydrogen sulfide gas as well as other chemicals typically found in sanitary sewers, and impact and abrasion attack shall be provided.

EXECUTION

3.1 EIT COATING

- A. All pipes in service shall be plugged or bypassed before any work is started on the structure. No debris is to be flushed down the line.
- B. Anyone entering the structure must conform to all OSHA requirements for "Confined Space Entry" equipment and permitting.
- C. Surface preparation shall meet the requirements of IET Systems Data Sheets on Concrete Preparation and interior surfaces of manhole shall be sound, porous,

dry, and free of dust, dirt, oil, grease and other contaminants prior to application of lining.

- D. Interior surface of structure must be pressure washed at 5,000 psi and must be abrasive-blasted with black beauty steel slag to remove all loose patching, old coatings and any contamination in the concrete. No silica sand shall be used.
 - a. "New" structures shall be abrasive-blasted to remove all oils and patch mud and to open pin holes and expose aggregate.
 - b. "Rehab" structures shall be abrasive-blasted to remove all loose patching, old coatings, and any contamination that penetrated the concrete. The finished interior of the structure shall be gray. The exposed invert/floor shall also be coated. Where there is severe deterioration of the mortar, place new concrete to match the original interior dimensions after abrasive-blasting and removal of all loose material and by-products of corrosion. Restore invert/floor to the original elevation.
 - c. Vacuum to remove all abrasives and debris.
- E. Repair all leaks by injecting grout using Avanti Multi-grout AV-202 or equivalent. Hydraulic cement shall not be used to stop any water leaks.
- F. Clean and remove dust material with pressure washing for maximum adhesion. Blow dry concrete at 250 cfm with 120 psi.
- G. Apply IET Systems Coating by the use of the IET Systems Spray Unit and IET Systems Spincaster. Apply IET coating at least three different intervals – prime coat, intermediate coat and finish coat, per IET Systems manufacturer instructions and specifications. The total thickness of the IET coating shall be at least 125 mils.
- H. Inspect lining system for holidays, cracks and pinholes. Take particular care to check lining over brick, block, heavy spalled surfaces, and other very rough surfaces and locate holes in the lining caused by voids in bricks, block, concrete and structure joints. Fill voids and holidays in accordance with the lining system manufacturer's instructions.
- I. Provide a ten (10) year unlimited warranty on all workmanship and products. The work includes the surface preparation and application of the IET coating system, shall protect the structure for at least ten (10) years from all leaks, and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.

END OF SECTION

SECTION 02607
SEWER MANHOLES

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing sewer manholes and all other appurtenances for a complete installation. Provide manholes built without steps and in accordance with the standard details shown in Section 9 of the Lee County Utilities Operations Manual. Except as otherwise specified, construct sewer manholes of precast reinforced concrete sections conforming to ASTM C 478.

- B. Related Work Specified in Other Sections Include:
 - a. Section 02603 – SherFlex Coasting System
 - b. Section 02604 – Raven Coating System
 - c. Section 02606 – IET Coating System
 - d. Section 05540 – Metal Casings

1.2 REFERENCE

- A. Codes and standards referred to in this Section are:
 - a. ASTM C 76 - Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

 - b. ASTM C 478 - Specification for Precast Reinforced Concrete Manhole Sections

 - c. ASTM C 32 - Specification for Sewer and Manhole Brick (Made for Clay or Shale)

 - d. ASTM C 443 - Specification for Joints for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets [Metric]

1.3 SUBMITTALS

- A. Shop Drawings: Submit shop drawings of sewer manholes as specified in Division 1.

- B. Quality Control: Submit shop and field test reports of concrete samples tested in an approved laboratory.

1.4 DELIVERY, STORAGE AND HANDLING

- A. General: Take every precaution to prevent injury to the manhole sections during transportation and unloading. Unload manhole sections using skids, pipe hooks, rope slings, or suitable power equipment, if necessary, and keep the sections under control at all times. Do not allow the manhole sections to be dropped, dumped or dragged under any conditions. Follow applicable requirements specified in Division 1.
- B. Damaged Section: If any manhole section is damaged in the process of transportation or handling, reject and immediately remove such sections from the site, and replace the damaged manhole sections at no increase in Contract Amount.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
 - a. Preformed Joint Sealing Compound:
 - i. Ram-Nek, as manufactured by K.T. Snyder Company, Inc., Houston, TX
 - b. Frame and covers as manufactured by U. S. Foundry, Model 240-B

2.2 MATERIALS

- A. Concrete, Steel Reinforcement and Aggregates: Provide reinforced concrete, cementitious materials, aggregates and steel reinforcement conforming to the requirements of ASTM C 478, with Grade 40 reinforcement bars, Type II cement, and a minimum wall thickness of 8 inches.
- B. Manhole Frames and Covers: Provide manhole frames and covers as shown on the Lee County Standard details. Castings for manhole frames, covers and other items shall conform to the ASTM Designation A48, Class 30. Castings shall be true to pattern in form and dimensions and free of pouring faults and other defects in positions which would impair their strength, or otherwise make them unfit for the service intended. The scating surfaces between frames and covers shall be machined to fit true so the frames and covers do not shift under traffic conditions or permit entry of storm water from flooding. Lifting or "pick" holes shall be provided, but shall not penetrate the cover. The words SANITARY SEWER, as well as LEE COUNTY shall be cast in all manhole covers. All manhole frames and covers shall be traffic bearing unless otherwise specified.

Frames and covers shall be fully bedded in mortar in the correct finish grade elevation with adjustment brick courses or concrete grade rings installed in conformance with the Lee County Utilities Operation Manual.

- C. Preformed Joint Sealing Compound: Provide preformed joint sealing compound for joining manhole sections.
- D. Concrete Protective Liner: Provide concrete protective liner conforming to Sections 02603, 02604 or 02606.
- E. Pipeline Connections: Provide neoprene boots with type 316 stainless steel clamps of a design approved by Lee County Utilities for joining sewers to manhole riser sections. The unfilled portion of the connection shall be filled with Ram-Nek.
- F. Inflow Protectors: All manholes under non-traffic bearing areas shall have a plastic inflow protector installed. All manholes under traffic bearing areas shall have an inflow protector installed manufactured from a high-quality 304 stainless steel with a consistent thickness of not less than 18 gage. The inflow shall have a deep dish bowl design with no less than 8 inches in depth to allow easy and unobstructed removal of the manhole cover. The manhole inflow protector is to be manufactured with a one-piece rubber gasket installed at the factory for a tight, consistent fit. The rubber gasket is to be designed to securely wrap around the entire leading edge of the inflow protector at the point where it comes in contact with the manhole frame and cover. The wrap around rubber gasket is to be manufactured to a width of no less than 3/8 inches, consistent on top and bottom of the leading edge of the inflow protector. The gasket shall be no more than 3/32 inches thick. The insert removal handle shall be manufactured of a high-quality stainless steel for strength and durability. The handle is installed in such a way that it does not interfere with the installation or removal of the manhole lid. The insert handle will be manufactured to withstand a minimum pull force of 500 pounds before it fails or separates from the insert. The inscription "PROPERTY OF LEE COUNTY UTILITIES" shall be etched, at the base of the handle frame, to provide a long-lasting identification marker for the owner. The inflow protector shall be as manufactured by Sewer Shield, Inc., Maitland, FL, or an approved equal.
- G. Master Manholes: Master manholes shall have a double cover with an outer 35-inch opening and a smaller inner 22-1/4-inch access cover and shall be constructed in accordance with the Lee County Standard Details. The double manhole rings and covers shall be as manufactured by U.S. Foundry Model 672-AF-M-ORS or an approved equal. The connecting gravity sewer between the master manhole and the wet well shall be PVC C900 or C905 SDR 18 pipe material. For manholes receiving flows from 16-inch or larger pipe, a six-foot diameter master manhole will be required.

2.3 SOURCE QUALITY CONTROL

- A. At least three cylinders will be taken each day that manhole sections are cast, with batch samples to be designated by the laboratory representative. At least one set of cylinders will be taken from each 9 cubic yards of concrete used in manhole section construction. These samples will be tested for strength. If the samples fail to meet specified minimum concrete strength requirements, all manhole sections manufactured from the concrete from which the cylinders were made will be rejected.
- B. The OWNER reserves the right to core manholes either at the job site or point of delivery to validate strength of concrete and placement of steel. If cores fail to demonstrate the required strength or indicate incorrect placement of reinforcing steel, all sections not previously tested will be considered rejected until sufficient additional cores are tested, at no increase in Contract Amount, to substantiate conformance to these requirements.

2.4 EXECUTION

- A. Lifting Holes: Lifting holes through the structure shall be grouted with non-shrink grout.
- B. Precast Base: The design of the structure shall include a precast base of not less than 8 inches in thickness poured monolithically with the bottom section of the manhole walls.
- C. Joining Manhole Sections: Precast sections shall be joined using Ram-Nek plastic joint sealing compound and trimmed prior to grouting. Non-shrink grout shall be used inside and outside for sealing between manhole precast sections and shall be of a type acceptable to Lee County Utilities and designed for use in water. All openings and joints shall be sealed watertight.
- D. Top Termination: Manhole tops shall terminate at such elevations as will permit laying up grade rings under the manhole frame to make allowances for future street grade adjustments.
- E. Drop Connections: Drop connections, where required on precast manholes, shall be manufactured with the manhole elements at the casting yard. Drop manholes shall be constructed per the Lee County Standard Details.
- F. Internal Protection: Unless otherwise approved by Lee County Utilities, all manholes shall be protected internally from deterioration by either of the following:

- a. SherFlex Elastomeric Polyurethane Coasting System, as manufactured by Sherwin-Williams Company or
 - b. Raven Coating system, as manufactured by Raven Lining System or
 - c. IET Coating system – surface preparation shall include pressure washing at 5,000 psi, abrasive blasting with black beauty steel slag and application of the IET coat at three (3) different intervals to a total thickness of 125 mils.
 - i. The liner or coating system must be installed per manufacturer’s recommendation and completely protect the structure from corrosion. The liner or coating system must extend and seal onto manhole ring, seal onto and around pipe openings, and any other protrusions, completely cover the bench and flow invert. Provide a ten (10)-year unlimited warranty on all workmanship and products. The work which includes the surface preparation and application of the coating or liner system, shall protect the structure for at least ten (10) years from all leaks and from failure due to corrosion from exposure to corrosive gases such as hydrogen sulfide.
- G. Coal Tar Epoxy: All manhole, wet well, and valve vault exteriors shall be coated with two (2) coats of coal tar epoxy to a minimum thickness of 18 mils. Where no corrosive conditions are expected in a wet well or manhole, with Lee County Utilities specific written approval, the interior of the manhole may be coated with two (2) coats coal tar epoxy to a minimum thickness of 18 mils.

END OF SECTION

SECTION 02610

POLYVINYL CHLORIDE (PVC) GRAVITY SEWER PIPE

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all labor, materials, equipment, and incidentals required, and install PVC gravity sewer pipe and appurtenances as shown on the Drawings and as specified herein.

1.2 SUBMITTALS DURING CONSTRUCTION

- A. Submittals during construction shall be made in accordance with Section 01340, Shop Drawings, Working Drawings, and Samples.
- B. Submit to the ENGINEER not less than fourteen (14) calendar days after the date of the Notice to Proceed, a list of materials to be furnished, the names of suppliers and an expected schedule of delivery of materials to the site.
- C. Furnish in duplicate to the ENGINEER sworn certificates that all tests and inspections required by the Specifications under which the pipe is manufactured have been satisfied.

1.3 INSPECTION AND TESTS

- A. All pipe and accessories to be installed under this Contract shall be inspected and tested at the place of manufacture by the manufacturer as required by the Standard Specifications to which the material is manufactured.
- B. In the event that any of the test specimens fail to meet the applicable standards, all pipe presented by such tests shall be subject to rejections. The CONTRACTOR may furnish two additional test specimens from the same shipment or delivery for each specimen that failed and the pipe will be considered acceptable if all of these additional specimens meet the requirements of the applicable standards.
- C. Pipe which has been rejected by the ENGINEER shall be removed from the site of the work by the CONTRACTOR and replaced with pipe which meets these specifications.
- D. Other testing requirements specific to the type of pipe are included under the appropriate Paragraph in Part 2, below.

PART 2 PRODUCTS

2.1 POLYVINYL CHLORIDE (PVC) PIPE

- A. Polyvinyl chloride (PVC) gravity sewer pipe and fittings 4-inch through 12-inch diameter shall conform to ASTM D-3034, "Type PSM Poly Vinyl Chloride (PVC) Sewer Pipe and Fittings," DR 26. If any portion of a gravity sewer has less than four feet of cover, the entire run shall be constructed of AWWA C-900 DR 18 or thicker wall pipe.
- B. The pipe shall be joined with an integral bell and spigot type rubber gasketed joints. Each integral bell joint shall consist of a formed bell with a rubber gasket. Flexible gasketed joints shall be elastomeric compression types conforming to ASTM F1336, ASTM D3201 and ASTM F477. Joints shall permit contraction, expansion and settlement, and yet maintain a watertight connection. Joints shall be tested in accordance with ASTM D3212.
- C. Pipe shall be furnished in standard laying lengths not exceeding 20 feet and shall be colored green in accordance with the Utility Location and Coordination Council Uniform Color Guide.
- D. All fittings and accessories shall be furnished by the pipe supplier and shall have bell and/or spigot configurations compatible with the pipe.

PART 3 EXECUTION

3.1 LAYING POLYVINYL CHLORIDE (PVC) PIPE AND FITTINGS

- A. Polyvinyl Chloride (PVC) gravity sewer pipe shall be laid in accordance with the instructions of the manufacturer, Section 02223 and ASTM D-2321, "Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe." Bell holes shall be excavated so that after installation only the pipe barrel shall bear upon the trench bottom. Proper selection and placement of bedding and backfill materials are necessary to minimize deflection of the pipe diameter. No blocking under the pipe will be permitted. For gravity sewers 12 inches in diameter and larger, Laser leveling shall utilize two (2) laser beams to check gradient and deflection. One laser beam shall be positioned 1-1/2 inches or less from the inside top of pipe. The second laser beam shall be positioned 2 inches or less from the inside bottom of pipe. Both beams must hit the target for the entire run of pipe being installed between manholes.

For pipelines less than 12 inches in diameter, a single laser level beam shall be utilized and centered inside the pipe.

- B. Use care in handling and installing pipe and fittings. Storage of pipe on the job site shall be done in accordance with the pipe manufacturer's recommendation

and with approval of the ENGINEER. Under no circumstances shall pipe or fittings be dropped either into the trench or during unloading. The interior of the pipe shall be kept clean of oil, dirt, and foreign matter, and the machined ends and couplings shall be wiped clean immediately prior to jointing.

- C. Use a PVC pipe cutter where necessary to cut and machine all PVC pipe in the field. A "full insertion mark" shall be provided on each field cut pipe end. Field-cut pipe shall be beveled with a beveling tool made especially for plastic pipe. Bevels shall be in accordance with the manufacturer's requirements.
- D. Each length of pipe and fitting shall be marked with the nominal size, the SDR designation, the name of the manufacturer or his trademark, and the date of manufacture.
- E. Rubber gaskets shall be marked with manufacturers identification sizes and proper insertion direction.
- F. Pipe stubs for all manhole connections shall not exceed 2 feet in length unless otherwise shown on the drawings. Install caps where required.
- G. Each time the work on the sewer is halted, the ends of the pipe shall be sealed to prevent foreign material from entering the pipe.

3.2 TESTS FOR GRAVITY SEWERS - GENERAL

- A. Gravity sewers shall be required to pass a leakage test before acceptance. Leakage tests shall be as described in Section 02676.
- B. All polyvinyl chloride and fiberglass sewer pipe shall be subject to deflection testing assuring that the maximum deflection of 5% has not been exceeded. Any pipe failing this test is subject to removal and replacement at the CONTRACTOR's expense. Do not use pipe rounders.

3.3 TELEVISION INSPECTION

- A. All sanitary sewer gravity lines shall be televised in accordance with Section 13511.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02624

CURED-IN-PLACE-PIPE LINER

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this section includes all labor, materials, accessories, equipment, and tools necessary to install and test cured-in-place pipe liner in sanitary sewer mains.

1.2 DESCRIPTION

- A. ASTM F1743, Standard Practice for Rehabilitation of Existing Pipelines and Conduits Pulled-in-Place Installation of Cured-in-Place Thermosetting Resin Pipe. This practice describes the procedures for the reconstruction of pipelines and conduits (4 to 96 inches diameter) by the pulled-in-place installation of a resin-impregnated, flexible fabric tube into an existing conduit and secondarily inflated through the inversion of a calibration hose by the use of a hydrostatic head or air pressure.
- B. For large diameter pipes the resin impregnated tube (initially inside out) can be inverted into the host pipe by use of hydrostatic head or air pressure (ASTM F1216). For pipe diameters less than 12-in., the liner can be directly inserted into the host pipe without inversion.
- C. The resin is cured by circulating hot water or by the introduction of controlled steam into the tube. When cured, the finished cured-in-place pipe will be continuous and tight fitting. This reconstruction process may be used in a variety of gravity and pressure applications such as sanitary sewers, storm sewers, process piping, electrical conduits, and ventilation systems.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 01570 - Traffic Regulation
- C. Section 02651 – Wastewater Service Reconnection, Sealing, and Inspection
- D. Section 02676 - Leakage Tests
- E. Section 13511 - Sanitary Sewer System Television Inspection
- F. Section 01740 - Warranty and Bonds

1.4 SUBMITTALS

- A. The CONTRACTOR shall submit shop drawings and other information as listed below to the COUNTY for review and approval. Included shall be all materials as well as design calculations for the work being completed.
1. Submit shop drawings in accordance with the Section 01300.
 2. Submit plans showing points of insertion and methodologies.
 3. Submit certificates of compliance with design and test reports performed by a third party in accordance with applicable ASTM and specified test methods.
 4. Submit design calculations for hydraulic capacity.
 5. Submit certifications of the materials including the cell classification, grades, type of resins, glass fibers, and other materials used in the manufacture of the liner pipe.
 6. Submit a certificate of "Compliance with Specifications" by the manufacturer for materials.
 7. Submit liner size, thickness calculations, liner and resin materials (except proprietary information), and resin manufacturer's heating requirements. Submit complete calculations including list of parameters, formulas, and other data that are necessary for the design of the liner pipe. Include soil loads, live loads, hydrostatic loads, pipe stiffness (PS), standard dimension ratio (SDR), pipe wall crushing strength, initial and long-term (50 years) values of pipe deflection, pipe bonding strain, hydrostatic collapse resistance, and constrained buckling strength. Submit drawings showing the cross sectional profile of the liner pipe wall.
 8. Submit a work plan to the COUNTY for acceptance. The work plan will address preparation steps required for pre-installation.
 9. Submit manufacturer's installation instructions including recommendations for transportation, storage, temperature control, handling, inserting, curing, trimming, and finishing. Submit a written description of the resin curing temperatures versus time (step cooking temperatures/hours at initial, intermediate, and final stages) depending upon the sewer size, length, and liner thickness.
 10. Submit the selected curing temperature and expected duration of curing time required to ensure proper curing and submit written concurrence from the CIPP liner manufacturer of the curing temperature, temperature monitor procedures, and duration of curing time.

11. Submit a plan detailing source of water to be used, pipeline locations, and discharge location.
12. Submit for the COUNTY's review a detailed description of special construction requirements and/or modifications to the CIPP installation process that may be required because of the voids present in the existing sewer pipe.
13. Submit written description of the methods and equipment proposed for repairs to the host conduit such as missing pipe, offset joints, protrusions, or other deformities to complete the CIPP rehabilitation of the host conduit. Such repairs shall be in accordance with the CIPP liner manufacturer's recommended written procedures and techniques.
14. Submit written descriptions of the methods and equipment for the repair of defects in the CIPP liner observed during the post-installation inspection.
15. Submit plans and written descriptions for traffic control, bypass pumping, pre-insertion cleaning, and pre/post-insertion CCTV inspection.
16. Submit results of post-installation resin and liner sample analyses to confirm installed liner meets the design requirements of these construction documents.

1.5 PRODUCT AND INSTALLER ACCEPTABILITY

- A. To be acceptable, a minimum of 100,000 L.F. of wastewater collection system installation of the product in the U.S. must be documented.
- B. To be acceptable, the installer must have had at least three (3) years active experience in the commercial installation of the product, and must have installed at least 20,000 L.F. of the product over 14" diameter in wastewater collection system installations in the State of Florida. This requirement may be waived by the COUNTY for products that have been installed in the COUNTY's utility system for a period not less than two (2) years and a length not less than 1,000 lineal feet.

PART 2 - PRODUCTS

2.1 MATERIALS FOR MAIN LINES

- A. The finished pipe in place shall be fabricated from materials, which when cured will be chemically resistant to withstand exposure to domestic sewage.
- B. The polyester fiber felt tubing and resin material shall be in accordance with the requirements with ASTM F1216 and be fabricated to a size that when installed will neatly fit the interior of the host pipe. Allowance shall be made for circumferential stretching during inversion. The minimum tube length shall be that deemed necessary by the CONTRACTOR to effectively span the distance between the

access points. Unless otherwise specified, the CONTRACTOR will use a polyester fiber felt tube and an epoxy vinyl ester and catalyst system compatible with the inversion process and having the following physical properties for the cured pipe:

Tensile Strength	ASTM D638	3,000 psi
Flexural Stress	#101 (Modified ASTM D790)	4,500 psi
Flexural Modulus of Elasticity	#101 (Modified ASTM D790)	250,000 psi
Minimum Long-Term (50 Year) Modulus of Elasticity		125,000 psi

C. CIPP liner shall be Insituform, National Liner, or Inliner.

2.2 LINER DESIGN

- A. The liner manufacturer shall submit to the COUNTY for review complete design calculations for the liner, signed and sealed by a Professional Engineer registered in the State of Florida and certified by the manufacturer as to the compliance of his materials to the values used in the calculations.
- B. The liner shall be designed to withstand a live load equivalent to two (2) H-20 passing trucks plus all pertinent dead loads, hydrostatic pressure (discussed below). For design purposes, the water table shall be considered at grade elevation.
- C. The liner shall be designed in accordance with ASTM F1216 and resist buckling in accordance with AWWA C950. The buckling analysis shall account for the combination of dead load, live load, and hydrostatic pressure exerted on the liner. Modulus of soil reaction shall not be taken higher than 1000, corresponding to moderate degree of compaction of bedding (85% to 95% Proctor) and a fine-grained soil as shown on Table A4 of AWWA C940.
- D. Design shall be in accordance with most current edition of ASTM F1216, Appendix X1 for "fully deteriorated pipe conditions" both gravity and pressure as applicable.
- E. Determine the thickness of the CIPP liner as the minimum thickness required to meet the design structural requirements for both internal and external loadings, excluding any sacrificial membranes or other materials that may be used for protection of the product during installation.
- F. As part of the design calculation submittal, the liner manufacturer shall submit a tabulation of time versus temperature. This tabulation shall show the lengths of time that exposed portions of the liner will endure without self-initiated cure or other deterioration beginning. The tabulation shall be at 5° F. increments ranging from 70° F. to 100° F.
- G. The manufacturer shall also submit his analysis of the progressive effects of such "pre-cure" on the insertion and cured properties of the liner. This information shall be submitted in a timely fashion prior to the pre-construction conference so that the

COUNTY may set procedures for dealing with such an instance caused by construction delays. The minimum liner thickness is for materials with characteristics as shown. Bidders with materials with other characteristics must supply complete information on their bids of the values as listed for ascertaining minimum thickness.

H. Liner shall be neither accepted nor installed until design calculations are acceptable to the COUNTY.

1. Design information is shown in the table below:

Design Criteria	Value
Maximum Wastewater Temperature	100°F
Minimum Wastewater Temperature	40°F
Height of Water Above Top of Pipe (feet)	13
Maximum Soil Cover (feet)	13
Soil Density (lbs/cu ft)	120
Modulus of Soil Reaction (psi)	1,000
Minimum Liner Tube Thickness (mil)	200

2. These criteria yield an in-place wall thickness requirement. Provide allowances for any circumferential stretching, polymerization shrinkage, and resin migration that may occur.

- I. It is the CONTRACTOR'S responsibility to check the sewer size and length prior to manufacturing. Modify the liner thickness and other properties to suit the site conditions.
- J. The liner tube shall consist of one or more layers of flexible needled felt or an equivalent nonwoven and/or woven material capable of carrying resin, withstanding installation pressures and curing temperatures, and is compatible with the resin system used. Fabricate the liner tube to a size that, when installed, will fit the internal circumference of the existing sewer without any annular space between liner and walls of the host pipe. Make allowances for circumferential stretching due to insertion of liner and deterioration of existing pipe walls. Fabricate liner felt layers in a manner to maintain uniform thickness.
- K. Fabricate the liner from a material which, when cured, will be chemically resistant to withstand internal exposure to sewage gases containing hydrogen sulfide, carbon monoxide, methane, petroleum hydrocarbons, saturation with moisture, and diluted sulfuric acid.
- L. Calculate the CIPP wall thickness for each diameter based on a factor of safety of 2:1 using the standard polyester resin. The thickness shall be rounded to the next highest multiple of 60 mils (1.5 mm) after adding an allowance of 5% to the design thickness for resin migration.

- M. Design the CIPP per ASTM F1216, Appendix X1, with the following additional requirements:
1. Maximum SDR 26 in accordance with ASTM F1216.
 2. External Buckling Design: Where the CIPP is designed as a stand-alone pipe, a fully deteriorated condition, acceptable third-party testing and verification of design analysis techniques (ASTM F1216, Section X1.2.2) shall be submitted by each manufacturer and/or CIPP product. This testing requirement can be accomplished with soil box testing.
- N. Verify the lengths in the field before resin impregnation and installation of the tube.
- O. Prior to insertion, provide data on the maximum allowable stresses and elongation of the tube. Mark the exterior of the manufactured tube along its length at regular intervals not to exceed 5 feet. Use these marks as a gauge to measure elongation during insertion. Should the overall elongation of a reach exceed 5%, the liner tube shall be rejected and replaced.
- P. Prior to insertion, the liner tube shall be free of visible tears, holes, cuts, foreign materials, dry spots, pinholes, delamination, and other defects. Repair defects that will affect the integrity or strength of the CIPP lining or replace the CIPP liner at no additional cost to the COUNTY. The method of repair shall maintain the full integrity of the liner.
- Q. Provide a thermosetting, polyester, vinylester, or epoxy resin, able to cure in the presence or absence of water, and a catalyst system compatible with the unimpregnated liner material that provides the cured physical and chemical resistance strengths specified. The initiation temperature for cure shall be as recommended by the resin manufacturer.
- R. Resin shall not be affected by ultraviolet light and shall form no excessive bubbling or wrinkling during lining. The resin system shall meet the requirements of ASTM F1216.

2.3 CIPP SYSTEM

- A. The materials shall be inert to attack by domestic sewage and shall be suitable for use in an underground sewer environment. The installed material shall be light-colored or white to facilitate CCTV inspection.
- B. Manufacture the material in such a manner to produce a tight-fitting liner after installation. There shall be no measurable continuous annular space between the outside diameter of the new liner and the existing host pipe.
- C. Resin-impregnated tube liner material shall consist of one or more layers of flexible needled felt or an equivalent woven or nonwoven material, capable of carrying resin and withstanding installation pressures and curing temperatures. The material shall

be able to stretch to fit irregular pipe sections and negotiate bends. The outside layer of the tube shall be plastic coated with a material compatible with the resin system used.

- D. The resin-impregnated flexible felt tube liner shall be cured by circulating heated water to effect the desired cure throughout the length of the tube, extending full length from manhole to manhole(s). The resin shall be cured into a hard impermeable pipe of the minimum specified thickness, providing a structurally sound, uniformly smooth interior and tight-fitting liner within the existing pipe.

2.4 CLEANING/SURFACE PREPARATION

- A. It shall be the responsibility of the CONTRACTOR to clean the pipeline with a high-pressure water jet and to remove all internal debris out of the pipeline in accordance with the Technical Specifications Section 02653 "Preparatory Cleaning and Root Removal" of the Contract.
- B. If conditions such as broken pipe and major blockages are found that will prevent proper cleaning or liner installation, the CONTRACTOR, with the concurrence of the COUNTY, shall perform the necessary point repairs. All point repairs and costs thereof shall be defined in writing prior to initiating. All estimated costs for point repairs shall be lump sum costs for all labor, time, equipment and material necessary to complete the repair. The COUNTY reserves the right to complete point repairs in-house or by alternative CONTRACTOR.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

- A. Exercise care during transportation, handling, storing, and installation of the CIPP lining to ensure that the material is not torn, cut, or otherwise damaged.
- B. If any part or parts of the CIPP liner material becomes torn, cut, or otherwise damaged before or during installation, it shall be repaired or replaced before proceeding with further installation and at no additional cost to the COUNTY.
- C. Handle and store the CIPP liner as recommended by the manufacturer to ensure installation in a sound, undamaged condition.
- D. Follow the resin manufacturer's requirements for handling and storage of the resin prior to, during, and following impregnation of the tube.

3.2 PREINSTALLATION PROCEDURES

- A. Notify the owners and residents of any homes or businesses whose service lateral will be affected by the lining work. Send written notice at least two weeks in advance of construction. In addition, deliver written notification to each such resident or

business two to three to days in advance of such lining work, further advising of the work. Include in the notifications any restrictions on use of the sewage system facilities. Describe exact days and hours when the sewer system cannot be used.

- B. Before installing the liner, clean and inspect the pipeline per Section 01710. Clear the pipeline of obstructions. Perform inspection by CCTV per Section 13511. Provide a copy of the inspection television record to the COUNTY's Representative. Inspect the existing pipeline to determine the locations of conditions that may prevent proper installation of the tube, such as protruding service taps, collapsed or crushed pipe, and reductions in cross section area of more than 5% due to solids deposition or offset joints. Obstruction Removal (by remote device) or Point Repair shall be made by the CONTRACTOR with the approval of the COUNTY.
- C. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the wastewater main under repair. See Technical Specifications Section 02652 "Wastewater By-Pass Pumping" of the Contract for additional information.

3.3 SAFETY

- A. The CONTRACTOR shall carry out operations under this Section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space. It shall be the CONTRACTOR's responsibility to comply with OSHA Standard and Regulations pertaining to all aspects of the work.

3.4 INSTALLATION

- A. Install the CIPP liner using an inversion process and hydrostatic head per the manufacturer's written recommendation and ASTM F1216 (the liner can be installed without inversion, as the felt layer out position, if the diameter of the tube is less than or equal to 12 in.).
- B. Designate a location and notify the COUNTY's Representative where resin impregnation will take place. Use a vacuum impregnation process with a roller system designed to uniformly distribute the resin throughout the tube.
- C. During insertion, protect the new liner and the existing pipe and manholes from any damage that might result during the insertion process.
- D. Equipment used to supply heat and pressure shall be capable of providing the necessary heat and pressure required for the installation condition.
- E. To ensure proper heat distribution of rehabilitation systems using heat exchange methods and to prevent the creation of flat bottoms in the liner profile, isolate the new liner system from inflow, infiltration, or standing water. Seal any leaks using chemical grout or another method proposed by the CONTRACTOR and approved

by the COUNTY. Vacuum out any standing water in the host pipe prior to installation.

- F. After the new liner is completely rounded, cool it to a temperature specified by the manufacturer prior to relieving the internal pressure. In no case shall this temperature be in excess of 100°F.
- G. Cut and trim the new liner at each end to conform to the inside manhole wall. If the liner fails to make a tight seal at the manhole wall, apply a sealant to the annular space.
- H. Cut and trim the new liner in intermediate manholes (if installed through manholes), between the insertion and termination manholes, at each inside manhole wall. Seal the liner to the manhole wall with a sealant material.

3.5 RESIN IMPREGNATION

- A. The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and the loss of resin through cracks and irregularities in the original pipe wall.
- B. Use a serial vacuum impregnation process (or equal) to provide maximum resin impregnation throughout the tube.
- C. Use a roller system to uniformly distribute the resin throughout the tube to ensure uniform wetting of the liner.
- D. If the CIPP does not fit tightly against the original pipe at its termination point(s), seal the space between the pipes by filling with a resin mixture compatible with the CIPP.

3.6 CURING IN PLACE

- A. After installation of the CIPP liner into the host conduit, perform curing in accordance with the manufacturer's written recommendations. Ensure that the temperature and the period of time that the temperature is to be maintained shall be as determined by the resin/catalyst system employed and as recommended by the manufacturer. The curing of the CIPP liner shall take into account the existing host conduit material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of the soil).
- B. Fit the heat source with monitors to accurately gauge the temperature of the incoming and outgoing heat source. Place another such gauge between the CIPP liner and the pipe invert at the removal end to determine the temperature during the curing process. The temperature in the CIPP-lined host conduit during the curing process shall be as recommended by the resin manufacturer. The length of time for allowing the curing process to be completed shall be of the duration recommended by the manufacturer, during which time the Contractor shall maintain the required temperature throughout the CIPP-lined host conduit. Provide temperature strip chart

data to the COUNTY's Representative for review to ensure that curing temperatures for the resin meet the manufacturer's recommendations.

- C. If cool-down is to be accomplished by the introduction of cool water into an inversion standpipe to replace the water being drained from a small hole made in the downstream end, cool the hardened pipe to a temperature below 100°F (38°C) before relieving static head in the inversion standpipe. Ensure that, in the release of static head, a vacuum will not be produced that could damage the newly installed CIPP liner.
- D. Vent and/or exhaust noxious fumes or odors generated during and remaining after the 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 the materials used and there is no more air pollution or potential health hazard left to the general public or the construction workers.
- E. Provide piping, pumps, valves, and other equipment to discharge curing water.

3.7 REINSTATEMENT OF SERVICES

- A. Immediately reinstate live services after rehabilitation, testing, and acceptance of sewer lines. Inactive service lines to a vacant lot, vacant building, or to an occupied residence with more than one service line serving the property shall be defined as a "live" service and shall be reinstated unless otherwise directed by the OWNER. All reinstated service lateral connections (between the liner and the existing pipe) shall be grouted using a 3' minimum lateral bladder.
- B. Locate live services prior to rehabilitation activities. Note each service connection by its size, position from a reference manhole, and orientation with respect to the circumference of the pipe. Reconnect from the interior of the sewer line by means of a television camera and a remote controlled cutting device. No excavation will be allowed.
- C. Holes cut through the rehabilitation liner shall be neat and smooth and shall match the bottom of the reinstated service line. Reinstated the service opening to a minimum of 95% and a maximum of 100% of the service lateral pipe area. The new edge shall be crack free with no loose or abraded material.
- D. The seam between the host pipe and the new liner at the reinstated service shall be free of gaps, voids, or cavities and shall be no more than a hairline crack. Any gaps, voids, or cavities at this joint shall be grouted with a packer and grouting system. Seal gaps between the liner and the service by internal methods prior to the post-construction televising.
- E. Provide a fully operational backup device for reinstating service laterals. If for any reason the remote cutting device fails during the reinstatement of a service lateral, immediately deploy the standby device to complete the reinstatement. The backup

device shall be fully functional without requiring removal of parts from the primary device. The backup equipment shall be onsite throughout the reinstatement process.

3.8 FIELD TESTING

- A. For each inversion length of CIPP liner, prepare one sample from a section of the cured liner at the termination point in accordance with ASTM F1216. Samples shall be large enough to provide a minimum of three specimens.
- B. CONTRACTOR shall be responsible for testing the samples for flexural, tensile, resistance to abrasive chemicals, and delamination properties. Flexure properties shall be tested in accordance with ASTM D790 and shall meet the requirements of Table 1 in ASTM F1216. Tensile properties for pressure pipe conditions shall be tested in accordance with ASTM D638 and shall meet the requirements of Table 1 in ASTM F1216. Test for delamination in accordance with ASTM D903 as set forth in Section 8.4 of ASTM F1216. Immerse test specimens in detergent (0.025 %), sodium hypochlorite (4 %), and sulfuric acid (3 %) solutions and test for resistance to chemical reagents in accordance with ASTM D543. Submit the results to the COUNTY for review.
- C. Provide leakage test in accordance with Section 02676.

3.9 MANHOLE RECONNECTION

- A. Following the leakage test and visual inspection, manhole reconnections shall be sealed by CONTRACTOR as deemed necessary by the COUNTY. The equipment used shall consist of a standard packer device along with all necessary materials, including but not limited to chemical sealant containers, pumps, controls, regulators, valves, and hoses. A controlled hole not less than ½-inch diameter and not more than ¾-inch diameter shall be drilled or punched in the invert of the mainline liner pipe. The controlled hole shall be installed not less than one foot (1') from the inside wall of the manhole. The standard packer device shall be properly positioned to straddle the controlled hole and the end elements inflated, thereby isolating a portion of the mainline pipe liner. The controlling unit for the standard packer device shall have provisions for accurately controlling the packer functions in addition to monitoring the inflatable pressure and the void pressure in the isolated area to be sealed.
- B. All manhole reconnections shall be sealed by the use of the standard packer device. After the packer device has been properly positioned in the mainline, the connection shall be sealed by the injection of chemical sealant. The chemical sealant shall be injected through the packer device, through the controlled hole and into the annular space between the liner pipe material and host pipe. The injection of chemical sealant shall continue until the chemical fluid back pressure is sufficient to insure the complete sealing of all the defects.

3.10 INSPECTION

- A. The finished CIPP liner shall be inspected visually and by using CCTV. Television inspection of the liner shall be in accordance with Section 13511.
- B. The finished liner shall be continuous between manholes and shall be free from visual defects such as foreign inclusions, reverse curvatures and flats. No infiltration of groundwater shall be allowed.
- C. Visual inspection shall be accomplished by review of post-rehabilitation CCTV. Should defects occur, the entire liner between manholes shall be removed and replaced at no cost to the COUNTY.
- D. In the event the COUNTY's Representative, based on review of post-installation CCTV video, has reasonable cause to suspect that any annular space exists between the liner and the host pipe, excavate and expose the existing sewer and remove the existing host pipe such that confirmation of the suspected annular space can be made. If an annular space equal to or greater than 10% of the pipe diameter is determined to exist, it shall be repaired in a manner approved by the COUNTY's Representative at no additional cost to the COUNTY. If it is determined that no annular space exists, the CONTRACTOR shall be reimbursed in accordance with the General Provisions.

3.11 WARRANTY INSPECTION

- A. Perform a warranty inspection by using CCTV per Section 13511 eleven (11) months after completion of the project. Provide a copy of the inspection television record to the COUNTY.
- B. The warranty inspection shall consist of televising 25% of the Work. The COUNTY shall determine which sewer sections shall be inspected. Should a failure be found, then the remaining 75% of the Work shall be televised at no additional cost to the OWNER.

3.12 WARRANTY

- A. CONTRACTOR shall provide warranty for rehabilitation in accordance with Section 01710.
- B. Any defects that are noted through the warranty period per the warranty inspection or a disruption of operation due to a failure shall be restored at no cost to the COUNTY. These defects include, but are not limited to, extensive wrinkling, flat inverts, buckling, cracking, fracture, leakage, partial or complete collapse of the liner.

END OF SECTION

SECTION 02625

FOLD AND FORM PIPE LINER (HDPE)

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this section includes all labor, materials, accessories, equipment, and tools necessary to install and test High Density Polyethylene (HDPE) Fold and Form (FF) pipe liner in sanitary sewer mains.

1.2 DESCRIPTION

- A. The Fold and Form liner process is defined as the reconstruction of wastewater gravity and force main by insertion of a folded pipe liner into the existing wastewater main and the reformation of the pipe liner into a circular pipe liner.
- B. The liner shall be reformed into its original extruded configuration by a combination of steam and pressurization, which bi-axially reorients the molecules of the liner material (HDPE) and allows the liner to conform to the shape of the existing pipe which locking at each joint and expanding into each service to form a concave dimple. Thus the FF/DR pipe liner's new configuration is its new memory and is a continuous, tight fitting liner along the host pipe.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 01570 - Traffic Regulation
- C. Section 02651 – Wastewater Service Reconnection, Sealing, and Inspection
- D. Section 02676 - Leakage Tests
- E. Section 13511 - Sanitary Sewer System Television Inspection
- F. Section 01740 - Warranty and Bonds

1.4 SUBMITTALS

- A. The CONTRACTOR shall submit shop drawings and other information as listed below to the COUNTY for review and approval. Included shall be all materials as well as design calculations for the work being completed.
1. Submit shop drawings in accordance with the Section 01300.
 2. Submit plans showing points of insertion and methodologies.
 3. Submit certificates of compliance with design and test reports performed by a third party in accordance with applicable ASTM and specified test methods.
 4. Submit design calculations for hydraulic capacity.
 5. Submit certifications of the materials including the cell classification, grades, type of resins (except proprietary information), reinforcement fibers, and other materials used in the manufacture of the liner pipe.
 6. Submit a certificate of "Compliance with Specifications" by the manufacturer for materials.
 7. Submit a work plan to the COUNTY for acceptance. The work plan will address preparation steps required for pre-installation.
 8. Submit liner size, thickness calculations, liner material (type of resin). Submit complete calculations including list of parameters, formulas, and other data that are necessary for the design of the liner pipe. Include soil loads, live loads, hydrostatic loads, pipe stiffness (PS), standard dimension ratio (SDR), pipe wall crushing strength, initial and long-term (50 years) values of pipe deflection, pipe bonding strain, hydrostatic collapse resistance, and constrained buckling strength. Submit drawings showing the cross sectional profile of the liner pipe wall.
 9. Submit manufacturer's installation instructions including recommendations for transportation, storage, handling, inserting, trimming, and finishing.
 10. Submit a plan detailing source of water (as deemed necessary for cleaning prior to installation) to be used, pipeline locations, and discharge location.
 11. Submit for the COUNTY's review a detailed description of special construction requirements and/or modifications to the liner installation process that may be required because of the voids present in the existing sewer pipe.
 12. Submit written description of the methods and equipment proposed for repairs to the host conduit such as missing pipe, offset joints, protrusions, or other deformities to complete the FF/DR rehabilitation of the host pipe. Such repairs shall be in accordance with the FF/DR liner manufacturer's recommended written procedures and techniques.

13. Submit written descriptions of the methods and equipment for the repair of defects in the FF/DR liner observed during the post-installation inspection.
14. Submit plans and written descriptions for traffic control, bypass pumping, pre-insertion cleaning, and pre/post-insertion CCTV inspection.
15. Submit results of post-installation liner sample analyses to confirm installed liner meets the design requirements of these construction documents.

1.5 PRODUCT AND INSTALLER ACCEPTABILITY

- A. To be acceptable, a minimum of 250,000 L.F. of wastewater collection system installation of the product in the U.S. must be documented.
- B. To be acceptable, the installer must have had at least three (3) years active experience in the commercial installation of the product, and must have installed at least 50,000 L.F. of the product over 12" diameter in wastewater collection system installations in the State of Florida. This requirement may be waived by the COUNTY for products that have been installed in the COUNTY's utility system for a period not less than two (2) years and a length not less than 1,000 lineal feet.

PART 2 - PRODUCTS

2.1 MATERIALS FOR MAIN LINES

- A. Deformed polyethylene pipe introduced into wastewater mains in order to rehabilitate the existing pipeline system without excavation shall comply with ASTM F1533 and D3350. This method applies to the rehabilitation of 8-inch through 21-inch diameter pipe in terms of material and installation. Unless otherwise required by installation depth, liner shall have an SDR of 26, maximum.
- B. The polyethylene pipe liner shall be completely factory manufactured, jointless, seamless, deformed and/or folded under factory controlled temperature conditions coiled, and packaged.
- C. The pipe liner producer's certification, in accordance with ASTM specifications, shall be furnished with the liner coils. The CONTRACTOR shall turn the pipe liner producer's certification and warranty over to the COUNTY prior to installation.
- D. The deformed and reformed pipe liner shall be U-Liner pipe or Pre-Approved Equal.
- E. Pipe shall be made from P.E. 3408 polyethylene resins complying with ASTM D3350, cell classification: P.E. 345434 D for High Density. It shall be Type 3,

Grade 4, Class D, according to ASTM D1248. The CONTRACTOR shall provide certified test results for review by the COUNTY from the manufacturer that the material conforms to the applicable requirements.

- F. At the time of manufacture, each lot of liner shall be reviewed for defects and tested in accordance with ASTM D2837 and D1693. At the time of delivery, the liner shall be homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters, or deleterious faults.
- G. The CONTRACTOR shall provide certified test results for review by the COUNTY from the manufacturer that the material conforms to the applicable requirements.
- H. For testing purposes, a production lot shall consist of all liner having the same marking number. It shall include any and all items produced during any given work shift and must be so identified as opposed to previous or ensuing production.
- I. Liner shall be marked at five foot (5') intervals or less with a coded number which identifies the manufacturer, SDR, size, material, date, and shift on which the liner was extruded. At the end of the production shift during which a production lot has been extruded, the marking code on the liner shall be changed to indicate that said time intervals have elapsed and then a new production shift has begun.

2.2 CHEMICAL AND PHYSICAL TESTING

- A. The COUNTY may, at any time, direct the manufacturer to obtain compound samples and to prepare test specimens in accordance with ASTM D1928. These specimens shall comply with the minimum property values as follows with the applicable ASTM F1533 and ASTM D3350 requirements for P.E. 3408.

ASTM D3350 Cell Classification Values

Physical Properties	ASTM Test Method	Cell Class	Cell Class Limits	Typical Values
Density	D1505	3	0.941 to 0.955	.0947
Melt Index	D1238	4	<0.15	<0.1
Flexural Modulus	D790	5	110,000 to <160,000 psi	120,000 psi

Tensile Strength at Yield	D638	4	3000 to <3500	3300 psi
Environmental Stress Crack Resistance	D1693	3	Condition C 192 hrs, F	>5000 hrs
Hydrostatic Design Basis At 23 C	D2837	4	1600 psi	1600 psi
Color and Stabilizer		D	Natural with UV Stabilizer	

2.3 LINER DESIGN

- A. The liner manufacturer shall submit to the COUNTY for review complete design calculations for the liner, signed and sealed by a Professional Engineer registered in the State of Florida and certified by the manufacturer as to the compliance of his materials to the values used in the calculations.
- B. The liner shall be designed to withstand a live load equivalent to two (2) H-20 passing trucks plus all pertinent dead loads, hydrostatic pressure (discussed below). For design purposes, the water table shall be considered at grade elevation.
- C. The liner shall resist buckling in accordance with AWWA C950. The buckling analysis shall account for the combination of dead load, live load, hydrostatic pressure and grout pressure against the liner. Modulus of soil reaction shall not be taken higher than 1000, corresponding to moderate degree of compaction of bedding (85% to 95% Proctor) and a fine-grained soil as shown on Table A4 of AWWA C940.
- D. Determine the thickness of the FF liner as the minimum thickness required to meet the design structural requirements for both internal and external loadings. The manufacturer shall submit the maximum temperature (F) and pressure (psi) to be applied for reforming the liner after being inserted into the host pipe. The minimum liner thickness is for materials with characteristics as shown. Bidders with materials with other characteristics must supply complete information on their bids of the values as listed for ascertaining minimum thickness.
- E. Liner shall be neither accepted nor installed until design calculations are acceptable to the COUNTY.
- F. Design information is shown in the table below:

Design Criteria	Value
Height of Water Above Top of Pipe (feet)	13
Maximum Soil Cover (feet)	13
Soil Density (lbs/cu ft)	120
Modulus of Soil Reaction (psi)	1,000
Minimum Liner Thickness (mil)	200

- G. It is the CONTRACTOR's responsibility to check the sewer size and length prior to manufacturing. Modify the liner thickness and other properties to suit the site conditions.
- H. Fabricate the liner from a material which, when installed, will be chemically resistant to withstand internal exposure to sewage gases containing hydrogen sulfide, carbon monoxide, methane, petroleum hydrocarbons, saturation with moisture, and diluted sulfuric acid.
- I. Calculate the FF liner wall thickness for each diameter based on a factor of safety of 2:1 using the standard HDPE as listed above. The thickness shall be rounded to the next highest multiple of 60 mils (1.5 mm).
- J. Verify the lengths in the field before installation of the FF liner.
- K. Prior to insertion, the FF liner shall be free of visible tears, holes, cuts, foreign materials, pinholes, and other defects. Repair defects that will affect the integrity or strength of the FF lining or replace the FF liner at no additional cost to the COUNTY. The method of repair shall maintain the full integrity of the liner.

PART 3 - EXECUTION

3.1 CLEANING/SURFACE PREPARATION

- A. It shall be the responsibility of the CONTRACTOR to clean the pipeline with a high-pressure water jet and to remove all internal debris out of the pipeline in accordance with the Technical Specifications Section 02653 "Preparatory Cleaning and Root Removal" of the Contract.
- B. If conditions such as broken pipe and major blockages are found that will prevent proper cleaning or liner installation, the CONTRACTOR, with the concurrence of the COUNTY, shall perform the necessary point repairs. All point repairs and costs thereof shall be defined in writing prior to initiating. All estimated costs for point repairs shall be lump sum costs for all labor, time, equipment and material necessary to complete the repair. The COUNTY reserves the right to complete point repairs in-house or by alternative CONTRACTOR.

3.2 DELIVERY, STORAGE, AND HANDLING

- A. Exercise care during transportation, handling, storing, and installation of the FF lining to ensure that the material is not torn, cut, or otherwise damaged.
- B. If any part or parts of the FF liner material becomes torn, cut, or otherwise damaged before or during installation, it shall be repaired or replaced before proceeding with further installation and at no additional cost to the COUNTY.
- C. Handle and store the FF liner as recommended by the manufacturer to ensure installation in a sound, undamaged condition.

3.3 PREINSTALLATION PROCEDURES

- A. Notify the owners and residents of any homes or businesses whose service lateral will be affected by the lining work. Send written notice at least two weeks in advance of construction. In addition, deliver written notification to each such resident or business two to three to days in advance of such lining work, further advising of the work. Include in the notifications any restrictions on use of the sewage system facilities. Describe exact days and hours when the sewer system cannot be used.
- B. Before installing the liner, clean and inspect the pipeline per Section 01710. Clear the pipeline of obstructions. Perform inspection by CCTV per Section 13511. Provide a copy of the inspection television record to the COUNTY's Representative. Inspect the existing pipeline to determine the locations of conditions that may prevent proper installation of the liner, such as protruding service taps, collapsed or crushed pipe, and reductions in cross section area of more than 5% due to solids deposition or offset joints. Obstruction Removal (by remote device) or Point Repair shall be made by the CONTRACTOR with the approval of the COUNTY.
- C. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the wastewater main under repair. See Technical Specifications Section 02652 "Wastewater By-Pass Pumping" of the Contract for additional information.

3.4 SAFETY

- A. The CONTRACTOR shall carry out operations under this Section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space. It shall be the CONTRACTOR's responsibility to comply with OSHA Standard and Regulations pertaining to all aspects of the work.

3.5 INSTALLATION

- A. During insertion, protect the new liner and the existing pipe and manholes from any damage that might result during the insertion process.
- B. Equipment used to supply heat and pressure shall be capable of providing the necessary heat and pressure required for the installation condition.
- C. To ensure proper heat distribution of rehabilitation systems using heat exchange methods and to prevent the creation of flat bottoms in the liner profile, isolate the new liner system from inflow, infiltration, or standing water. Seal any leaks into the host pipe using chemical grout or another method proposed by the CONTRACTOR and approved by the COUNTY. Vacuum out any standing water in the host pipe prior to installation.
- D. A cable shall be strung through the existing pipe to be rehabilitated and attached to the liner through an existing manhole or access point. The liner shall be pulled through the existing conduit by this cable. Care shall be taken not to damage the deformed pipe during installation. Appropriate sleeves and rollers shall be used to protect the liner.
- E. During insertion, precautions such as some type of cover shall be provided on the leading edge of the pipe liner to prevent the ragged edges of the existing pipe from scarring the outside of the liner as it is pulled into the pipe. Once insertion is initiated, it is desirable to continue the pull at a rate of no greater than fifteen feet (15') to twenty feet (20') per minute to completion.
- F. When the deformed and reformed pipe is in place, it shall be cut and the processing manifolds (pipe end closing assembly used for heat and pressure control within liner) shall be attached in and secured at both pipe ends. The temperature and pressure measuring instruments shall be attached to the deformed and reformed pipe at both ends.
- G. Through the use of heat and pressure the HDPE pipe liner should unfold and expand sufficiently to press against the wall of the existing wastewater main, lock into the joints, and form dimples at the services. The deformed pipe shall be pressurized while the termination point valves are kept open to provide heat flow. Refer to manufacturer's recommended temperatures and pressures for in-situ reforming of the liner.
- H. The CONTRACTOR shall cool the reformed pipe in accordance with the manufacturer's recommendations. The heat and pressure equipment shall be disconnected after ambient temperature is attained.
- I. Temperature and pressures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the manufacturer's recommended temperature and pressure levels. Copies of these records shall be given to the COUNTY at the completion of each installation.

- J. Cut and trim the new liner at each end to conform to the inside manhole wall. If the liner fails to make a tight seal at the manhole wall, apply a sealant to the annular space.
- K. The beginning and end of the new polyethylene pipe shall be seated to the rehabilitated pipeline. The sealing material shall be compatible with the polyethylene pipe and shall provide a watertight seal.

3.6 REINSTATEMENT OF SERVICES

- A. Immediately reinstate live services after rehabilitation, testing, and acceptance of sewer lines. Inactive service lines to a vacant lot, vacant building, or to an occupied residence with more than one service line serving the property shall be defined as a “live” service and shall be reinstated unless otherwise directed by the OWNER. The CONTRACTOR shall stop all visible leaks, including at service drop connections as required. All reinstated service lateral connections and drop Tee’s (between the liner and the existing pipe) shall be grouted, using a minimum 3’ lateral bladder on the packer.
- B. Locate live services prior to rehabilitation activities. Note each service connection by its size, position from a reference manhole, and orientation with respect to the circumference of the pipe. Reconnect from the interior of the sewer line by means of a television camera and a remote controlled cutting device. No excavation will be allowed.
- C. Holes cut through the rehabilitation liner shall be neat and smooth and shall match the bottom of the reinstated service line. Reinstall the service opening to a minimum of 95% and a maximum of 100% of the service lateral pipe area. The new edge shall be crack free with no loose or abraded material.
- D. The seam between the host pipe and the new liner at the reinstated service shall be free of gaps, voids, or cavities and shall be no more than a hairline crack. Any gaps, voids, or cavities at this joint shall be grouted with a packer and grouting system. Seal gaps between the liner and the service by internal methods prior to the post-construction televising.
- E. Provide a fully operational backup device for reinstating service laterals. If for any reason the remote cutting device fails during the reinstatement of a service lateral, immediately deploy the standby device to complete the reinstatement. The backup device shall be fully functional without requiring removal of parts from the primary device. The backup equipment shall be onsite throughout the reinstatement process.

3.7 FIELD TESTING

- A. CONTRACTOR shall prepare one sample FF liner, from the stack shipped for installation, inserted into a split mold with a nominal inside diameter equal to the outside diameter of the FF liner specimen.
- B. CONTRACTOR shall be responsible for testing specimens, cut out of the sample liner, for stiffness per ASTM D2412, resistance to abrasive chemicals in domestic sewage per ASTM D543, flexural strength per ASTM D790 and tensile strength per ASTM D638. Flexural strength coupons shall be cut out circumferentially and tensile strength dumbbell specimens shall be cut out longitudinally from the sample liner. Immerse test specimens in detergent (0.025 %), sodium hypochlorite (4 %), and sulfuric acid (3 %) solutions and test for resistance to chemical reagents in accordance with ASTM D543. Submit the test result to the COUNTY for review.
- C. Provide leakage test in accordance with Section 02676.

3.8 MANHOLE RECONNECTION

- A. Following the leakage test and visual inspection, manhole reconnections shall be sealed by CONTRACTOR as deemed necessary by the COUNTY. The equipment used shall consist of a standard packer device along with all necessary materials, including but not limited to chemical sealant containers, pumps, controls, regulators, valves, and hoses. A controlled hole not less than ½-inch diameter and not more than ¾-inch diameter shall be drilled or punched in the invert of the mainline liner pipe. The controlled hole shall be installed not less than one foot (1') from the inside wall of the manhole. The standard packer device shall be properly positioned to straddle the controlled hole and the end elements inflated, thereby isolating a portion of the mainline pipe liner. The controlling unit for the standard packer device shall have provisions for accurately controlling the packer functions in addition to monitoring the inflatable pressure and the void pressure in the isolated area to be sealed.
- B. All manhole reconnections shall be sealed by the use of the standard packer device. After the packer device has been properly positioned in the mainline, the connection shall be sealed by the injection of chemical sealant. The chemical sealant shall be injected through the packer device, through the controlled hole and into the annular space between the liner pipe material and host pipe. The injection of chemical sealant shall continue until the chemical fluid back pressure is sufficient to insure the complete sealing of all the defects.

3.9 INSPECTION

- A. The finished FF liner shall be inspected visually and by using CCTV. Television inspection of the liner shall be in accordance with Section 13511.
- B. The finished liner shall be continuous between manholes and shall be free from visual defects such as foreign inclusions, reverse curvatures, flats, dry spots, pinholes, and delamination. No infiltration of groundwater shall be allowed.
- C. Visual inspection shall be accomplished by review of post-rehabilitation CCTV. Should defects occur, the entire liner between manholes shall be removed and replaced at no cost to the COUNTY.
- D. In the event the COUNTY's Representative, based on review of post-installation CCTV video, has reasonable cause to suspect that any annular space exists between the liner and the host pipe, excavate and expose the existing sewer and remove the existing host pipe such that confirmation of the suspected annular space can be made. If an annular space equal to or greater than 5% of the pipe diameter is determined to exist, it shall be repaired in a manner approved by the COUNTY's Representative at no additional cost to the COUNTY. If it is determined that no annular space exists, CONTRACTOR shall be reimbursed in accordance with the General Provisions.
- E. The maximum allowable size of wrinkle or bulge as shown in the inspection shall not exceed 1/4 inch in the crown or wall of the pipe. No wrinkles will be allowed in the invert of the pipe.

3.11 WARRANTY INSPECTION

- A. Perform a warranty inspection by using CCTV per Section 13511 eleven (11) months after completion of the project. Provide a copy of the inspection television record to the COUNTY.
- B. The warranty inspection shall consist of televising 25% of the Work. The COUNTY shall determine which sewer sections shall be inspected. Should a failure be found, then the remaining 75% of the Work shall be televised at no additional cost to the OWNER.

3.12 WARRANTY

- A. CONTRACTOR shall provide warranty for rehabilitation in accordance with Section 01710.

- B. Any defects that are noted through the warranty period per the warranty inspection or a disruption of operation due to a failure shall be restored at no cost to the COUNTY. These defects include, but are not limited to, extensive wrinkling, flat inverts, buckling, cracking, fracture, leakage, partial or complete collapse of the liner.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02626

FOLD AND FORM PIPE LINER (PVC)

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this section includes all labor, materials, accessories, equipment, and tools necessary to install and test PVC Fold and Form (FF) pipe liner in sanitary sewer mains.

1.2 DESCRIPTION

- A. The Fold and Form liner process is defined as the reconstruction of wastewater gravity and force main by insertion of a folded pipe liner into the existing wastewater main and the reformation of the pipe liner into a circular pipe liner.
- B. The liner shall be reformed into its original extruded configuration by a combination of steam and pressurization, which bi-axially reorients the molecules of the liner material (HDPE) and allows the liner to conform to the shape of the existing pipe which locking at each joint and expanding into each service to form a concave dimple. Thus the FF/DR pipe liner's new configuration is its new memory and is a continuous, tight fitting liner along the host pipe.

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 01570 - Traffic Regulation
- C. Section 02651 – Wastewater Service Reconnection, Sealing, and Inspection
- D. Section 02676 - Leakage Tests
- E. Section 13511 - Sanitary Sewer System Television Inspection
- F. Section 01740 - Warranty and Bonds

1.4 SUBMITTALS

- A. The CONTRACTOR shall submit shop drawings and other information as listed below to the COUNTY for review and approval. Included shall be all materials as well as design calculations for the work being completed.
1. Submit shop drawings in accordance with the Section 01300.
 2. Submit plans showing points of insertion and methodologies.
 3. Submit certificates of compliance with design and test reports performed by a third party in accordance with applicable ASTM and specified test methods.
 4. Submit design calculations for hydraulic capacity.
 5. Submit certifications of the materials including the cell classification, grades, type of resins (except proprietary information), reinforcement fibers, and other materials used in the manufacture of the liner pipe.
 6. Submit a certificate of "Compliance with Specifications" by the manufacturer for materials.
 7. Submit a work plan to the COUNTY for acceptance. The work plan will address preparation steps required for pre-installation.
 8. Submit liner size, thickness calculations, liner material (type of resin). Submit complete calculations including list of parameters, formulas, and other data that are necessary for the design of the liner pipe. Include soil loads, live loads, hydrostatic loads, pipe stiffness (PS), standard dimension ratio (SDR), pipe wall crushing strength, initial and long-term (50 years) values of pipe deflection, pipe bonding strain, hydrostatic collapse resistance, and constrained buckling strength. Submit drawings showing the cross sectional profile of the liner pipe wall.
 9. Submit manufacturer's installation instructions including recommendations for transportation, storage, handling, inserting, trimming, and finishing.
 10. Submit a plan detailing source of water (as deemed necessary for cleaning prior to installation) to be used, pipeline locations, and discharge location.
 11. Submit for the COUNTY's review a detailed description of special construction requirements and/or modifications to the liner installation process that may be required because of the voids present in the existing sewer pipe.
 12. Submit written description of the methods and equipment proposed for repairs to the host conduit such as missing pipe, offset joints, protrusions, or other deformities to complete the FF/DR rehabilitation of the host pipe. Such repairs shall be in accordance with the FF/DR liner manufacturer's recommended written procedures and techniques.

13. Submit written descriptions of the methods and equipment for the repair of defects in the FF/DR liner observed during the post-installation inspection.
14. Submit plans and written descriptions for traffic control, bypass pumping, pre-insertion cleaning, and pre/post-insertion CCTV inspection.
15. Submit results of post-installation liner sample analyses to confirm installed liner meets the design requirements of these construction documents.

1.5 PRODUCT AND INSTALLER ACCEPTABILITY

- A. To be acceptable, a minimum of 250,000 L.F. of wastewater collection system installation of the product in the U.S. must be documented.
- B. To be acceptable, the installer must have had at least three (3) years active experience in the commercial installation of the product, and must have installed at least 50,000 L.F. of the product over 12" diameter in wastewater collection system installations in the State of Florida. This requirement may be waived by the COUNTY for products that have been installed in the COUNTY's utility system for a period not less than two (2) years and a length not less than 1,000 lineal feet.

PART 2 - PRODUCTS

2.1 MATERIALS FOR MAIN LINES

- A. The FF/DR liner shall be fabricated from materials, which is chemically resistant to withstand exposure to domestic sewage. FF/DR pipe introduced into wastewater mains in order to rehabilitate the existing pipeline system without excavation shall comply with ASTM F1504 and D1784. This method applies to the rehabilitation of 8-inch through 21-inch diameter pipe in terms of material and installation. Unless otherwise required by installation depth, liner shall have an SDR of 26, maximum.
- B. The liner shall be made from virgin PVC compound meeting all the requirements for cell classifications 12334-B or 12344-B in accordance with ASTM F1504 and ASTM D1784. The liner shall be fabricated to a size that when installed will neatly fit the interior of the host pipe. The minimum FF liner segment length shall be that deemed necessary by the CONTRACTOR to effectively span the distance between the access points.
- C. The outside diameter and minimum wall thickness shall be manufactured to a size that when installed will fit the internal circumference of the conduit specified (without annular space). Allowance shall be made for misaligned and missing conduit.
- D. The deformed and reformed pipe liner shall be EX Pipe or Pre-Approved Equal.

- E. Each production lot of pipe liner shall be inspected and tested at the time of manufacture for defects in accordance with ASTM D2990. All pipe liner shall be homogeneous, uniform in color, free of cracks, holes, foreign material, blisters and deleterious faults. Production lot of pipe liner shall include unique markings to clearly discern from other production lots.
- F. The CONTRACTOR shall provide certified test results for review by the COUNTY from the manufacturer that the material conforms to the applicable requirements.
- G. For testing purposes, a production lot shall consist of all liner having the same marking number. It shall include any and all items produced during any given work shift and must be so identified as opposed to previous or ensuing production.
- H. Liner shall be marked at five foot (5') intervals or less with a coded number which identifies the manufacturer, SDR, size, material, date, and shift on which the liner was extruded. At the end of the production shift during which a production lot has been extruded, the marking code on the liner shall be changed to indicate that said time intervals have elapsed and then a new production shift has begun.

2.2 PHYSICAL PROPERTIES

- A. The COUNTY may, at any time, direct the manufacturer to obtain compound samples and to prepare test specimens in accordance with ASTM D638, ASTM D696, and ASTM D790. These specimens shall comply with the minimum property values as follows with the applicable ASTM F1504 and ASTM F1947 requirements.

Physical Properties	ASTM Test Method	Typical Values
Flexural Modulus	D790	340,000 psi
Flexural Strength	D790	9,000 psi
Tensile Strength at Yield	D638	6,000 psi
Coefficient of Thermal Expansion	D696	3.0×10^{-5} in/in °F

2.3 LINER DESIGN

- A. The liner manufacturer shall submit to the COUNTY for review complete design calculations for the liner, signed and sealed by a Professional Engineer registered in the State of Florida and certified by the manufacturer as to the compliance of his materials to the values used in the calculations.
- B. The liner shall be designed to withstand a live load equivalent to two (2) H-20 passing trucks plus all pertinent dead loads, hydrostatic pressure (discussed below). For design purposes, the water table shall be considered at grade elevation.
- C. The liner shall resist buckling in accordance with AWWA C950. The buckling analysis shall account for the combination of dead load, live load, hydrostatic pressure and grout pressure against the liner. Modulus of soil reaction shall not be taken higher than 1000, corresponding to moderate degree of compaction of bedding (85% to 95% Proctor) and a fine-grained soil as shown on Table A4 of AWWA C940.
- D. Determine the thickness of the FF liner as the minimum thickness required to meet the design structural requirements for both internal and external loadings. The manufacturer shall submit the maximum temperature (F) and pressure (psi) to be applied for reforming the liner after being inserted into the host pipe. The minimum liner thickness is for materials with characteristics as shown. Bidders with materials with other characteristics must supply complete information on their bids of the values as listed for ascertaining minimum thickness.
- E. Liner shall be neither accepted nor installed until design calculations are acceptable to the COUNTY.
- F. Design information is shown in the table below:

Design Criteria	Value
Height of Water Above Top of Pipe (feet)	13
Maximum Soil Cover (feet)	13
Soil Density (lbs/cu ft)	120
Modulus of Soil Reaction (psi)	1,000
Minimum Liner Thickness (mil)	200

- G. It is the CONTRACTOR's responsibility to check the sewer size and length prior to manufacturing. Modify the liner thickness and other properties to suit the site conditions.
- H. Fabricate the liner from a material which, when installed, will be chemically resistant to withstand internal exposure to sewage gases containing hydrogen

sulfide, carbon monoxide, methane, petroleum hydrocarbons, saturation with moisture, and diluted sulfuric acid.

- I. Calculate the FF liner wall thickness for each diameter based on a factor of safety of 2:1 using the standard PVC as listed above. The thickness shall be rounded to the next highest multiple of 60 mils (1.5 mm).
- J. Verify the lengths in the field before installation of the FF liner.
- K. Prior to insertion, the FF liner shall be free of visible tears, holes, cuts, foreign materials, pinholes, and other defects. Repair defects that will affect the integrity or strength of the FF lining or replace the FF liner at no additional cost to the COUNTY. The method of repair shall maintain the full integrity of the liner.

PART 3 - EXECUTION

3.1 CLEANING/SURFACE PREPARATION

- A. It shall be the responsibility of the CONTRACTOR to clean the pipeline with a high-pressure water jet and to remove all internal debris out of the pipeline in accordance with the Technical Specifications Section 02653 "Preparatory Cleaning and Root Removal" of the Contract.
- B. If conditions such as broken pipe and major blockages are found that will prevent proper cleaning or liner installation, the CONTRACTOR, with the concurrence of the COUNTY, shall perform the necessary point repairs. All point repairs and costs thereof shall be defined in writing prior to initiating. All estimated costs for point repairs shall be lump sum costs for all labor, time, equipment and material necessary to complete the repair. The COUNTY reserves the right to complete point repairs in-house or by alternative CONTRACTOR.

3.2 DELIVERY, STORAGE, AND HANDLING

- A. Exercise care during transportation, handling, storing, and installation of the FF lining to ensure that the material is not torn, cut, or otherwise damaged.
- B. If any part or parts of the FF liner material becomes torn, cut, or otherwise damaged before or during installation, it shall be repaired or replaced before proceeding with further installation and at no additional cost to the COUNTY.
- C. Handle and store the FF liner as recommended by the manufacturer to ensure installation in a sound, undamaged condition.

3.3 PREINSTALLATION PROCEDURES

- A. Notify the owners and residents of any homes or businesses whose service lateral will be affected by the lining work. Send written notice at least two weeks in advance of construction. In addition, deliver written notification to each such resident or business two to three to days in advance of such lining work, further advising of the work. Include in the notifications any restrictions on use of the sewage system facilities. Describe exact days and hours when the sewer system cannot be used.
- B. Before installing the liner, clean and inspect the pipeline per Section 01710. Clear the pipeline of obstructions. Perform inspection by CCTV per Section 13511. Provide a copy of the inspection television record to the COUNTY's Representative. Inspect the existing pipeline to determine the locations of conditions that may prevent proper installation of the liner, such as protruding service taps, collapsed or crushed pipe, and reductions in cross section area of more than 5% due to solids deposition or offset joints. Obstruction Removal (by remote device) or Point Repair shall be made by the CONTRACTOR with the approval of the COUNTY.
- C. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the wastewater main under repair. See Technical Specifications Section 02652 "Wastewater By-Pass Pumping" of the Contract for additional information.

3.4 SAFETY

- A. The CONTRACTOR shall carry out operations under this Section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving work on an elevated platform and entry into a confined space. It shall be the CONTRACTOR's responsibility to comply with OSHA Standard and Regulations pertaining to all aspects of the work.

3.5 INSTALLATION

- A. During insertion, protect the new liner and the existing pipe and manholes from any damage that might result during the insertion process.
- B. Equipment used to supply heat and pressure shall be capable of providing the necessary heat and pressure required for the installation condition.
- C. To ensure proper heat distribution of rehabilitation systems using heat exchange methods and to prevent the creation of flat bottoms in the liner profile, isolate the new liner system from inflow, infiltration, or standing water. Seal any leaks into

the host pipe using chemical grout or another method proposed by the CONTRACTOR and approved by the COUNTY. Vacuum out any standing water in the host pipe prior to installation.

- D. A cable shall be strung through the existing pipe to be rehabilitated and attached to the liner through an existing manhole or access point. The liner shall be pulled through the existing conduit by this cable. Care shall be taken not to damage the deformed pipe during installation. Appropriate sleeves and rollers shall be used to protect the liner.
- E. During insertion, precautions such as some type of cover shall be provided on the leading edge of the pipe liner to prevent the ragged edges of the existing pipe from scarring the outside of the liner as it is pulled into the pipe. Once insertion is initiated, it is desirable to continue the pull at a rate of no greater than fifteen feet (15') to twenty feet (20') per minute to completion.
- F. When the deformed and reformed pipe is in place, it shall be cut and the processing manifolds (pipe end closing assembly used for heat and pressure control within liner) shall be attached in and secured at both pipe ends. The temperature and pressure measuring instruments shall be attached to the deformed and reformed pipe at both ends.
- G. Through the use of heat and pressure the PVC pipe liner should unfold and expand sufficiently to press against the wall of the existing wastewater main, lock into the joints, and form dimples at the services. The deformed pipe shall be pressurized while the termination point valves are kept open to provide heat flow. Refer to manufacturer's recommended temperatures and pressures for in-situ reforming of the liner.
- H. The CONTRACTOR shall cool the reformed pipe in accordance with the manufacturer's recommendations. The heat and pressure equipment shall be disconnected after ambient temperature is attained.
- I. Temperature and pressures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the manufacturer's recommended temperature and pressure levels. Copies of these records shall be given to the COUNTY at the completion of each installation.
- J. Cut and trim the new liner at each end to conform to the inside manhole wall. If the liner fails to make a tight seal at the manhole wall, apply a sealant to the annular space.
- K. The beginning and end of the new PVC pipe shall be seated to the rehabilitated pipeline. The sealing material shall be compatible with the PVC pipe and shall provide a watertight seal.

3.6 REINSTATEMENT OF SERVICES

- A. Immediately reinstate live services after rehabilitation, testing, and acceptance of sewer lines. Inactive service lines to a vacant lot, vacant building, or to an occupied residence with more than one service line serving the property shall be defined as a "live" service and shall be reinstated unless otherwise directed by the OWNER. The CONTRACTOR shall stop all visible leaks, including at service drop connections as required. All reinstated service lateral connections and drop Tee's (between the liner and the existing pipe) shall be grouted, using a minimum 3' lateral bladder on the packer.
- B. Locate live services prior to rehabilitation activities. Note each service connection by its size, position from a reference manhole, and orientation with respect to the circumference of the pipe. Reconnect from the interior of the sewer line by means of a television camera and a remote controlled cutting device. No excavation will be allowed.
- C. Holes cut through the rehabilitation liner shall be neat and smooth and shall match the bottom of the reinstated service line. Reinstatement the service opening to a minimum of 95% and a maximum of 100% of the service lateral pipe area. The new edge shall be crack free with no loose or abraded material.
- D. The seam between the host pipe and the new liner at the reinstated service shall be free of gaps, voids, or cavities and shall be no more than a hairline crack. Any gaps, voids, or cavities at this joint shall be grouted with a packer and grouting system. Seal gaps between the liner and the service by internal methods prior to the post-construction televising.
- E. Provide a fully operational backup device for reinstating service laterals. If for any reason the remote cutting device fails during the reinstatement of a service lateral, immediately deploy the standby device to complete the reinstatement. The backup device shall be fully functional without requiring removal of parts from the primary device. The backup equipment shall be onsite throughout the reinstatement process.

3.7 FIELD TESTING

- A. CONTRACTOR shall prepare one sample FF liner, from the stack shipped for installation, inserted into a split mold with a nominal inside diameter equal to the outside diameter of the FF liner specimen. Reform the FF liner specimen in the split mold with pressurized steam for at least 15 minutes at minimum 200 F ambient temperature as indicated in ASTM F1504.
- B. CONTRACTOR shall be responsible for testing specimens, cut out of the sample liner, for stiffness per ASTM D2412, resistance to abrasive chemicals in domestic

sewage per ASTM D543, flexural strength per ASTM D790 and tensile strength per ASTM D638. Flexural strength coupons shall be cut out circumferentially and tensile strength dumbbell specimens shall be cut out longitudinally from the sample liner. Immerse test specimens in detergent (0.025 %), sodium hypochlorite (4 %), and sulfuric acid (3 %) solutions and test for resistance to chemical reagents in accordance with ASTM D543. Submit the test result to the COUNTY for review.

- C. Provide leakage test in accordance with Section 02676.

3.8 MANHOLE RECONNECTION

- A. Following the leakage test and visual inspection, manhole reconnections shall be sealed by CONTRACTOR as deemed necessary by the COUNTY. The equipment used shall consist of a standard packer device along with all necessary materials, including but not limited to chemical sealant containers, pumps, controls, regulators, valves, and hoses. A controlled hole not less than ½-inch diameter and not more than ¾-inch diameter shall be drilled or punched in the invert of the mainline liner pipe. The controlled hole shall be installed not less than one foot (1') from the inside wall of the manhole. The standard packer device shall be properly positioned to straddle the controlled hole and the end elements inflated, thereby isolating a portion of the mainline pipe liner. The controlling unit for the standard packer device shall have provisions for accurately controlling the packer functions in addition to monitoring the inflatable pressure and the void pressure in the isolated area to be sealed.
- B. All manhole reconnections shall be sealed by the use of the standard packer device. After the packer device has been properly positioned in the mainline, the connection shall be sealed by the injection of chemical sealant. The chemical sealant shall be injected through the packer device, through the controlled hole and into the annular space between the liner pipe material and host pipe. The injection of chemical sealant shall continue until the chemical fluid back pressure is sufficient to insure the complete sealing of all the defects.

3.9 INSPECTION

- A. The finished FF liner shall be inspected visually and by using CCTV. Television inspection of the liner shall be in accordance with Section 13511.
- B. The finished liner shall be continuous between manholes and shall be free from visual defects such as foreign inclusions, reverse curvatures, flats, dry spots, pinholes, and delamination. No infiltration of groundwater shall be allowed.
- C. Visual inspection shall be accomplished by review of post-rehabilitation CCTV. Should defects occur, the entire liner between manholes shall be removed and replaced at no cost to the COUNTY.

- D. In the event the COUNTY's Representative, based on review of post-installation CCTV video, has reasonable cause to suspect that any annular space exists between the liner and the host pipe, excavate and expose the existing sewer and remove the existing host pipe such that confirmation of the suspected annular space can be made. If an annular space equal to or greater than 5% of the pipe diameter is determined to exist, it shall be repaired in a manner approved by the COUNTY's Representative at no additional cost to the COUNTY. If it is determined that no annular space exists, CONTRACTOR shall be reimbursed in accordance with the General Provisions.
- E. The maximum allowable size of wrinkle or bulge as shown in the inspection shall not exceed 1/4 inch in the crown or wall of the pipe. No wrinkles will be allowed in the invert of the pipe.

3.11 WARRANTY INSPECTION

- A. Perform a warranty inspection by using CCTV per Section 13511 eleven (11) months after completion of the project. Provide a copy of the inspection television record to the COUNTY.
- B. The warranty inspection shall consist of televising 25% of the Work. The COUNTY shall determine which sewer sections shall be inspected. Should a failure be found, then the remaining 75% of the Work shall be televised at no additional cost to the OWNER.

3.12 WARRANTY

- A. CONTRACTOR shall provide warranty for rehabilitation in accordance with Section 01710.
- B. Any defects that are noted through the warranty period per the warranty inspection or a disruption of operation due to a failure shall be restored at no cost to the COUNTY. These defects include, but are not limited to, extensive wrinkling, flat inverts, buckling, cracking, fracture, leakage, partial or complete collapse of the liner.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02627

PRESSURIZED WASTEWATER PIPE (FORCE MAIN) REHABILITATION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this section includes all labor, materials, accessories, equipment, and tools necessary to install and test Cured-In-Place-Pipe (CIPP) and Fold and Form (FF) pipe liners used in rehabilitation of sanitary sewer force mains.

1.2 DESCRIPTION

The Fold and Form liner process is defined as the reconstruction of wastewater gravity and force main by insertion of a folded pipe liner into the existing wastewater main and the reformation of the pipe liner into a circular pipe liner. The liner shall be reformed into its original extruded configuration by a combination of steam and pressurization, which bi-axially reorients the molecules of the liner material (HDPE) and allows the liner to conform to the shape of the existing pipe locking at each joint and expanding into each service to form a concave dimple. Thus the structural pipe liner's new configuration is its new memory and is a continuous, tight fitting liner along the host pipe.

The CIPP liner process is defined as insertion of polymeric resin (vinyl/poly ester) impregnated (wet out) tube (felt with high density polyethylene membrane on one side) into a deteriorated pipe. The resin impregnated assembly is conveyed to the site with the smooth (e.g., HDPE) side on the outside and then inverted while being inserted into the host pipe so that the CIPP liner can attach onto the interior of the host pipe by curing of the resin and the wastewater can flow on the HDPE smooth side. The resin is cured by circulating hot water or by the introduction of controlled steam into the tube. When cured, the finished cured-in-place pipe will be continuous and tight fitting. For small diameter pipes (less than 12 inches in diameter) the liner can be directly installed without inversion (i.e., liner brought to site with impregnated side on the exterior).

1.3 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 01300 - Submittals
- B. Section 01570 - Traffic Regulation
- C. Section 02651 – Wastewater Service Reconnection, Sealing, and Inspection
- D. Section 13511 - Sanitary Sewer System Television Inspection

E. Section 01740 - Warranty and Bonds

1.4 SUBMITTALS

- A. Submit shop drawings and other information as listed below to the COUNTY for review and approval. Included shall be all materials as well as design calculations for the work being completed.
1. Submit shop drawings in accordance with the Section 01300.
 2. Submit plans showing points of insertion and methodologies.
 3. Submit certificates of compliance with design and test reports performed by a third party in accordance with applicable ASTM and specified test methods.
 4. Submit design calculations for hydraulic capacity.
 5. Submit certifications of the materials including the cell classification, grades, type of resins (except proprietary information), reinforcement fibers, and other materials used in the manufacture of the liner pipe.
 6. Submit a certificate of "Compliance with Specifications" by the manufacturer for materials.
 7. Submit a work plan to the COUNTY for acceptance. The work plan will address preparation steps required for pre-installation and access points.
 8. Submit details of how existing tees, air relief valves, blow-off valves, threaded taps, etc. will be reinstated.
 9. Submit liner size, thickness calculations, liner material (type of resin). Submit complete calculations including list of parameters, formulas, and other data that are necessary for the design of the liner pipe. Include soil loads, live loads, hydrostatic loads, pipe stiffness (PS), standard dimension ratio (SDR), pipe wall crushing strength, initial and long-term (50 years) values of pipe deflection, pipe bonding strain, hydrostatic collapse resistance, and constrained buckling strength. Submit drawings showing the cross sectional profile of the liner pipe wall.
 10. Submit manufacturer's installation instructions including recommendations for transportation, storage, handling, inserting, trimming, and finishing.
 11. Submit a plan detailing source of water to be used, pipeline locations, and discharge location.

12. Submit for the COUNTY's review a detailed description of special construction requirements and/or modifications to the liner installation process that may be required because of the voids present in the existing sewer pipe.
13. Submit written description of the methods and equipment proposed for repairs to the host conduit such as missing pipe, offset joints, protrusions, or other deformities to complete the CIPP/FF rehabilitation of force main. Such repairs shall be in accordance with the CIPP/FF liner manufacturer's recommended written procedures and techniques.
14. Submit written descriptions of the methods and equipment for the repair of defects in the CIPP/FF liner observed during the post-installation inspection.
15. Submit plans and written descriptions for traffic control (Section 01570), bypass pumping (Section 02652), pre-insertion cleaning (Section 02653), and pre/post-insertion CCTV inspection (Section 13511).
16. Submit results of post-installation liner sample analyses to confirm installed liner meets the design requirements of these construction documents.

1.5 PRODUCT AND INSTALLER ACCEPTABILITY

- A. To be acceptable, a minimum of 250,000 L.F. of wastewater collection system installation of the product in the U.S. must be documented.
- B. To be acceptable, the installer must have had at least three (3) years active experience in the commercial installation of the product, and must have installed at least 50,000 L.F. of the product over 12" diameter in wastewater collection/transmission system installations in the State of Florida. This requirement may be waived by the COUNTY for products that have been installed in the COUNTY's utility system for a period not less than two (2) years and a length not less than 1,000 lineal feet.

PART 2 - PRODUCTS

2.1 MATERIALS

A. FOLD AND FORM STRUCTURAL LINER

1. Fold and form (FF) liner to be used for rehabilitation of wastewater force mains shall be fully structural (stand alone), made of high density polyethylene (HDPE) or polyvinyl chloride (PVC), and unless otherwise required due to design conditions, liner shall have an SDR of 26, maximum.

2. The FF liner shall be completely factory manufactured, jointless, seamless, deformed and/or folded under factory controlled temperature conditions coiled, and packaged.
3. The pipe liner producer's certification, in accordance with ASTM specifications, shall be furnished with the liner coils. The CONTRACTOR shall turn the pipe liner producer's certification and warranty over to the COUNTY prior to installation.
4. Dimensional tolerances for wall thickness and diameter shall be per ASTM F-714 or manufacturer's process specification, whichever is more stringent.
5. The nominal outside diameter of the lining pipe shall be left to the discretion of the installing contractor. The liner shall provide a close- or tight-fit in the host pipe.
6. At the time of manufacture, each lot of liner shall be reviewed for defects and tested in accordance with ASTM D2837 and D1693. At the time of delivery, the liner shall be homogeneous throughout, uniform in color, free of cracks, holes, foreign materials, blisters, or deleterious faults.
7. Provide certified test results for review by the COUNTY from the manufacturer that the material conforms to the applicable requirements.
8. The fittings to be installed at each end of each line section shall meet the operating and material requirements of the finished system. HDPE /PVC fittings, including electrofusion end fittings and saddles shall meet the requirements of the above-referenced material specifications. Mechanical fittings used with the system shall meet relevant standards.
9. For testing purposes, a production lot shall consist of all liner having the same marking number. It shall include any and all items produced during any given work shift and must be so identified as opposed to previous or ensuing production.
10. Liner shall be marked at five foot (5') intervals or less with a coded number which identifies the manufacturer, SDR, size, material, date, and shift on which the liner was extruded.
11. Fold and form liner shall be Insituform Blue as manufactured by Insituform Technologies, Inc. or pre-approved equal.

B. CURED-IN-PLACE-PIPE (CIPP) STRUCTURAL LINER

1. Tube - The sewn tube shall consist of two or more layers of absorbent non-woven synthetic fiber combined with glass fiber reinforcement. The tube shall be fabricated to dimensions such that it will stretch to a size that when installed will cure while in contact with the existing pipe.
2. The outside layer of the tube shall be plastic coated with a translucent flexible material that clearly allows inspection of the resin impregnation (wet out) procedure.
3. The tube shall have a uniform thickness that when compressed at installation pressures will exceed the minimum required thickness specified in the design submittals.
4. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. The tube shall contain glass fiber reinforcement quantities appropriate for the internal pressure requirements.
5. The wall color of the interior pipe surface of the CIPP after installation shall be a light reflective color so that a clear detail examination may be made of the final product with closed circuit television inspection equipment or by man-entry.
6. A vinyl ester or epoxy resin system that is compatible with the inversion process shall be used.
7. CIPP structural liner shall be Insituform for Reconstruction of Pressurized Piping (RPP) as manufactured by Insituform Technologies, Inc. or pre-approved equal.

2.2 MATERIAL TESTING

- A. The COUNTY may, at any time, direct the manufacturer to obtain compound samples and to prepare test specimens in accordance with the ASTM standards referenced in this specification.
- B. The physical properties used in the design submittal shall be clearly identified. These physical properties shall be the basis for the acceptance of prequalification submittals of previous field samples and the acceptance of the final product. At a minimum, the CIPP or Fold and Form liner shall have the following physical properties:

Property	ASTM Test Method	Minimum Value*
Initial Flexural Modulus of Elasticity	D790	350,000 psi
Initial Flexural Strength	D790	7,000 psi
Initial Tensile Strength	D638	6,000 psi
Initial Tensile Load Capacity per Layer	D638	775 lbs/inch

*Applies to design conditions at 75 °F.

2.3 LINER DESIGN

- A. A.The liner manufacturer shall submit to the COUNTY for review complete design calculations for the liner, signed and sealed by a Professional Engineer registered in the State of Florida and certified by the manufacturer as to the compliance of his materials to the values used in the calculations.
- B. The liner shall be designed to withstand internal pressure, a live load equivalent to two (2) H-20 passing trucks plus all pertinent dead loads, and hydrostatic pressure. For design purposes, the water table shall be considered at grade elevation.
- C. Determine the thickness of the fully structural liner as the minimum thickness required to meet the design structural requirements for both internal and external loadings. The minimum liner thickness is for materials with characteristics as shown. Bidders with materials with other characteristics must supply complete information on their bids of the values as listed for ascertaining minimum thickness.
- D. Liner shall be neither accepted nor installed until design calculations are acceptable to the COUNTY.
- E. Design information is shown in the table below:

Design Criteria	Value
Height of Water Above Top of Pipe (feet)	4
Maximum Soil Cover (feet)	4
Soil Density (lbs/cu ft)	120
Modulus of Soil Reaction (psi)	1,000
Minimum Liner Thickness (mil)	200

- F. It is CONTRACTOR's responsibility to check the pipe size and length prior to manufacturing.
- G. The CIPP shall be designed as per ASTM F1216, Appendix X1.3.2 for the Fully Deteriorated Pressure Pipe condition, and shall be provided as a prequalification submittal. These detailed calculations shall provide the input

data as well as the actual calculation for Eqs X1.1, X1.3, X1.4 and X1.7 of Appendix X1. of ASTM F1216. The design submittal shall also clearly identify the physical properties used for design.

H. The CIPP design shall assume no bonding to the original pipe wall.

I. The design of the CIPP shall be based on the following parameters:

Diameter	As Indicated on Plans
Internal Design Pressure	50 psi
Normal Internal Operating Temperature (Design)	90 °F
Maximum Internal Temperature	100 °F
Internal Vacuum	10 psi
Soil Depth (above invert)	5 feet
Ground Water Depth (above invert)	5 feet
Live Load	15 psi
Modulus of Soil Reaction	1,000 psi
Soil Density	120 pcf

J. For the external load design in Appendix X.1 of ASTM F1216, the long-term (time-corrected) flexural modulus of elasticity shall be determined by multiplying the design initial flexural modulus of elasticity by a creep retention factor (C_L). At a minimum, a creep retention factor of 50% shall be applied.

K. The external load design shall be based on an enhancement factor (K) of 7.0, an ovality (q) of 0%, a Poisson's (v) ratio of 0.35 and a factor of safety of 2.0.

L. For the internal pressure design in Appendix X.1 of ASTM F1216, the design shall be based on factor of safety of 2.0 and a long-term tensile strength (or tensile load capacity per layer) equal to 1/3 of the design initial tensile.

M. The design physical properties shall be adjusted, as necessary, to account for the Normal Internal Operating Temperature specified in Paragraph I.

N. Fabricate the liner from a material, which when installed, will be chemically resistant to withstand internal exposure to sewage gases containing hydrogen sulfide, carbon monoxide, methane, hydrocarbons, saturation with moisture, and diluted sulfuric acid.

O. Calculate the FF liner wall thickness for each diameter based on a factor of safety of 2:1 using the standard HDPE as listed above. The thickness shall be rounded to the next highest multiple of 60 mils (1.5 mm).

P. Verify the lengths in the field before installation of the structural liner.

- Q. Prior to insertion, the structural liner shall be free of visible tears, holes, cuts, foreign materials, pinholes, and other defects. Repair defects that will affect the integrity or strength of the structural lining or replace the liner at no additional cost to the COUNTY. The method of repair shall maintain the full integrity of the liner.

PART 3 EXECUTION

3.1 PRE-INSTALLATION PROCEDURES

- A. Prior to entering access areas and performing inspection or cleaning operations, the CONTRACTOR shall make an evaluation of the atmosphere to determine the presence of toxic or flammable vapors or lack of oxygen. This shall be undertaken in accordance with local, state, or federal safety regulations.
- B. Inspect the pipeline per Section 01710. Clear the pipeline of obstructions. Perform inspection by CCTV per Section 13511. Provide a copy of the inspection television record to the COUNTY's Representative. Inspect the existing pipeline to determine the locations of conditions that may prevent proper installation of the liner, such as collapsed or crushed pipe and reductions in cross section area of more than 5% due to solids deposition or offset joints. Obstruction Removal (by remote device) or Point Repair shall be made by the CONTRACTOR with the approval of the COUNTY.
- C. Clean the pipeline, at minimum, with a high-pressure water jet to remove all internal debris out of the pipeline in accordance with the Technical Specifications Section 02653 "Preparatory Cleaning and Root Removal".
- D. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the force main under repair. See Technical Specifications Section 02652 "Wastewater By-Pass Pumping" of the Contract for additional information.
- E. Delivery Storage and Handling
 - 1. Exercise care during transportation, handling, storing, and installation of the FF/CIPP lining to ensure that the material is not torn, cut, or otherwise damaged.
 - 2. If any part or parts of the FF/CIPP liner material becomes torn, cut, or otherwise damaged before or during installation, it shall be repaired or replaced before proceeding with further installation and at no additional cost to the COUNTY.
 - 3. Handle and store the FF/CIPP liner as recommended by the manufacturer to ensure installation in a sound, undamaged condition.

4. Follow the resin manufacturer's requirements for handling and storage of the resin prior to, during, and following impregnation of the tube (applies to CIPP only).

3.2 INSTALLATION

A. FOLD AND FORM STRUCTURAL LINER

1. During insertion, protect the new liner and existing pipe and manholes from any damage that might result during the insertion process.
2. Equipment used to supply heat and pressure shall be capable of providing the necessary heat and pressure required for the installation condition.
3. During insertion, precautions such as some type of cover shall be provided on the leading edge of the pipe liner to prevent the ragged edges of the existing pipe from scarring the outside of the liner as it is pulled into the pipe. Once insertion is initiated, it is desirable to continue the pull at a rate of no greater than fifteen feet (15') to twenty feet (20') per minute to completion.
4. Launch and receiving pits shall allow for a smooth curve in the liner during insertion into the host pipe. The length of pit is determined by the depth of the host pipe and diameter of the liner. The CONTRACTOR shall determine pit dimensions in coordination with the COUNTY. Additional pits between the launch and receiving pits will be allowed, as required, for installation of fittings or connections.
5. When the deformed and reformed pipe is in place, it shall be cut and the processing manifolds (pipe end closing assembly used for heat and pressure control within liner) shall be attached in and secured at both pipe ends. The temperature and pressure measuring instruments shall be attached to the deformed and reformed pipe at both ends.
6. Through the use of heat and pressure the HDPE/PVC pipe liner should unfold and expand sufficiently to press against the wall of the host pipe, lock into the joints (unless assembled for the entire pipe segment prior to installation), and form dimples at the services. The deformed pipe shall be pressurized while the termination point valves are kept open to provide heat flow. Refer to manufacturer's recommended temperatures and pressures for in-situ reforming of the liner.
7. Cool the reformed pipe in accordance with the manufacturer's recommendations. The heat and pressure equipment shall be disconnected after ambient temperature is attained.

8. Temperature and pressures shall be monitored and recorded throughout the installation process to ensure that each phase of the process is achieved at the manufacturer's recommended temperature and pressure levels. Copies of these records shall be given to the COUNTY at the completion of each installation.

B. CIPP STRUCTURAL LINER

1. The CIPP tube shall be vacuum-impregnated (wet out) with resin under controlled conditions. The quantity of resin used for tube impregnation shall be sufficient to fill the volume of air voids in the tube with additional allowances for polymerization shrinkage and loss of resin through cracks and irregularities in the original pipe wall.
2. The COUNTY will designate a location where the tube will be vacuum impregnated prior to installation. To ensure a thorough wet out, the point of vacuum shall be no further than 25 feet from the point of initial resin introduction. After vacuum in the tube is established, the vacuum points shall be no further than 75 feet from the leading edge of the resin. The leading edge of the resin slug shall be as near to perpendicular as possible. Vacuum points shall be sealed as they are vacated. A roller system shall be used to uniformly distribute the resin throughout the tube. The CONTRACTOR shall allow the COUNTY to inspect the materials and procedures used to vacuum impregnate the tube.
3. The wet out tube shall be inserted through an approved access point by means of an inversion process and the application of a hydrostatic head sufficient to extend it to the next designated manhole or termination point.
4. Before the installation begins, the CONTRACTOR shall determine the minimum pressure required to hold the tube tight against the existing pipeline, and the maximum allowable pressure so as not to damage the tube. Once the installation has started, the pressure shall be maintained between the minimum and maximum pressures until the installation has been completed. Tube installation forces or pressures shall be limited so as not to stretch the tube longitudinally by more than 5% of the original length.
5. The use of a lubricant during inversion may be needed to reduce friction. The lubricant used shall be a nontoxic product that has no detrimental effects on the tube or boiler and pump system, shall not support the growth of bacteria, and shall not adversely affect the fluid to be transported.

6. After installation is completed, a suitable heat source and water recirculation equipment shall be used to circulate heated water throughout the pipeline. The equipment shall be capable of delivering hot water throughout the pipeline to uniformly raise the water temperature above the temperature required to affect a cure of the resin. Water temperature in the line during the cure period shall be as determined by the CONTRACTOR.
7. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. To determine the temperatures during the cure cycle, a gauge shall be placed at the beginning and termination points between the impregnated tube and the invert of the existing pipe. The temperature of the cure water shall be monitored at the termination end by placing a temperature probe through a small hole in the tube, near the invert, into the cure water. The hole in the tube shall be made such that the temperature probe fits tightly and minimizes cure water leakage.
8. Initial cure will occur during temperature heat-up and is completed when exposed portions of the new pipe appear to be hard and sound and the remote temperature sensor indicates that the temperature is of a magnitude to realize a cure in the resin. After initial cure is reached, the temperature shall be raised to the post-cure temperature determined by the CONTRACTOR based on manufacturer's recommendations. The post-cure temperature shall be held for a period as determined by the CONTRACTOR, during which time the recirculation of the water and cycling of the boiler to maintain the temperature continues. The curing process shall take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of soil).
9. The CIPP shall be cooled to a temperature below 90°F before relieving the hydrostatic head. Cool-down shall be accomplished by the introduction of cool water to replace water being drained from the system. Care shall be taken in the release of the static head so that a vacuum will not be developed that could damage the newly installed CIPP. In addition, the cure water incoming temperature during cool-down shall not decrease at a rate greater than 20°F per hour.
10. Install end seals at each of the CIPP beginning and termination points.
11. The end seals shall be a mechanical, expansion type, constructed of stainless steel and elastomeric rubber seals. The end seals shall be rated by the manufacturer for the operating pressure and shall be compatible with the piped fluid. The existing pipeline at the end seal installation points shall be structurally sound and free of any significant pitting or heavy corrosion. This is required to ensure an adequate seal

between the CIPP and existing pipeline. Otherwise, replacement with a new steel spool piece at these ends may be required.

12. All reinstatements of tees, air relief valves, blow-off valves, threaded taps, etc., shall provide a sufficient seal to prevent water tracking between the CIPP and host pipe.

3.3 FIELD TESTING

A. CIPP STRUCTURAL LINER

1. Sampling - For each CIPP liner segment between two access points, prepare one sample from a section of the cured liner at the termination point in accordance with ASTM F1216. Samples shall be large enough to provide a minimum of three specimens.
2. CONTRACTOR shall be responsible for testing the samples for flexural, tensile, resistance to abrasive chemicals, and delamination properties. Flexure properties shall be tested in accordance with ASTM D790 and shall meet the requirements of the Table in Paragraph 2.2(B). Tensile properties for pressure pipe conditions shall be tested in accordance with ASTM D638 and shall meet the requirements of the Table in Paragraph 2.2(B). Test for delamination in accordance with ASTM D903 as set forth in Section 8.4 of ASTM F1216. Immerse test specimens in detergent (0.025 %), sodium hypochlorite (4 %), and sulfuric acid (3 %) solutions and test for resistance to chemical reagents in accordance with ASTM D543. Submit the results to the COUNTY for review.
3. Provide leakage test in accordance with Section 02676.

B. FOLD AND FORM STRUCTURAL LINER

1. Prepare one sample FF liner, from the stack shipped for installation, inserted into a split mold with a nominal inside diameter equal to the outside diameter of the FF liner specimen.
2. CONTRACTOR shall be responsible for testing specimens, cut out of the sample liner, for stiffness per ASTM D2412, resistance to abrasive chemicals in domestic sewage per ASTM D543, flexural strength per ASTM D790 and tensile strength per ASTM D638. Flexural and Tensile properties shall meet the requirements of Paragraph 2.2(B). Immerse test specimens in detergent (0.025 %), sodium hypochlorite (4 %), and sulfuric acid (3 %) solutions and test for resistance to chemical reagents in accordance with ASTM D543. Submit the test result to the COUNTY for review.
3. Provide leakage test in accordance with Section 02676.

3.4 SAFETY

CONTRACTOR shall carry out operations under this Section in strict accordance with all applicable OSHA Standards. It shall be the CONTRACTOR's responsibility to comply with OSHA Standard and Regulations pertaining to all aspects of the work.

3.5 INSPECTION

- A. The finished CIPP/FF liner shall be inspected visually and by using CCTV. Television inspection of the liner shall be in accordance with Section 13511.
- B. The finished liner shall be continuous between access points and shall be free from visual defects such as foreign inclusions, reverse curvatures, flats, dry spots, pinholes, and delamination.
- C. Visual inspection shall be accomplished by review of post-rehabilitation CCTV. Should defects occur, the entire liner between access points shall be removed and replaced at no cost to the COUNTY.
- D. The maximum allowable size of wrinkle or bulge as shown in the inspection shall not exceed 1/4 inch.

3.6 WARRANTY INSPECTION

- A. Perform a warranty inspection by using CCTV per Section 13511 eleven (11) months after completion of the project. Provide a copy of the inspection television record to the COUNTY.
- B. The warranty inspection shall consist of televising 25% of the Work. The COUNTY shall determine which sewer sections shall be inspected. Should a failure be found, then the remaining 75% of the work shall be televised at no additional cost to the COUNTY.

3.7 WARRANTY

- A. CONTRACTOR shall provide warranty for rehabilitation in accordance with Section 01710.
- B. Any defects that are noted through the warranty period per the warranty inspection or a disruption of operation due to a failure shall be restored at no cost to the COUNTY. These defects include, but are not limited to, extensive wrinkling, flat inverts, buckling, cracking, fracture, leakage, partial or complete collapse of the liner.

END OF SECTION

SECTION 02651

WASTEWATER SERVICE RECONNECTION, SEALING, AND INSPECTION

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This Section specifies the method of process for furnishing all labor, materials, tools, equipment, and incidentals necessary to provide for the reconnection, sealing, and inspection of wastewater services after the installation of a CIPP or fold-and-form pipe liner.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 02624 – CIPP Liner
- B. Section 02625 - Fold and Form Liner (HDPE)
- C. Section 02626 - Fold and Form Liner (PVC)

PART 2 PRODUCTS

2.1 SEALANT

- A. The chemical sealant used shall be in accordance with the liner manufacturer's requirements.

PART 3 EXECUTION

3.1 GENERAL

- A. Service reconnections shall be sealed with the use of equipment which shall consist of a closed circuit television system and a special sealing packer device along with any necessary materials including but not limited to chemical sealant containers, pumps, controls, regulators, valves, and hoses. The special sealing packer shall be so constructed that it can straddle four-inch (4") to six-inch (6") diameter service connections in eight inches (8") or larger wastewater main. When properly positioned and with the end elements inflated, a special inflatable sealing tube shall be extended up the service connection a minimum five feet (5') thereby isolating a portion of the service connection containing one (1) or more pipe joints for sealing. The

controlling unit for the device shall have provisions for accurately controlling the packer functions in addition to monitoring the inflatable pressure and the void pressure in the isolated area to be sealed.

- B. All wastewater main service reconnections shall be sealed by use of the special packer device. After the packer device has been properly positioned in the main line with the inflatable tube extended into the service connection, the connection shall be sealed by the injection of the chemical sealant. The chemical sealant shall be injected through the special packer device into the annular space between the inflatable tube and the service connection. The injection of the chemical sealant shall continue until the chemical fluid backpressure is sufficient to insure the complete sealing of all the defects along the length of the inflatable tube.
- C. After the service connection has been successfully sealed, the following procedures shall be performed to insure that the sealing operation did not block the service connection.
 - 1) The inflatable tube shall be removed from the connection.
 - 2) The packer and elements shall be deflated.
 - 3) The special packer shall be moved forward and the closed circuit 360° camera shall be positioned in the center of the service connection and rotated to look up the service connection to insure that the chemical sealant did not cause blockage.
- D. If blockage is observed, the chemical sealant shall be removed to insure the service connection is free flowing. The CONTRACTOR is to orient the camera in such a position to assure that blockage is not present.

3.2 REINSTATEMENT OF SERVICES

- A. Immediately reinstate live services after rehabilitation, testing, and acceptance of sewer lines. Inactive service lines to a vacant lot, vacant building, or to an occupied residence with more than one service line serving the property shall be defined as a “live” service and shall be reinstated unless otherwise directed by the OWNER.
- B. Locate live services prior to rehabilitation activities. Note each service connection by its size, position from a reference manhole, and orientation with respect to the circumference of the pipe. Reconnect from the interior of the sewer line by means of a television camera and a remote controlled cutting device. No excavation will be allowed.

- C. Holes cut through the rehabilitation liner shall be neat and smooth and shall match the bottom of the reinstated service line. Reinstatement of the service opening shall be to a minimum of 95% and a maximum of 100% of the service lateral pipe area. The new edge shall be crack free with no loose or abraded material.
- D. The seam between the host pipe and the new liner at the reinstated service shall be free of gaps, voids, or cavities and shall be no more than a hairline crack. Any gaps, voids, or cavities at this joint shall be grouted with a packer and grouting system. Seal gaps between the liner and the service by internal methods prior to the post-construction televising.
- E. Provide a fully operational backup device for reinstating service laterals. If for any reason the remote cutting device fails during the reinstatement of a service lateral, immediately deploy the standby device to complete the reinstatement. The backup device shall be fully functional without requiring removal of parts from the primary device. The backup equipment shall be onsite throughout the reinstatement process.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02652

WASTEWATER BY-PASS PUMPING

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this Section includes all labor, materials, accessories, equipment, and tools for performing all operations required to bypass pump wastewater around a manhole or wastewater main section in which work is to be performed. The CONTRACTOR shall be prepared to bypass pump wastewater as a part of his operations.
- B. The CONTRACTOR shall provide all pumps, piping, and other equipment to accomplish this task; perform all construction; obtain all permits; pay all costs; and perform complete restoration of all existing facilities to equal or better condition to the satisfaction of the COUNTY.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL

- A. When wastewater main flows at the upstream manhole of the section being repaired are above the maximum allowable requirements for television survey, or do not allow the proper wastewater main or manhole repair, the flows shall be reduced to the levels indicated by one (1) of the following methods: manual operation of pumping stations by COUNTY forces or by the CONTRACTOR's pumping/bypassing of the flows if authorized in writing by the COUNTY.
- B. In some applications, the wastewater flow may be plugged and contained within the capacity of the collections system. This shall only be done after the CONTRACTOR has obtained authorization from the COUNTY when it has been determined the system can accommodate the surcharging without any adverse impact.
- C. For the pre-installation and post-installation television surveys, the wastewater main shall be blocked completely. No flow, except Infiltration/Inflow will be allowed through the respective wastewater main being televised in these cases.
- D. For all other television surveys, including warranty surveys and joint testing and sealing, the depth of flow within the wastewater main shall not

exceed that shown below for the respective pipe sizes as measured in the manhole.

Maximum Depth of Television Survey Flow

6" - 10" Pipe	20% of pipe diameter
12" - 24" Pipe	25% of pipe diameter
Above 24" Pipe	30% of pipe diameter

Maximum Depth of Joint Testing/Sealing Flow

6" - 10" Pipe	25% of pipe diameter
15" - 24" Pipe	30% of pipe diameter
Above 24" Pipe	35% of pipe diameter

E. When wastewater main flows at the upstream manhole of the line being repaired, in the opinion of the COUNTY, are too excessive to plug while the rehabilitation is being preformed; the CONTRACTOR shall submit a written plan and pump/bypass the flow as acceptable to the COUNTY.

3.2 WORKMANSHIP

- A. Plugging and Blocking - A wastewater main plug shall be inserted into the line at a manhole upstream from the section being surveyed or repaired. The plug shall be so designed that all or any portion of the operation flows can be released. During the survey portion of the operation, flows shall be shut off or reduced to within the maximum flow limits specified. During repairs, the flows shall be shut off or pumped/bypassed, as acceptable to the COUNTY. After the work tasks have been completed, flows shall be restored to normal.

- B. Pumping and Bypassing - When pumping/bypassing is required, as determined by the COUNTY, the CONTRACTOR will supply the necessary pumps, conduits, and other equipment to divert the flow of sewage around the section in which work is to be performed. The bypass system shall be of sufficient capacity to handle existing flows plus additional flow that may occur during periods of rainstorms. The CONTRACTOR will be responsible for furnishing the necessary labor and supervision to set up and operate the pumping and bypassing system. A "setup" consists of the necessary pumps, conduits and

other equipment to divert the flow of sewage around a section, from the start to finish of all work performed in the section.

- C. Pumps and equipment shall operate automatically based on float levels and shall be continuously monitored by the CONTRACTOR on a 24-hour basis. The person designated by the CONTRACTOR to be responsible for the by-pass pumping operation shall be capable of starting, stopping, refueling, and maintaining these pumps during the rehabilitation. If pumping is required on a 24-hour basis, engines shall be equipped in a manner to keep noise to a minimum.
- D. Surcharging Wastewater Mains - Where the raw sewage flow is blocked or plugged, sufficient precautions must be taken to protect the public health. The wastewater main shall also be protected from damage. The following occurrences shall not be allowed:
 - 1) No sewage shall be allowed to back up into any homes or buildings
 - 2) No sewage shall overflow any manholes, clean-outs, or any other access to the wastewater mains.
 - 3) Users upstream of the repair area shall be able to use all their water and wastewater main utilities without interruption.
- E. If any of the above occur or are expected to occur, the CONTRACTOR shall bypass pump to alleviate one (1) or all of the Conditions. If any of the conditions stated above in Section 3.2D occur, the CONTRACTOR shall be responsible for all necessary clean up and fines from FDEP. Additionally, the CONTRACTOR is required to observe the conditions upstream of the plug and be prepared to immediately start bypassing pumping, if needed.
- F. Pumps - Any sump pumps, bypass pumps, trash pumps, or any other type pump which pulls sewage/water or any type of material out of the manhole or wastewater main shall discharge this material into another manhole, or appropriate vehicle or container acceptable to the COUNTY. Under no circumstances shall this material be discharged, stored, or deposited on the ground, swale, storm drain, or open environment.
- G. Traffic Control - The CONTRACTOR shall take appropriate steps to ensure that all pumps, piping, and hoses that carry raw sewage are protected from traffic. Traffic control shall be performed in accordance with Section 01570 of the Lee County Utilities Operations Manual.
- H. Sewage Spills – In the event, during any form of sewage flow control, that raw sewage is backed up into homes or buildings, spilled, discharged, leaked, or otherwise deposited in the open environment, due to the CONTRACTOR's work, the CONTRACTOR is responsible for any clean up of solids and disinfections of the area affected. This work will be performed at the

CONTRACTOR's expense with no additional cost to the COUNTY. The CONTRACTOR is also responsible for notifying the system maintenance personnel and complying with any and all regulatory notification requirements in regards to the size of the spill with no additional cost to the OWNER. The CONTRACTOR shall also be responsible for paying any fines from FDEP or other agencies imposed on the COUNTY arising from such spills.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02653

PREPARATORY PIPE CLEANING AND ROOT REMOVAL

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This Section covers the preparatory cleaning of wastewater mains and manholes as needed prior to the internal survey and/or repair of the wastewater mains and the cleaning of manholes prior to rehabilitation. The CONTRACTOR shall furnish all necessary material, labor, equipment, and services required for cleaning the specific wastewater mains.

1.2 GENERAL

- A. The intent of wastewater main cleaning is to remove foreign materials from the lines and restore the sewer to a minimum of 95% of the original carrying capacity or as required for proper seating of internal pipe liner repairs. Since the success of other phases of work depends a great deal on the cleanliness of the lines, the importance of this phase of the operation is emphasized. It is recognized that there are some conditions such as broken pipe and major blockages that prevent cleaning from being accomplished or where additional damage would result if cleaning were attempted or continued. Should such conditions be encountered, the CONTRACTOR will not be required to clean those specific sewer sections. If, in the course of normal cleaning operations, damage does result from unforeseen conditions, the CONTRACTOR will not be held responsible.
- B. Hydraulically Propelled Equipment - The equipment used shall be of a movable dam-type and be constructed in such a way that a portion of the dam may be collapsed at any time during the cleaning operation to protect against flooding of the sewer. The movable dam shall be equal in diameter to the pipe being cleaned and shall provide a flexible scraper around the outer periphery to insure removal of grease. If sewer cleaning balls or other equipment that cannot be collapsed is used, special precautions to prevent flooding of the sewers and public or private property shall be taken.
- C. High Velocity Jet (Hydrocleaning) Equipment - All high-velocity sewer cleaning equipment shall be constructed for ease and safety of operation. The equipment shall have a selection of two (2) or more high-velocity nozzles. The nozzles shall be capable of producing a scouring action from 15° to 45° in all size lines designated to be cleaned. Equipment shall also include a high-velocity gun for washing and scouring manhole walls and floor. The gun shall be capable of producing flows from a fine spray to a solid stream. The equipment shall carry its own water tank, auxiliary engines, pumps, and hydraulically driven hose reel.

- D. Mechanically Powered Equipment - Bucket machines shall be in pairs with sufficient power to perform the work in an efficient manner. Machines shall be belt operated or have an overload device. Machines with direct drive that could cause damage to the pipe will not be allowed. A power rodding machine shall be either a sectional or continuous rod-type capable of holding a minimum of 750 feet of rod. The rod shall be specifically heat-treated steel. To insure safe operation, the machine shall be fully enclosed and have an automatic safety clutch or relief valve.

PART 2 PRODUCTS

NOT USED

PART 3 EXECUTION

3.1 GENERAL

- A. The designated sewer manhole sections shall be cleaned using hydraulically propelled, high-velocity jet, or mechanically powered equipment. The equipment shall be capable of removing dirt, grease, rocks, sand, and other materials and obstructions from the wastewater mains and manholes. If cleaning of an entire sewer section cannot be successfully performed from one manhole, the equipment shall be set up on the other manhole and cleaning again attempted. If, again successful cleaning cannot be performed or the equipment fails to traverse the entire section, it will be assumed that a major blockage exists and the cleaning effort shall be abandoned.

3.2 CLEANING PRECAUTIONS

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

3.3 MATERIAL REMOVAL

- A. All sludge, dirt, sand, rocks, grease, roots, and other solid or semisolid material resulting from the cleaning operation shall be removed at the downstream manhole of the section being cleaned. Passing material from manhole section to manhole section, which could cause line stoppages, accumulation of sand in wet wells, or damage pumping equipment shall not be permitted.
- B. Under no circumstances shall sludge or other debris removed during these operations be dumped or spilled into the streets, ditches, storm drains, or other sanitary sewers, or otherwise deposited in the open environment.
- C. The CONTRACTOR is advised that he shall not dispose of this material by legal or illegal dumping on private or public property, by sale of others, or any means other than those given in Article 3.4. All sludge or other debris removed during these operations shall become the property of the CONTRACTOR and as such, any load of material, or any portion thereof, disposed of in a non-permitted and/or unauthorized fashion shall become the sole responsibility of the CONTRACTOR. Any fines or clean-up costs associated with such dumping shall be paid by the CONTRACTOR; if necessary, monies shall be withheld from any monies due the CONTRACTOR until restitution is made.

3.4 DISPOSAL OF MATERIALS

- A. All solids or semisolids resulting from the cleaning operations shall be removed from the site and disposed of by the CONTRACTOR in a legal and sanitary manner as approved by appropriate authorities, at the CONTRACTOR's cost. Copies of all disposal documentation shall be furnished to the COUNTY, indicating disposal site, date, amount and a brief description of materials disposed. All materials shall be removed from the site no less often than at the end of each workday. Under no circumstances will the CONTRACTOR be allowed to accumulate any type of debris on the site of work beyond the stated time, except in totally enclosed containers and as acceptable to the COUNTY.

3.5 ROOT REMOVAL

- A. Roots shall be removed in the designated sections and manholes where root intrusion is indicated. Special attention should be used during the cleaning operation to assure almost complete removal of roots from the joints. Any roots which could prevent the proper seating and application of cured-in-place, fold-and-formed, sectional cured-in-place liners, or rigid slip-liners, shall be removed. Procedures may include the use of mechanical equipment such as rodding machines, bucket machines and winches using root cutters and porcupines, and equipment such as high-velocity jet cleaners. Chemical root treatment shall be used before or at the completion of the root removal operation, depending on the manufacturer's recommendation. CONTRACTOR shall capture and remove all roots from the line.

3.6 CHEMICAL ROOT TREATMENT

- A. To aid in the removal of roots, manhole sections and piping that have root intrusion shall be treated with an acceptable herbicide. The application of the herbicide to the roots shall be done in accordance with the manufacturer's recommendations and specifications in such a manner to preclude damage to surrounding vegetation. Any damaged vegetation so designated by the COUNTY shall be replaced by the CONTRACTOR at no additional cost to the COUNTY. All safety precautions as recommended by the manufacturer shall be adhered to concerning handling and application of the herbicide.

3.7 TUBERCULATION REMOVAL

- A. Tuberculation shall be sufficiently removed from the host pipe in order to provide a suitable surface for subsequent pipe liner installation.
- B. Tuberculation shall be removed from the lateral connections to ensure that the liner/lateral connection can be adequately sealed, and that the flow from the lateral is not obstructed.
- C. Tuberculation removal shall be accomplished by successive passes of pipe cleaning equipment, starting with the least aggressive method and then progressing to more aggressive methods as required to achieve a surface suitable for lining to the satisfaction of the OWNER and ENGINEER.
- D. Procedures may include the use of high-velocity jet cleaners, rodding machines, and winches using rotating cutters or scrapers.

3.8 ACCEPTANCE OF CLEANING OPERATION

- A. Acceptance of wastewater main cleaning shall be made upon the successful completion of the television survey and shall be to the satisfaction of the COUNTY. If television survey shows the cleaning to be unsatisfactory, the CONTRACTOR shall be required to reclean and reinspect the wastewater main until the cleaning is shown to be satisfactory. In areas where television survey is not performed, the COUNTY may require the CONTRACTOR to pull a double squeegee (with each squeegee the same diameter as the sewer) through each manhole section as evidence of adequate cleaning. If internal sealing is to follow the television survey, particular attention should be given to the adequacy of the cleaning to insure that proper seating of the sealing packer can be achieved.

3.9 MAINS WITH SAGS OR DIPS

- A. All those lines which have sags or dips, to an extent that the television camera lens becomes submerged for three (3) or more feet during the television inspection, the CONTRACTOR shall pull double squeegee and/or sponges through the line in order to remove the water from those dips or sags. Water removal through the use

of squeegees and/or sponges shall be performed until the television camera lens will no longer be submerged.

3.10 GROUTING

- A. All sources of infiltration that would prevent an acceptable pipe liner installation shall be grouted with Avanti chemical grout or pre-approved equal.
- B. Grouting the existing host pipe shall be considered incidental to the bid prices of the various related items of work. Separate payment for this work will not be allowed.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02654

STRUCTURAL MANHOLE LINING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Work required for the various types of manhole linings identified in the repair schedule contained in the plans. The materials and methods included in this section are designed to eliminate infiltration through manhole walls and enhance structural integrity of severely deteriorated manholes. Materials of linings are spray applied polymeric (epoxy and polyurethane) resins.
- B. Related Work Specified Elsewhere includes:
 - 1. Section 01026 – Measurement and Payment
 - 2. Section 01300 – Submittals
 - 3. Section 02676 – Leakage Tests
 - 4. Section 02999 – Miscellaneous Work and Cleanup

1.2 SUBMITTALS

- A. Contractor shall submit manufacturer's technical literature on material and description of installation method including, but not limited to:
 - 1. Requirements for application, such as temperature and humidity
 - 2. Requirements for worker safety, such as ventilation and safe handling procedures
 - 3. Maximum storage life
 - 4. Mixing and proportioning requirements for specific application
 - 5. Pot life
 - 6. Curing time
 - 7. Physical properties
 - 8. Test results on resistance to abrasive chemicals

1.3 QUALITY ASSURANCE

- C. Product application shall be performed only by workmen trained and experienced with specified material and trained in confined space entry.
1. Certification: Applicators for spray-applied coating installation shall be certified by the manufacturer.
 2. Contractor Experience: Minimum of five (5) years of experience with similar applications of the materials specified.

PART 2 PRODUCTS

2.1 SPRAY APPLIED RESINS

1. The spray-applied coating shall be resistant to hydrogen sulfide gas, sulfuric acid, and other chemicals typically found in sanitary sewers.
2. The spray-applied coating shall also be resistant to damage due to impact and abrasion.
3. The spray-applied coating shall be either a 100% solids epoxy; e.g., Raven 405 manufactured by Raven Lining Systems or a 100% solids rigid polyurethane; e.g., SprayWall by SprayRoq, Inc. or pre-approved equal. The liner shall conform to the minimum physical requirements listed below.

Compressive strength, ASTM D695	10,500 psi
Flexural modulus (initial), ASTM D790	735,000 psi
Flexural strength, ASTM D790	12,000 psi
Bond strength, ASTM D4541	Must exceed substrate tensile strength
Tensile strength, ASTM D638	7,000 psi
Chemical Resistance (ASTM D543) – Exposure to sodium hypochlorite (10 percent) and sulfuric acid (15 percent) for 168 hours	No degradation in physical or mechanical properties

PART 3 EXECUTION

3.1 GENERAL

- A. All pipes in service shall be plugged or bypassed in accordance with Section 02652 before any work is started on the structure. No debris shall be flushed down the line.
- B. Only personnel who are aptly trained in confined space entry shall be permitted to enter the structure. All OSHA requirements for confined space entry equipment and permitting shall be complied with. The Contractor shall obtain a confined space entry permit from Lee County Utilities prior to beginning any work.

3.2 PREINSTALLATION/SURFACE PREPARATION

- A. High pressure grout: High pressure grout shall be injected from the interior of the manhole surfaces into cracks and voids in order to stop leaks. The use of hydraulic cement will not be allowed.
 - 1. Suitable equipment shall be utilized for pumping the grout from above ground through a hose and injecting the grout under pressure to fill voids beyond the manhole structure. The equipment shall have a means of measuring the amount of grout used in gallons.
 - 2. Grout shall be used in accordance with the manufacturer's recommendations for the specific application.
 - 3. The following are acceptable grout products: Avanti AV-202 Multigrout or pre-approved equal
- B. Patching cement: After all loose and deteriorated material has been removed from the interior surfaces of the manhole and after all leaks have been grouted, patching cement shall be applied to fill in any irregularities to achieve an acceptable smooth surface.
 - 1. Patching Cement shall be compatible with the liner material as specified in item 2.1.
- C. Evaluation of Atmosphere: Prior to entering structures, an evaluation of the atmosphere shall be conducted to determine the presence of toxic, flammable vapors or possible lack of oxygen. The evaluation shall be in accordance with local, state or federal safety regulations.

- D. Clean manhole ring and cover free of rust and debris so the lid will properly seat when reinstalling the lid. Use power brushing such as wire wheel on a grinder/needle gun as most types of debris cannot be removed by hand wire brushing.
- E. Surfaces to be lined shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide strong bond between the lining and substrate.
- F. High pressure water jetting (NACE Standard No. 5/SSPC-SP12) abrasive (sand) blasting, and mechanical wire-brushing shall be the methods to remove previous coatings, laitance, contaminated, disintegrated or chalky material. Detergent water cleaning and hot water blasting may be necessary to remove oil and grease.
- G. Use of acid for cleaning purposes, no matter how dilute, will not be allowed. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. Fill any large voids with quick setting cement patch mix recommended by the manufacturer of liner product. The surface to be repaired must be clean and free of any loose materials.
- H. Application of liner shall not be made unless the ambient Temperature inside the structure is 50 degrees °F or higher.
- I. After the patched areas have cured sufficiently, prepare manhole wall surfaces in accordance with the manhole liner manufacturer's recommendations.
- J. All resurfaced or repaired surfaces shall be inspected for cleanliness and suitability to receive spray-applied liner. Additional surface preparation may be necessary prior to application.
- K. Apply manhole liner in accordance with manufacturer's recommendations regarding temperature and installation procedures and in accordance with Lee County Utilities specifications. The liner shall be applied to the invert and walls of the manhole from the bench up to the bottom of the casting.
- L. Only manufacturer-certified personnel shall be permitted to install spray-applied liner.
- M. Spray equipment shall be specifically designed to accurately ratio and apply the coating products and shall be in good working order.
- N. Prepared surfaces shall be lined by spray application to a minimum wet film thickness of 200 mils.

- O. During application, a wet film thickness gauge meeting ASTM D4414 shall be used. All necessary measurements shall be taken and attested to by the Contractor. Written reports signed by the Contractor shall be given to the Owner and Engineer.
- P. Allow the final application to cure for the amount of time recommended by the manufacturer before being subjected to sewage flow, or installation of spray-applied liner (where indicated).

3.3 QUALITY CONTROL

- A. Inspect lining system for holidays, cracks, and pinholes using the spark-test method and equipment in accordance with NACE RPO 188. Especially check the lining over brick, block, and very rough surfaces.
- B. Repair voids and holidays per the manufacturer's instructions.

3.4 SAFETY

The CONTRACTOR shall carry out operations under this section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving entry into a confined space. It shall be the CONTRACTOR's responsibility to comply with OSHA Standard and Regulations pertaining to all aspects of the work.

PART 4 WARRANTY

Provide a ten (10) year unlimited warranty on all workmanship and products. The work covered by the warranty shall include surface preparation, grouting, liner application, as well as other work performed under this section. The warranty shall be effective beginning on the date of final acceptance by Lee County Utilities, and shall guarantee that the manhole will be protected from leaks and from failure due to corrosion from exposure to hydrogen sulfide and other corrosive chemicals normally encountered in raw sewage.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02655

NON-STRUCTURAL MANHOLE LINING

PART 1 GENERAL

1.1 SUMMARY

- A. Section includes: Work required for the various types of manhole coatings/linings identified in the repair schedule contained in the plans. The materials and methods included in this section are designed to eliminate infiltration through manhole walls and prevent further deterioration/corrosion of the interior of manholes. Materials of linings include spray applied elastomeric resins and concrete embedment polyvinyl chloride and high density polyethylene liners.
- B. Related Work Specified Elsewhere includes:
 - 1. Section 01026 – Measurement and Payment
 - 2. Section 01300 – Submittals
 - 3. Section 02676 – Leakage Tests
 - 4. Section 02999 – Miscellaneous Work and Cleanup

1.2 SUBMITTALS

- A. CONTRACTOR shall submit manufacturer's technical literature on material and description of installation method including, but not limited to:
 - 1. Requirements for application, such as temperature and humidity
 - 2. Requirements for worker safety, such as ventilation and safe handling procedures
 - 3. Maximum storage life
 - 4. Mixing and proportioning requirements for specific application
 - 5. Pot life
 - 6. Curing time
 - 7. Physical properties
 - 8. Test results on resistance to abrasive chemicals

1.3 QUALITY ASSURANCE

1. Product application shall be performed only by workmen trained and experienced with specified material and trained in confined space entry.
2. Certification: Applicators for spray-applied coating installation shall be certified by the manufacturer.
3. Spray equipment shall be specifically designed to accurately ratio and apply the coating products and shall be in good working order.
4. Contractor Experience: Minimum of five (5) years of experience with similar applications of the materials specified.

PART 2 PRODUCTS

2.1 SPRAY APPLIED RESINS

- A. The spray-applied coating shall be resistant to hydrogen sulfide gas, sulfuric acid, and other chemicals typically found in sanitary sewers.
- B. The spray-applied coating shall also be resistant to damage due to impact and abrasion.
- C. The spray-applied coating shall be an elastomeric polymer compound; e.g., Integrated Environmental Technologies (IET), SherFlex, Rhino Linings or pre-approved equal. The liner shall conform to the minimum physical requirements listed below.

Hardness (Shore D), ASTM D2240	65 +/- 5
Tear Strength (Die C), ASTM D624	190 pli
Tensile Strength (ASTM D412)	2000 psi
Chemical Resistance (ASTM D543) – Exposure to sodium hypochlorite (10 percent) and sulfuric acid (15 percent) for 168 hours	No degradation in physical or mechanical properties

2.2 CONCRETE EMBEDMENT LINERS

- A. The material used in the liner, welding strips and other accessory items, shall be a combination of polyvinyl chloride (PVC) or high density polyethylene

(HDPE) resin, pigments and plasticizers, specially compounded to remain flexible. The resin shall constitute not less than 97 percent by weight, of the resin used in the formulation.

- B. Continuous locking extensions embedded in concrete shall withstand a test pull of at least 100 pounds per linear inch (1800 kg/m), applied perpendicularly to the concrete surface for a period of one minute, without rupture of the locking extensions or withdrawal from embedment. This test shall be made at a temperature of 70°-80°F (21°C) inclusive.
- C. All plastic liner plate sheets, including locking extension, all joint, corner and welding strips shall be free of cracks, cleavages or other defects adversely affecting the protective characteristics of the material.
- D. The lining shall have a good impact resistance, shall be flexible and shall have an elongation sufficient to bridge up to ¼-inch (6 mm) settling cracks.
- E. The lining shall be repairable at any time during the life of the pipe or the structure. Liner sheets shall be a minimum of 65 mils (1.65 mm) in thickness.
- F. Locking extensions of the same material as that of the liner shall be integrally extruded with the sheet.
- G. Sheets not used for shop fabrication into larger sheets shall be shop tested for pinholes using an electrical spark tester set between 18,000 and 22,000 volts. Any holes shall be repaired and retested.
- H. Concrete embedment liner shall be T-Lock as manufactured by Ameron Protective Lining Products, GSE StudLiner as manufactured by GSE Lining Technology, Inc. or pre-approved equal.

PART 3 EXECUTION

3.1 GENERAL

- A. All pipes in service shall be plugged or bypassed in accordance with Section 02652 before any work is started on the structure. No debris shall be flushed down the line.
- B. Only personnel who are aptly trained in confined space entry shall be permitted to enter the structure. All OSHA requirements for confined space entry equipment and permitting shall be complied with. The Contractor shall obtain a confined space entry permit from Lee County Utilities prior to beginning any work.

3.2 SPRAY APPLIED RESINS

A. PREINSTALLATION/SURFACE PREPARATION

1. High pressure grout: High pressure grout shall be injected from the interior of the manhole surfaces into cracks and voids in order to stop leaks. The use of hydraulic cement will not be allowed.
 - a. Suitable equipment shall be utilized for pumping the grout from above ground through a hose and injecting the grout under pressure to fill voids beyond the manhole structure. The equipment shall have a means of measuring the amount of grout used in gallons.
 - b. Grout shall be used in accordance with the manufacturer's recommendations for the specific application.
 - c. The following are acceptable grout products: Avanti AV-202 Multigrout or pre-approved equal
2. Patching cement: After all loose and deteriorated material has been removed from the interior surfaces of the manhole and after all leaks have been grouted, patching cement shall be applied to fill in any irregularities to achieve an acceptable smooth surface.
 - a. Patching Cement shall be compatible with the liner material as specified in 2.2 herein.
3. Evaluation of Atmosphere: Prior to entering structures, an evaluation of the atmosphere shall be conducted to determine the presence of toxic, flammable vapors or possible lack of oxygen. The evaluation shall be in accordance with local, state or federal safety regulations.
4. Clean manhole ring and cover free of rust and debris so the lid will properly seat when reinstalling the lid. Use power brushing such as wire wheel on a grinder/needle gun as most types of debris cannot be removed by hand wire brushing.
5. Surfaces to be lined shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide strong bond between the lining and substrate.
6. High pressure water jetting (NACE Standard No. 5/SSPC-SP12) abrasive (sand) blasting, and mechanical wire-brushing shall be the methods to

remove previous coatings, laitance, contaminated, disintegrated or chalky material. Detergent water cleaning and hot water blasting may be necessary to remove oil and grease.

7. Use of acid for cleaning purposes, no matter how dilute, will not be allowed. Loose or protruding brick, mortar and concrete shall be removed by using a mason's hammer and chisel. Fill any large voids with quick setting cement patch mix recommended by the manufacturer of liner product. The surface to be repaired must be clean and free of any loose materials.
 8. Application of liner shall not be made unless the ambient temperature inside the structure is 50 degrees °F or higher.
 9. After the patched areas have cured sufficiently, prepare manhole wall surfaces in accordance with the manhole liner manufacturer's recommendations.
 10. All resurfaced or repaired surfaces shall be inspected for cleanliness and suitability to receive spray-applied liner. Additional surface preparation may be necessary prior to application.
- B. Apply manhole liner in accordance with manufacturer's recommendations regarding temperature and installation procedures and in accordance with Lee County Utilities specifications. The liner shall be applied to the invert and walls of the manhole from the bench up to the bottom of the casting.
- C. Prepared surfaces shall be lined by spray application to a minimum wet film thickness of 125 mils.
- D. During application, a wet film thickness gauge meeting ASTM D4414 shall be used. All necessary measurements shall be taken and attested to by the Contractor. Written reports signed by the Contractor shall be given to the COUNTY and Engineer.
- E. Allow the final application to cure for the amount of time recommended by the manufacturer before being subjected to sewage flow, or installation of spray-applied liner (where indicated).

3.3 CONCRETE EMBEDMENT LINERS

- A. Installation of the lining, including preheating of sheets in cold weather and the welding of all joints, shall be done in accordance with the recommendations of the liner manufacturer.

- B. Coverage of the lining shall not be less than the minimum shown on the plans.
- C. The lining shall be held snugly in place against inner forms.
- D. Concrete poured against lining shall be vibrated, spaded or compacted in a careful manner so as to protect the lining and produce a dense, homogenous concrete, securely anchoring the locking extensions into the concrete.
- E. In removing forms, care should be taken to protect the lining from damage. Sharp instruments shall not be used to pry forms from lined surfaces. When forms are removed, any nails that remain in the lining shall be pulled, without tearing the lining, and the resulting holes clearly marked.
- F. All nail and tie holes and all cut, torn and seriously abraded areas in the lining shall be patched. Patches made entirely with welding strip shall be fused to the liner over patch area. Larger patches may consist of smooth liner sheet applied over the damaged area with adhesive. All edges must be covered with welding strip fused to the patch and the sound lining adjoining the damaged area.
- G. Hot joint compounds, such as coal tar, shall not be poured or applied to the lining.
- H. The CONTRACTOR shall take all necessary measures to prevent damage to installed lining from equipment and materials used in or taken through the work.
- I. Liner sheets shall be closely fitted and properly secured to the inner forms. Sheets shall be cut to fit curved and warped surfaces using a minimum number of separate pieces.
- J. Unless otherwise shown on the plans, the lining shall be returned at least 3 inches (75 mm) at the surfaces of contact between the concrete structure and items not of concrete (including manhole frames and brick manholes). The same procedure shall be followed at joints where the type of protective lining is changed or the new work is built to join existing unlined concrete. At each return, the returned liner shall be sealed to the item in contact with the plastic-lined concrete using manufacturer's recommended adhesive system. If the liner cannot be sealed with this adhesive because of the joint at the return being too wide or rough or because of safety regulations, the joint space shall be densely caulked with approved caulking materials to a depth of 2 inches (50 mm) and finished with a minimum of 1 inch (25 mm) of an approved corrosion resistant material.
- K. Lining at joints shall be free of all mortar and other foreign material and shall be clean and dry before joints are made.

- L. Field joints in the lining shall be of the following described typed:
1. Type C-1: The joint shall be made with a separate 4-inch (100 mm) joint strip and two welding strips. The 4-inch (100 mm) joint strip shall be centered over the joint, heat-sealed to the liner then welded along each edge to adjacent sheets with a 1-inch (25 mm) wide welding strip. The width of the space between adjacent sheets shall not exceed 2 inches (50 mm). The 4 inch (100 mm) joint strip shall lap over each sheet a minimum of ½ inch (13 mm). It may be used at any transverse or longitudinal joint.
 2. Type C-2: The joint shall be made by lapping sheets not less than ½ inch (13 mm). One 1-inch (25 mm) welding strip is required. The lap shall be heat-sealed into place prior to welding on the 1-inch (25 mm) welding strip.
 3. Type C-3: The joint shall be made by applying 2-inch (50 mm) wide waterproof tape or 1-inch (25 mm) wide welding strip on the back of the maximum ¼-inch (6 mm) gap butt joint or by some other method approved by the Engineer to prevent wet concrete from getting under the sheet. After the forms have been stripped, a 1-inch (25 mm) welding strip shall be applied over the face of the sheet.

3.4 QUALITY CONTROL

A. SPRAY APPLIED RESINS

1. Inspect lining system for holidays, cracks, and pinholes using the spark-test method and equipment in accordance with NACE RPO 188. Especially check the lining over brick, block, and very rough surfaces.
2. Repair voids and holidays per the manufacturer's instructions. All welds shall be physically tested by a nondestructive probing method. All patches over holes, or repairs to the liner wherever damage has occurred, shall be accomplished in accordance with Item 3.3 (F).

B. CONCRETE EMBEDMENT LINERS

1. All welds shall be physically tested by a nondestructive probing method. All patches over holes, or repairs to the liner wherever damage has occurred, shall be accomplished in accordance with item 3.3(F).
2. Each transverse welding strip which extends to a lower edge of the liner will be tested by the purchasing agency. The welding strips shall extend 2-inches (50 mm) below the liner to provide a tab. A 10-pound (5 kg) pull will be applied to each tab. The force will be applied normal to the face of the

structure by means of spring balance. Liner adjoining the welding strip will be held against the concrete during application of the force. The 10-pound (5 kg) pull will be maintained if a weld failure develops, until no further separation occurs. Defective welds will be retested after repairs have been made. Tabs shall be trimmed away neatly by the installer of the liner after the welding strip has passed inspection. Inspection shall be made within 2 days after the joint has been completed in order to prevent tearing the protecting weld strip and consequent damage to the liner from equipment and materials used in or taken through the work.

3.5 SAFETY

CONTRACTOR shall carry out operations under this section in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving entry into a confined space. It shall be CONTRACTOR's responsibility to comply with OSHA Standard and Regulations pertaining to all aspects of the work.

PART 4 WARRANTY

Provide a ten (10) year unlimited warranty on all workmanship and products. The work covered by the warranty shall include surface preparation, grouting, liner application, as well as other work performed under this section. The warranty shall be effective beginning on the date of final acceptance by Lee County Utilities, and shall guarantee that the manhole will be protected from leaks and from failure due to corrosion from exposure to hydrogen sulfide and other corrosive chemicals normally encountered in raw sewage.

END OF SECTION

SECTION 02656

MANHOLE REPAIRS FOR INFLOW PREVENTION

PART 1 GENERAL

1.1 SUMMARY

Section includes: Work required for the various types of manhole repairs to prevent inflow (rainwater entering into manholes through frame/lid and chimney). Materials and methods include sealing manhole chimneys with cured-in-place or prefabricated products and manhole frame/cover sealing/replacement. Chimney seals shall be provided for (i) All manholes where the existing frame is to be removed and either reset or replaced with a new frame (ii) Manhole chimneys where inflow is detected.

A. Related Work Specified Elsewhere includes:

1. Section 01026 – Measurement and Payment
2. Section 01300 – Submittals
3. Section 02999 – Miscellaneous Work and Cleanup
4. Section 02222 – Excavation - Earth and Rock
5. Section 02223 – Backfilling
6. Section 02400 – Lawn Restoration
7. Section 02575 – Pavement Repair and Restoration
8. Section 02654 – Structural Manhole Lining
9. Section 02655 – Non-Structural Manhole Lining

1.2 SUBMITTALS

A. Contractor shall submit manufacturer's technical literature on material and description of installation method including, but not limited to:

1. Requirements for application, such as temperature and humidity
2. Requirements for worker safety, such as ventilation and safe handling procedures
3. Maximum storage life
4. Mixing and proportioning requirements for specific application (cured-in-place products)
5. Pot life (cured-in-place products)
6. Application thickness per coat (cured-in-place products)

7. Curing time (cured-in-place products)

1.3 QUALITY ASSURANCE

- A. Product application shall be performed only by workmen trained and experienced with specified material and trained in confined space entry.
- B. Certification: Applicators for spray-applied coating installation shall be certified by the manufacturer.
- C. Contractor Experience: Minimum of five (5) years of experience with similar applications of the materials specified.

PART 2 PRODUCTS

2.1 FRAME & COVER

- A. Castings for manhole frames and covers shall conform to ASTM A48 Class 30 and shall be traffic bearing.
- B. The seating surfaces between frames and covers shall be machined to fit true so the frames and covers do not shift under traffic conditions or permit entry of stormwater from flooding.
- C. Lifting or pick holes shall be provided, but shall not penetrate the cover.
- D. The words "SANITARY SEWER" and "LEE COUNTY" shall be cast in all manhole covers.
- E. Manhole frames and covers shall be U.S. Foundry Casting Specification 240-B or pre-approved Equal.
- F. Two rows of butyl rubber rope mastic shall be applied to the top surface of the manhole chimney or cone (whichever the frame will attach to). The frame shall be carefully set onto the rope mastic so that the frame opening is concentric to the manhole opening.
- G. Inflow protectors shall be provided for all manholes. ABS or 304 stainless steel inflow protectors shall be provided for manholes in non-traffic bearing locations. High-quality 304 stainless steel inflow protectors with a consistent thickness of not less than 18 gauge shall be provided for manholes in traffic bearing locations.

- H. Inflow protectors shall have a deep dish bowl design with no less than 8 inches in depth to allow easy and unobstructed removal of the manhole cover.
- I. Manhole inflow protectors are to be manufactured with a one-piece gasket installed at the factory for a tight, consistent fit. The rubber gasket is to be designed to securely wrap around the entire leading edge of the inflow protector at the point where it comes in contact with the manhole frame and cover.
- J. The wrap-around rubber gasket is to be manufactured to a width of no less than 3/8 inches, consistent on top and bottom of the leading edge of the inflow protector. The gasket shall be no more than 3/32 inches thick.
- K. The insert removal handle shall be manufactured of high-quality stainless steel for strength and durability. The handle shall be installed in such a way that it does not interfere with the installation or removal of the manhole cover. The handle shall be designed and manufactured to withstand a minimum pull force of 500 pounds before it fails or separates from the insert.
- L. The inscription "PROPERTY OF LEE COUNTY UTILITIES" shall be etched at the base of the handle frame to provide a long-lasting identification marker for the OWNER.
- M. Inflow protectors shall be as manufactured by Sewer Shield, Inc., Maitland, FL or pre-approved Equal.

2.2 INTERNAL CHIMNEY SEALS

Rubber Insert

Frame/chimney seals shall consist of a flexible internal rubber sleeve, extensions and stainless steel expansion bands, all conforming to the following requirements:

- A. Rubber Sleeve and Extension – The flexible rubber sleeve and extensions shall be extruded or molded from a high grade rubber compound conforming to the applicable material requirements of ASTM C-923, with a minimum 1500 psi tensile strength, maximum 18% compression set and a hardness (durometer) of 48+5.
- B. The rubber sleeve shall be double, triple or quadruple pleated with a minimum unexpanded vertical height of 8 inches, 10 inches or 13 inches respectively and a minimum thickness of 3/16 inches. The top and bottom section of the sleeve that compresses against the manhole frame casting and the chimney/cone shall have an integrally formed expansion band recess and a series of sealing fins to facilitate a watertight seal. These sealing fins shall have teardrop holes or air

pockets to allow the sealing area to conform to minor surface irregularities that may be encountered.

- C. The top section of the extension shall have a minimum thickness of 3/32 inches and shall be shaped to fit into the bottom band recess of the sleeve under the bottom chimney seal band and the remainder of the extension shall have a minimum thickness of 3/16 inches. The bottom section of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the rubber sleeve.
- D. Any splice used to fabricate the sleeve and extension shall be hot vulcanized and have a strength such that the sleeve shall withstand a 180 degree bend with no visible separation.
- E. Expansion Bands – The expansion bands used to compress the sleeve against the manhole shall be integrally formed from 16 gauge stainless steel conforming to the applicable material requirements of ASTM C-923, Type 304, with no welded attachments and shall have a minimum width of 1-3/4 inches.
- F. The bands shall have a minimum adjustment range of 2-1/2 diameter inches and the mechanism used to expand the band shall have the capacity to develop the pressures necessary to make a watertight seal. The band shall be permanently held in place with a positive locking mechanism which secures the band in its expanded position after tightening.
- G. Frame/chimney seal shall remain flexible throughout a 50 year design life, allowing repeated vertical movement of the frame of not less than 2 inches and/or repeated horizontal movement of not less than one half ½ inch.
- H. The manufacturers of all manhole frame/chimney seals shall submit a notarized certification to the Engineer stating that their product meets the design life, performance and applicable material requirements of this specification.
- I. External chimney seals shall span the entire adjustment area of the manhole by connecting to the bottom base flange of the frame casting and to the top of the manhole cone.
- J. Each external chimney seal shall be either an external rubber sleeve with compression bands or a heat shrinkable wrap-around sleeve. Internal chimney seals shall span the entire adjustment area of the manhole.
- K. Each internal chimney seal shall be a rubber sleeve with expansion bands.
- L. The rubber insert chimney seal shall be as manufactured by Cretex Specialty Products or pre-approved equal.

Cured-In-Place Chimney Seal

Cured-In-Place internally applied chimney seal shall be a spray or trowel applied elastomeric polyurethane based rubber.

- A. Application thickness shall be 200 mils throughout the substrate.
- B. Minimum physical properties shall be as provided below:

Top coat Properties

Report	Test Method	Test Results
Weight (as applied)	ASTM E-201	9.07 lbs. gal
Specific Gravity	ASTM D-792	1.09
Solids (by weight)	ASTM D-2369	100%
Solids(by weight as applied)	ASTM D-2369	71%
Hardness, Shore"A"	ASTM D-2240	75±5
Elongation (Ultimate)	ASTM-D412	850% ± 50
Elongation (as applied)		335% ± 10
Tensile Strength	ASTM D-412	2000 ± 50
Adhesive Strength	ASTM D-903	(See Primer)
Tear Resistance, Die C	ASTM D-624	300 ±10
Temperature Service Range	Fed Std. 141 Method 6223	-65 to 200° F
Water Absorption	ASTM D-471	<0.05% by weight
Negative Air Pressure (Vacuum) Test	ASTM C-1244	5minutes@10 inches (254mm)
Weatherability (Weather- Ometer) – 500 hrs	ASTM D-822	Slight Color Change
Flash Point (Pensky-Martens Closed Cup)	ASTM D-93	Non-flammable >212° F (100C)

Primer Properties

Report	Test Method	Test Results
Weight (as applied)	ASTM E-201	8.72 lbs/.gal
Specific Gravity	ASTM D-792	1.045
Solids (by weight)	ASTM D-2369	91.37%
Hardness, Shore "A"	ASTM D-2240	85 \pm 5
Ultimate Elongation	ASTM D-412	650 \pm 50
Tensile Strength	ASTM D-412	3200 \pm 50 psi
Adhesive Strength	Elcometer 109	>700psi(5MPa)on steel >700psi(5Mpa)on concrete
Tear Resistance, Die C	ASTM D-624	325 \pm 10
Temperature Service Range	FedStd. 141 Method 6223	-65 to 200° F.
Water Absorption	ASTM D-471	<0.03% by weight
FlashPoint(Pensky-Martens Closed Cup)	ASTM-D93	Non-flammable >212° F (100C)

- C. Cured in place internal chimney seals shall be Elastaseal as manufactured by Utility Sealing Services, Incorporated or pre-approved equal.

2.3 EXTERNAL CHIMNEY SEALS

Rubber Sleeve

Frame/chimney seals shall consist of a flexible external rubber sleeve, extensions and stainless steel expansion bands, all conforming to the following requirements:

- A. Frame seals shall remain flexible throughout a 50 year design life, allowing repeated vertical movement of the frame of not less than 2 Inches and/or repeated horizontal movement of not less than one half 1/2 inch.
- B. The sleeve portion of the seal shall be corrugated with a minimum unexpanded vertical height of either 6 inches or 9 inches and shall be capable of being mechanically locked to the base flange of the manhole frame casting.
- C. The sleeve and extension shall have a minimum thickness of 3/16 inches and shall be made from a high quality rubber compound conforming to the applicable material requirements of ASTM C-923, with a minimum 1500 psi tensile strength, a maximum 18% compression set and hardness (durometer) of

48+5. The area of the seal that compresses against the base flange of the manhole frame casting and the chimney/cone shall have a series of sealing fins to facilitate a watertight seal.

- D. The compression bands shall be integrally formed from 16 gauge stainless steel conforming to the applicable material requirements of ASTM C-923, Type 304, with no welded attachments and shall have a minimum adjustment range of 2 diameter inches. Any screws, bolts or nuts used on this band shall be stainless steel conforming to ASTM F-593 and 594, Type 304.
- E. The rubber sleeve chimney seal shall be as manufactured by Cretex Specialty Products or pre-approved equal.

Wrap-around Sleeve

The wrap-around heat shrinkable sleeve system shall stop inflow and protect cone/chimney, and frame of manhole structure from ground moisture, preventing corrosion and freeze thaw damage. The wrap-around sleeve shall conform to the following:

- A. Wrap-around backing material shall be irradiated and cross-linked polyethylene coated with protected heat-activated adhesive.
- B. Wrap-around sleeve shall bond to primed concrete, metal, and fiberglass substrate.
- C. Wrap-around sleeve shall be compatible with concrete, steel, iron, and fiberglass and shall have the following minimum physical properties:

Heat Shrinkable Sleeve

Report	Test Method	Test Results
Peel Strength	ASTM D-1000	8.6 pli
Lap Shear	ASTM D-1002	1.5 psi
Water Absorption	ASTM D-570	0.05% Maximum
Low Temperature Flexibility	ASTM D-2671	-40 °F
Fully Recovered Thickness	-	125 mils
Shrink Factor	-	40 percent minimum
Sleeve Adhesive Softening Point	ASTM E-28	212 °F

Sleeve Backing

Report	Test Method	Test Results
Tensile Strength	ASTM D-638	2900 psi
Elongation	ASTM D-638	600 percent
Hardness (Shore D)	ASTM D-2240	46
Abrasion Resistance	ASTM D-1044	35 mg

- D. The wrap-around sleeve chimney seal shall be WrapidSeal as manufactured by CANUSA or pre-approved equal.

PART 3 EXECUTION

3.1 INTERNAL CHIMNEY SEALS

Rubber Insert

The surface preparation required to install the frame/chimney seal and the installation of the seal and extensions shall be in accordance with the manufacturer's instructions.

- A. All loose and protruding mortar and brick that would interfere with the seal's performance shall be removed and the appropriate areas of the manhole frame, chimney and or cone/corbel cleaned by wire brushing. All sealing surfaces shall be reasonably smooth and circular, clean and free of any loose material or excessive voids. If an adequate sealing surface does not exist on the masonry, a repair mortar conforming to the requirements of Paragraph 3 shall be used to prepare a uniformly vertical 3"-4" wide surface for the sleeve and extensions to seal against.
- B. Detailed surface preparation, including providing a vertical surface on a cone when none exists, shall be in accordance with the frame seal manufacturer's instructions.
- C. Repair mortar shall be a one component, quick set, high strength, non-shrink; polymer modified cementitious patching mortar, which has been formulated for vertical or overhead use meeting the requirements of ASTM C-109 for compressive strength. Repair mortar shall not contain any chlorides, gypsums, plasters, iron particles, aluminum powder or gas-forming agents nor shall it promote the corrosion of any steel that it may come in contact with.

- D. Cementitious grout shall be a premixed, non metallic, high strength, non-shrink grout which meets the requirements of ASTM C-191 and C-827 as well as CRD-C-588 and C-621. When mixed to a mortar or “plastic” consistency, it shall have minimum one day and 28 day compressive strength of 6,000 and 9,000 psi, respectively.
- E. The Contractor shall field measure the manholes to determine the information required on the manufacturer’s “Sizing and Ordering” procedure. This information is needed to obtain the proper size of bands, the size, shape and width of the rubber sleeve and the need for and size of any extensions.
- F. Manhole frame/chimney seals shall be visually inspected after installation to ensure that the seal is properly positioned, tight against the manhole and frame surfaces, that no voids or leakage points exist and that the bands are securely locked in place. Any seals failing this test shall be reworked as necessary and retested at no additional cost to the owner. Any seals not passing this visual inspection may, at the Contractor’s option, be tested for leakage using a method approved by the Engineer.
- G. The contractor shall have a manufacturer’s recommended expansion tool and all other equipment/tools necessary to prepare the surfaces of the manhole and install the frame seals.
- H. All manhole frames that are misaligned from the chimney or cone/corbel by 3 inches or more shall be excavated and realigned. All existing frames shall be thoroughly cleaned before reinstallation. The frames shall be in a bed of cementitious grout conforming to the requirements of Paragraph E, mixed to a mortar or “plastic” consistency. The frames shall be set so that the tops of the covers are flush with the adjoining pavement or ground surface.

Cured-In-Place Chimney Seal

Internal cured-in-place polymer resin seals shall be applied in accordance with the following:

- A. Clean manhole ring and cover free of rust and debris so the lid will properly seat when reinstalling the lid. Use power brushing such as wire wheel on a grinder/needle gun as most types of debris cannot be removed by hand wire brushing.
- B. Repair voids, spalls and shallow areas with a compatible repair mortar. High pressure sandblast the chimney section including the metal frame for manholes. High pressure sandblast the substrate area to be coated in applications such as top of electrical panel boxes or areas, which need corrosion protection. Surfaces shall be sound, clean and free of bond-inhibiting materials including

oil, grease, dirt and dust. All surfaces shall be dry (less than 4% moisture content) prior to application.

- C. Mix and apply the primer over the surface prepared area in accordance with the manufacturer's written instructions. Allow approximately 30 to 45 minutes for product to cure (become tacky) before applying the top coat.
- D. Apply the topcoat mixture over the primed area evenly, filling in the gaps and indentations for an overall consistent depth of minimum 200 mils.
- E. Measure thickness as the lining is applied using a wet film thickness gauge (ASTM D4414). Take minimum one thickness measurement per one sq. ft. Record thickness measurements for the County's review
- F. Vacuum to remove debris and abrasives.
- G. Repair all leaks by injecting high pressure grout. Where there is severe deterioration, the surface preparation methods outlined in Paragraph 1 above will leave a deeper surface. Apply patching cement to build up these areas to match the adjoining sound areas. Leave wall surfaces textured for better adhesion of manhole liner. Finished bench and invert surfaces shall be troweled smooth and free of ridges.

3.2 EXTERNAL CHIMNEY SEALS

Rubber Sleeve

The surface preparation and installation of the frame/chimney seal and extensions shall be in accordance with the manufacturer's instructions outlined in Part 3.1-A in addition to Lee County Specifications Sections 02999 – Miscellaneous Work and Cleanup, 2222 - Excavation – Earth and Rock, 02223 – Backfilling, 02400 - Lawn Restoration, 02575 – Pavement Repair and Restoration.

Wrap-around Sleeve

Examine surfaces to be sealed by wrap-around sleeve. Notify the Owner if the surfaces are not acceptable. Do not begin surface preparation until unacceptable conditions have been corrected.

- A. Prepare the manhole frame, chimney/cone exterior surface with manufacturer's instructions.
- B. Ensure surfaces are clean, dry, and free of frost, surface rust, foreign objects, sharp edges, and projections that can damage the wrap-around sealing system.

- C. Install wrap-around, heat shrink sealing system in accordance with the manufacturer's instructions.
- D. Allow sleeve to cool before backfilling manhole. Water quenching is permissible to expedite backfilling.
- E. Prevent damage to sleeve by backfilling with select backfill or material with no sharp stones or large particles, or protect sleeve with extruded polyethylene mesh or other suitable protective shield approved by the Engineer.

3.3 QUALITY CONTROL

A. INTERNAL CHIMNEY SEAL

Rubber Insert

Manhole frame seals shall be visually inspected after installation to ensure that the seal is properly positioned, tight against the manhole and frame surfaces, that no voids or leakage points and that the bands are securely locked in place. Any seals failing this test shall be reworked as necessary and retested at no additional cost to the Owner. Any seals not passing this visual inspection shall be tested for leakage using a method approved by the Engineer.

Cured-In-Place Chimney Seal

Inspect cured-in-place chimney lining for holidays, cracks, and pinholes using the spark-test method and equipment in accordance with (NACE RPO 188). Especially check the lining over brick, block, and very rough surfaces. Repair voids and holidays per the manufacturer's instructions.

B. EXTERNAL CHIMNEY SEAL

Rubber Sleeve

See Paragraph 3.3-A (1)

Wrap-around Sleeve

Visually inspect installed sleeve to ensure:

1. Sleeve is in full contact with substrate including cone section and manhole frame.
2. No cracks or holes in polyethylene backing

3. No voids below sleeve
4. Adhesive has flowed beyond sleeve edges.
5. Test 1 of every 100 sleeves installed for adhesion at 77 ± 10 °F, unless environmental conditions will not allow and continuation of test is approved by the Engineer.
6. Use a 1-inch wide hand peel gage to perform the test.
7. Peel the sleeve off the manhole frame at a rate of 4 inches/minute.
8. Cut strip and induce initial failure by undercutting and peeling back strip until a 2-inch is flap is created.
9. Minimum peel strength shall be 8.6 pli with cohesive failure of adhesive.

3.4 WARRANTY

- A. Provide a ten (10) year unlimited warranty on all workmanship and products. The work covered by the warranty shall include surface preparation, grouting, liner application, as well as other work performed under this section. The warranty shall be effective beginning on the date of final acceptance by Lee County Utilities, and shall guarantee that the manhole will be protected from leaks and from failure due to corrosion from exposure to hydrogen sulfide and other corrosive chemicals normally encountered in raw sewage.

END OF SECTION

SECTION 02676

LEAKAGE TESTS

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Testing for any signs of leakage in all rehabilitated gravity sewers by hydrostatic testing using infiltration / exfiltration methods.
- B. Operation of Existing Facilities: Conduct all tests in a manner to minimize as much as possible any interference with the day-to-day operations of existing facilities.

1.2 PERFORMANCE REQUIREMENTS

- A. Written Notification of Testing: Provide written notice when the work is ready for testing, and make the tests as soon thereafter as possible.
 - 1. Personnel for reading meters, gauges, or other measuring devices, will be furnished.
 - 2. Furnish all other labor, equipment, air, water and materials, including meters, gauges, smoke producers, blower, pumps, compressors, fuel, water, bulkheads and accessory equipment.

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
- B. Testing Report: Prior to placing the sewer system in service submit for review and approval a detailed bound report summarizing the leakage test data, describing the test procedure and showing the calculations on which the leakage test data is based.
 - 1. The length and diameter of the section of line tested (MH to MH) including any laterals.
 - 2. A complete description of test procedures and methods, including type of plugs used and where, depth of sewer, ground water pressure over sewer pipe, and amount of leakage measured.

3. The name of the inspector/tester and the date(s) and time(s) of all testing, including any retesting.
4. A description of any repairs made.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 INFILTRATION/EXFILTRATION TEST FOR GRAVITY SEWER

- A. The allowable limits of infiltration or exfiltration for the entire system, or any portion thereof, shall not exceed a rate of 50 gallons per inch of inside pipe diameter per mile of pipe per 24 hours.
- B. No additional allowance shall be made for house service lines. Any part of or all of the system shall be tested for infiltration or exfiltration, as directed by the ENGINEER or as required by the COUNTY.
- C. The procedures and limitations for conducting infiltration/exfiltration tests shall be established at the pre-construction conference on a project-by-project basis.
- D. All testing shall be run continuously for 24 hours, unless the OWNER's REPRESENTATIVE can visually verify that this test duration is not required due to the observed infiltration/exfiltration rate.
- E. The amounts of infiltration or exfiltration shall be determined by pumping water into or out of calibrated drums, or by other methods approved by the ENGINEER and the COUNTY, such as in-line V-notch weirs.
- F. Infiltration: Prior to testing for infiltration, the system shall be pumped out so that normal infiltration conditions exist at the time of testing. The cumulative results of the entire collection system results shall not be a satisfactory method for gauging infiltration compliance. Each sewer section between manholes must permit infiltration no greater than the maximum allowable, as specified above.
- G. Exfiltration: The exfiltration test, when required due to groundwater levels, will be conducted by filling the portion of the system being tested with water to a level 2 feet above the uppermost manhole invert or 1 foot above the pipe crown, whichever is greater, in the section being tested. The cumulative results of the

entire collection system results shall not be a satisfactory method for gauging exfiltration compliance. Each sewer section between manholes must permit exfiltration no greater than the maximum allowable, as specified above.

- H. Where infiltration or exfiltration exceeds the allowable limits specified herein, the CONTRACTOR shall, at his own expense, determine the source of leakage. He shall then repair or replace all defective materials and/or workmanship at no additional cost to the COUNTY until a satisfactory test is achieved.
- I. If the defective portions cannot be located, remove and reconstruct as much of the work as is necessary in order to conform to the specified allowable leakage limits.
- J. All visible leaks shall be repaired regardless of the amount of leakage.
- K. Provide all labor, equipment and materials required and conduct all testing required under the direction of the OWNER's REPRESENTATIVE.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 02757

POINT REPAIR OF SANITARY SEWER

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this Section includes repairs to sections or segments (up to 15 feet) of existing sanitary sewers, mains or service lines, which require excavation from the surface to accurately locate sources of infiltration or inflow and to eliminate them by making necessary repairs.

1.2 GENERAL

- A. Methods, procedures and requirements are similar when sections of existing pipe have been crushed, cracked, or settled, or have holes in them and are to be replaced with new pipe. Generally, point repairs are made at specific locations and involve relatively short lengths of sewer or fittings (up to 15 feet) which are to be repaired or replaced. "Isolation" of affected reaches of sewer by plugging and/or bypass pumping, if required, shall be performed as specified in Section 02652 - Wastewater By-Pass Pumping.
- B. Locations where point repairs are to be made will be made available to the CONTRACTOR through Work Orders and will be based on previously performed smoke tests and television surveys. It is understood that the exact location of pipe leaks and failures cannot always be determined before the pipe is exposed because the smoke injected into the existing pipe to detect their presence can migrate through passages in the earth, and overburden, and may not emerge directly over the leak or failure.
- C. It is also understood that the smoke testing and closed circuit television surveys performed by others prior to the commencement of this project cannot always determine the precise cause of leakage or failure. The pipe shall be exposed and the source located, examined and evaluated before repairs are made. Additional smoke shall be introduced into the pipe by the CONTRACTOR to aid in the final evaluation and determination of required work if necessary to locate the area to be repaired.
- D. After the designated repairs have been made, the CONTRACTOR will test them as described in this Section of these Specifications. The costs of testing will be borne by the CONTRACTOR. If a repaired joint or section should prove to be defective, the CONTRACTOR shall re-perform the work at no additional cost to the OWNER and shall also be responsible for the costs of any retesting required by the OWNER.

- E. Where work is to be performed on private property, the CONTRACTOR shall consult with the OWNER who will make arrangements and schedules with the property owners before the CONTRACTOR performs the work.
- F. Excavation, backfill, exploratory excavation, sheeting and shoring, dewatering, conflicts with other utilities, and miscellaneous work shall conform to the requirements of Section 02222 – Excavation – Earth and Rock and Section 02223 - Backfilling.

1.3 SUBMITTALS

- A. The CONTRACTOR shall submit shop drawings in accordance with Section 01300 - Submittals

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pipe materials are specified in Section 02610 – Polyvinyl Chloride (PVC) Gravity Sewer Pipe.

PART 3 EXECUTION

3.1 PROCEDURES

- A. The point repair procedures shall be as follows:
 - 1. Site preparation shall be performed as described in Division 2. When the repairs are to be made on sewers or facilities lying under paved surfaces, those surfaces shall be removed to the limits specified for point repairs of the particular size pipe involved (trench width plus two feet for concrete surfaces) unless otherwise acceptable to the OWNER.
 - 2. The CONTRACTOR shall excavate and backfill in accordance with Section 02222 – Excavation – Earth and Rock and Section 02223 - Backfilling. Under no circumstances shall the CONTRACTOR be allowed to remove concrete or asphalt without prior cutting. The saw cutting shall be deep enough to produce an even, straight cut.
 - 3. Dewater, sheet and or brace all excavations in accordance with Section 02222 – Excavation – Earth and Rock and Section 02223 - Backfilling. Well points, pumps, sheeting, bracing and/or sock drain shall be used to provide a safe, dry, open hole for all repairs or replacements specified herein.

4. Excavate down to the pipe, completely exposing the pipe up to the next undamaged section of pipe on each side.
5. Locate the leak to be repaired.
6. After the leak or failure is located and exposed, CONTRACTOR shall make recommendation and the OWNER will identify the method of rehabilitation. One or a combination of the following methods shall be used:
 - a. Remove and replace section(s) of pipe or fitting. Remove section(s) of defective pipe or fitting by cutting on each side along lines perpendicular to longitudinal axis of pipe so as to leave "spigot ends" to be connected to replacement pipe. Cut or fabricate replacement section. Make connections using stainless steel shear rings or approved equal. Bedding or embedment shall be placed and compacted. Reconnect to service line if required. As a minimum, a total of six (6) feet of piping shall be replaced by the CONTRACTOR.

In the case of point repairs performed on service laterals, the CONTRACTOR shall:

- (1) Determine the exact location of the repair by means of television inspection with an electronic locating device (sonde).
- (2) If roots are encountered inside the lateral being repaired, a minimum of 15 feet of lateral shall be replaced.
- (3) If the pipe being replaced reached the private property line, a cleanout shall be installed at that location in both the back yard and front yard easements.
- (4) Where the OWNER has indicated a fused-on saddle, sewer service connections shall be joined to the fold-and-formed pipe by means of an electrofusion sewer saddle as manufactured by Central Plastics Company, or approved equal. The installation of the saddle shall be done in accordance with manufacturer's recommended procedures. The outlet shall be gasketed, sized for ASTM D 3034 SDR 35 PVC pipe. The fusion of the saddle base must be achieved by input of 40 volts of current supplied by a micro-processor manufactured by Central Plastics Company, or approved equal.

7. The adequacy of point repairs in sewer mains shall be demonstrated by the CONTRACTOR by testing. Testing of mains and services may be accomplished by one of two alternate methods, depending on the depth of the line and the difference in elevation of the pipe at the ends of the reach. Smoke testing shall be used if the pipe slope exceeds one percent. Testing shall be performed while dewatering is continued and before backfilling.
 - a. Smoke-Testing. The reach of sewer in which the repair (or repairs) has been made shall be isolated by plugging the upstream and downstream manholes as necessary not only to temporarily eliminate the flow of sewage through it but also to prohibit the smoke from entering other reaches of sewer. Smoke shall then be introduced into one of the manholes and into the reach using smoke bombs and a blower especially designed or adapted for smoke testing sanitary sewers and acceptable to the OWNER. The repaired area shall then be observed for the emergence of smoke for a period of 15 minutes. If none can be seen, the repair will be deemed to have passed the test.
 - b. Exfiltration-Testing: This method may be used only on sewers laid on grades less than 1.00 percent. Water, colored with a bright-colored dye acceptable for usage in testing, is introduced into the pipe so as to impose a 2-foot static head over the top of the pipe at the point of repair when the pipe in the lower manhole is plugged. Observations shall then be made by the OWNER to determine if leakage of the colored water occurs at the repair point. Care shall be taken, when this method is used, that:
 - (1) Not more than 4-feet of static head are induced on the main at the lower end of the reach, and
 - (2) No back-up problems are caused in service lines.
8. Complete placement and compaction of backfill.
9. Restore surface features to at least as good condition as existed before construction began, including roadways, driveway and walks.

3.2 TELEVISION SURVEY

- A. Television survey, including Preconstruction Survey and Post Construction Survey as indicated in Section 13511 – Televising and Inspection of Gravity Sewer Systems.

END OF SECTION

SECTION 02770

CIP FULL CIRCLE MAIN / LATERAL CONNECTION

PART 1 - GENERAL

1.1 SCOPE OF WORK

- A. The work specified in this section consists of providing for the reconstruction of a particular mainline section and the adjacent lateral sewer pipe without excavation while providing a structural one piece leak free connection at the interface of the mainline and lateral pipelines.

1.2 GENERAL

- A. The reconstruction will be accomplished using a non-woven fabric tube of particular length and a thermoset resin with physical and chemical properties appropriate for the application. The lateral tube within a translucent inversion bladder is vacuum impregnated with the resin then placed inside a protective carrying device. The mainline liner that is physically attached to the lateral tube is affixed around a rigid launching device. The launching device and protective carrying device are winched into the existing sewer. When the launching device is properly positioned at the lateral connection, the mainline liner is inflated and the resin saturated tube is inverted up through the lateral pipe, using air or water pressure, by the action of the inversion bladder. Once the tube/resin composite is cured, the inversion bladder and launching/carrying devices are removed. The cured-in-place mainline/lateral connection repair system shall be "T-Liner" or approved equal.

1.3 SUBMITTALS

- A. The CONTRACTOR shall submit shop drawings, samples of materials, and other information to the OWNER for review in accordance with Section 01300, "Submittals". Included shall be design calculations for the work.

1.4 QUALIFICATIONS

- A. The Qualifications of the CONTRACTOR shall be submitted with submittal. These Qualifications shall include detailed descriptions of the following:
 - 1. The CONTRACTOR shall sign and date the information provided and certify, that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel submitted will be directly

involved with and used on this project. Substitutions of personnel will not be allowed without written authorization of the OWNER.

2. Specialty technicians shall be certified by the proposed product manufacturer and/or its authorized representative. Certifications shall be submitted to the OWNER.
3. The CONTRACTOR shall provide the references of previous project lists going back four years including his customer's names, city contact name, phone number, city project number, city project name. The list must include the number of laterals rehabilitated as well as the number and type of connection seals installed. If there have been any changes in the materials it shall be brought to the attention of the OWNER and is to be noted on the submitted projects used for references showing the date and type of the changes.
4. To be acceptable, the installer (the company bidding) must have a minimum of 1,000 full circle connection installations of the specific product bid, which must be documented, in Florida.
5. To be acceptable, the installer (the company bidding) must have had a minimum of five years active experience in the commercial installation of the product bid.

PART 2 - PRODUCTS

2.1 GENERAL

- A. The finished liner shall be fabricated from material as specified in this section which when cured will be resistant to the corrosive effects of the raw sewage and hydrogen sulfide.

2.2.1 LINER SIZING

- A. The liner shall be fabricated to a size that when installed will neatly fit the internal circumference of the conduit to be repaired as specified by the OWNER.

2.3 LINER MATERIAL

- A. The liner shall be one piece and will consist of a lateral portion and the mainline portion with one or more layers of flexible needled felt or an equivalent non-woven material. The liner will be continuous in length and the wall thickness shall be uniform. No overlapping sections shall be allowed in the circumference or the length of the lateral liner. The tube will be capable of conforming to offset joints, bells, and disfigured pipe sections. The mainline liner will be flat with one end

overlapping the second end and sized accordingly to create a circular lining equal to the diameter of the mainline pipe. The resin will be polyester or vinyl ester or epoxy, with proper catalysts as designed for the specific application. The cured-in-place pipe shall provide a smooth bore interior. Both the lateral pipe and the main connection shall have a design report documenting the design criteria, fully deteriorated pipe section for the lateral and partially deteriorated for the main (if the main has already been lined), relative to the hydrostatic pressures, depth of soil cover, and type of soil. The mainline sectional liner shall be a full-circle 16-inch long CIPP liner integrally manufactured to the lateral liner providing a seamless connection between the mainline pipe liner and the lateral liner. Installation will be accomplished remotely using air or water for inversion and curing. The cured pipe repair system shall be watertight and shall conform to the existing pipe and eliminate any leakage or connection to the outside of the host pipe/service.

- B. The liner shall meet or exceed ASTM F2561-06.
- C. The composite of the materials above will, upon installation inside the host pipe, exceed the minimum test standards specified by the American Society for Testing Methods.

Physical Characteristics	Test Procedure	Minimum Value
Flexural Strength	ASTM D790	4,500 psi
Flexural Modulus	ASTM D790	250,000 psi
Long Term Modulus	Reduction for Creep	50%

Design Considerations	Criteria	
Tube Design	ASTM F 1216	Appendix X1
Hydrostatic Buckling	ASTM F 1216	Appendix X1

The CIPP design for the lateral tube and mainline connection shall assume no bonding to the original host pipe.

2.4 LINER DESIGN

- A. The minimum required structural CIPP wall thickness shall be based on the physical properties described above and in accordance with the design equations in the appendix of ASTM F 1216, and the following design parameters:

Design Safety Factor	2.0
Retention Factor for Long-Term Flexural Modulus to be used in Design	50 %
Ovality*	2 %
Groundwater Depth = Pipe Depth (above	ft.

invert)*	
Soil Depth (above crown)*	ft.
Soil Modulus	700 psi
Soil Density	120 pcf
Live Load	One H20 passing truck
Design Condition (lateral pipe)	Fully deteriorated
Design Condition (main pipe) Lined Main Pipe	Partially deteriorated
Design Condition (main pipe) Unlined Main Pipe	Fully deteriorated
<i>*Denotes information which can be provided here or in inspection video tapes or project construction plans. Multiple line segments may require a table of values.</i>	

Note: There are two conditions that require design calculation in accordance with ASTM F1216. 1) Lateral piping. 2) The connection in the main, lined or unlined main.

- B. The lining manufacturer shall submit to the OWNER for review complete design calculations for the liner, both main connection and lateral pipe designs, signed and sealed by a Professional Engineer registered in the State of Florida and certified by the manufacturer as to the compliance of his materials to the values used in the calculations. A safety factor of 2 shall be applied in the design calculation. The lateral host pipe shall be considered fully deteriorated, the previously lined main pipe shall be considered partially deteriorated. The liner shall be designed to withstand a live load equivalent to one H-20 passing truck plus all pertinent dead loads, hydrostatic pressure and grout pressure (if any). For design purposes, the water table shall be considered at grade elevation. The liner shall be designed in accordance with ASTM F 1216. The buckling analysis shall account for the combination of dead load, live load, hydrostatic pressure and grout pressure (if any). The liner side support shall be considered as if provided by soil pressure against the liner. The existing lateral pipe shall not be considered as providing any structural support. If the main pipe has been lined a partially deteriorated condition is to be used for the design of the main. Hydrostatic loads must be considered in three existing pipe conditions 1) mainline design, for previously lined mains and 2) unlined mains as well as 3) the lateral pipe design for unlined pipe. Modulus of soil reaction shall be 700 psi, corresponding to a moderate degree of compaction of bedding and a fine-grained soil as shown in AWWA Manual M45, Fiberglass Pipe Design.
- C. Liner shall be neither accepted nor installed until design calculations are acceptable to the OWNER for the three existing pipe conditions.

PART 3 - EXECUTION

3.1 CLEANING SEWER LINES

- A. Prior to any lining of a pipe, it shall be the responsibility of the CONTRACTOR to remove internal deposits from the pipeline in accordance with Section 02653 - Preparatory Pipe Cleaning and Root Removal. Both mainline and lateral line shall be cleaned.

3.2 TELEVISION SURVEY

- A. Television survey shall be performed in accordance with Section 13511 – Televising and Inspection. Both main line and lateral line shall be televised under separate pay items utilizing a pan and tilt camera for both mains and laterals.
- B. The interior of the pipeline shall be carefully surveyed to determine the locations and extent of any structural failures. The location of any conditions which may prevent proper installation of lining materials into the pipelines shall be noted so that these conditions can be corrected. A video and suitable log in PACP format shall be kept and a copy turned over to the OWNER.

3.3 FLOW BYPASSING

- A. The CONTRACTOR, when required, shall provide for the transfer of flow, through or around section or sections of pipe that are to be repaired. The proposed bypassing system shall be acceptable in advance by the OWNER. The acceptance of the bypassing system in advance by the OWNER shall in no way relieve the CONTRACTOR of his responsibility and/or public liability. The flow bypassing shall be done in accordance with Section 02652 - Wastewater By-Pass Pumping.

3.4 LINE OBSTRUCTIONS

- A. It shall be the responsibility of the CONTRACTOR to clear the line of obstruction. If survey reveals an obstruction that cannot be removed by conventional cleaning equipment, the CONTRACTOR shall make a point repair excavation in accordance with Section 02757 - Point Repair of Sanitary Sewers to uncover and remove or repair the obstruction. Such excavation shall be approved in writing by the OWNER prior to the commencement of the work.

3.5 LINER INSTALLATION

- A. The tube is inspected for tears and frayed sections. The tube, in good condition, will be vacuum impregnated with the thermostat resin. The resin will be introduced into the tube creating a slug of resin at the beginning of the tube. A

calibration roller will assist the resin slug to move throughout the tube. All air in the tube shall be removed by vacuum allowing the resin to thoroughly impregnate the tube. All resin shall be contained to ensure no public property or persons are exposed to the liquid resin. The mainline liner will be saturated upon a wet-out platform. The resin impregnated sample (wick), shall be retained by the installer to provide verification of the curing process taking place in the host pipe.

- B. The saturated tube along with the inversion bladder will be inserted into the carrying device. The mainline liner is affixed on the launching device. Both the launching and carrying device is pulled into the pipe using a cable winch. The pull is complete when the open port of the launching device is aligned with the interface of the service connection and mainline pipe. The resin saturated lateral tube is completely protected during the pull. No resin shall be lost by contact with manhole walls or the pipe during the pull. The resin saturated mainline liner is supported upon the rigid launcher that is elevated above the pipe invert by means of rotating skid system. The mainline liner should not be contaminated or diluted by exposure to dirt, debris, or water during the pull.
- C. The installer shall document the placement of the liner by internal video inspection with the camera being inserted from the lateral pipe down to the mainline pipe.
- D. The mainline liner is expanded against the mainline pipe and lateral tube is inverted out of the launcher/carrying device by controlled air or water pressure. The installer shall be capable of viewing the lateral liner contacting the lateral pipe from the beginning to the end of the repair. The mainline liner and the lateral tube are held tightly in place against the wall of the host pipe by controlled pressure until the cure is complete.
- E. When the curing process is complete, the pressure will be released. The inversion bladder and launching device shall be removed from the host pipe with the winch. No barriers, coatings, or any material other than the cured tube/resin composite, specifically designed for desirable physical and chemical resistance properties, should ever be left in the host pipe. Any materials used in the installation other than the cured tube/resin composite are to be removed from the pipe by the installer.

3.6 ACCEPTANCE AND TESTING

- A. The finished liner shall be continuous over the entire length of the installation. The liner shall be free from visual defects, damage, deflection, holes, delamination, uncured resin, and the like. There shall be no visible infiltration through the liner or from behind the liner.
- B. Verification of a non-leaking lateral liner and service connection shall require an air test in accordance with the following specifications. Testing shall be

performed at the OWNER'S discretion but at a frequency not to exceed one test for every ten liners installed. The cost for the test shall be included in the liner installation cost, and no separate payment shall be made.

1. A camera shall be inserted into the lateral pipe via a clean-out upstream of the upper most portion of the cured in-place lateral liner. The camera is then moved through the lateral pipe until it becomes positioned at the lateral/main connection. The camera is utilized to assist in positioning and placing a pair of plugs in the mainline on either side of the lateral opening. A test device with a minimum of a ten-inch clear separation shall be centered on the lateral opening and spanning the brim of the lined connection.
2. Next, an air test plug shall be introduced into the lateral pipe. The test plug will be placed inside of the cured in-place lateral liner at its upper most portion. The test plug shall be inflated and sealed against the cured in-place lateral liner at the upstream end of the liner.
3. The testing devices within the mainline are then inflated and sealed across the service connection.
4. Air-pressure not less than 4 PSI shall be introduced through the test plug. The void area between the three plugs shall be pressurized at 4 PSI, held for 2 minutes and during this time the pressure shall not drop below 3.0 PSI.
5. If an installed cured in-place lateral liner fails the specified air test, the following corrective measures shall be taken.
 - a. The cured in-place lateral liner shall be re-inspected by use of a closed circuit television camera in attempt to identify the defect.
 - b. Any repairs made shall consist of materials that are structural and meet or exceed the same criteria as the cured in-place lateral liner is required to meet in a domestic sewer collection system. Such materials shall have a minimum life expectancy of 50 years in accordance with ASTM F-1216 (most recent standard) Appendix X1 Design Considerations and Appendix X2 Chemical-Resistance Test.
 - c. Once the defect has been corrected, the renewed lateral pipe shall be re-tested in accordance with the air test procedure as described above.
 - d. Any corrective measures shall be performed at the CONTRACTOR's expense.

6. If any of the air tests fail, the OWNER at its option may require the CONTRACTOR to test an additional lateral at no additional charge to the OWNER. If a second air test shall fail, the OWNER at its option may require the CONTRACTOR to test additional or all of the installed cured in-place lateral linings at no additional charge to the OWNER.

3.7 CLEANUP

- A. After the liner installation has been completed and accepted, the CONTRACTOR shall clean up the entire project area and return the ground cover to grade. All excess material and debris not incorporated into the permanent installation shall be disposed of by the CONTRACTOR.

- END OF SECTION -

SECTION 02999

MISCELLANEOUS WORK AND CLEANUP

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. This Section includes operations which cannot be specified in detail as separate items but can be sufficiently described as to the kind and extent of work involved. Furnish all labor, materials, equipment and incidentals to complete the work under this Section.
- B. The work of this Section includes, but is not limited to, the following:
 - 1. Restoring of sidewalks, driveways, curbing and gutters.
 - 2. Crossing utilities.
 - 3. Relocation of existing water lines, low pressure, gas lines, telephone lines, electric lines, cable TV lines and storm drains as necessary, all as shown on the drawings.
 - 4. Restoring easements and rights-of-ways.
 - 5. Cleaning up.
 - 6. Incidental work.

1.2 WORK SPECIFIED UNDER OTHER SECTIONS

- A. All work shall be completed in a workmanlike manner by competent workmen in full compliance with all applicable sections of these Specifications.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Materials required for this Section shall be of at least the same type and quality as materials that are to be restored. Where possible, reuse existing materials that are removed and then replaced, with the exception of paving.

PART 3 EXECUTION

3.1 RESTORING OF CURBING, FENCES, AND GUARD RAILS

- A. Existing curbing shall be protected. If necessary, curbing shall be removed from joint to joint and replaced after backfilling. Curbing which is damaged during construction shall be replaced with curbing of equal quality and dimension.

3.2 CROSSING UTILITIES

- A. This item shall include any extra work required in crossing culverts, water courses, drains, water mains, and other utilities, including all sheeting and bracing, extra excavation and backfill, or any other work required for the crossing, whether or not shown on the drawings.

3.3 RELOCATIONS OF EXISTING GAS LINES, TELEPHONE LINES, ELECTRIC LINES, AND CABLE TV LINES

- A. Notify the proper authority of the utility involved when relocation of these lines is required. Coordinate all work by the utility so that the progress of construction will not be hampered.

3.4 PROTECTION AND RESTORATION OF PROPERTY

- A. Protection and Restoration of Property: During the course of construction, take special care and provide adequate protection in order to minimize damage to vegetation, surfaced areas, and structures within the construction right-of-way, easement or site, and take full responsibility for the replacement or repair thereof. Immediately repair any damage to private property created by encroachment thereon. Should the removal or trimming of valuable trees, shrubs, or grass be required to facilitate the installation within the designated construction area, this work shall be done in cooperation with the County and/or local communities which the work takes place. Said valuable vegetation, removed or damaged, shall be replanted, if possible, or replaced by items of equal quality, and maintained until growth is re-established. Top soil damaged in the course of work shall be replaced in kind with suitable material, graded to match existing grade. Following construction completion, the work area along the route of the installation shall be finish grade to elevations compatible with the adjacent surface, with grassing or hand raking required within developed areas.
- B. Existing lawn surfaces damaged by construction shall be re-graded and re-sodded. These areas shall be maintained until all work under this Contract has been completed and accepted.

3.5 CLEANING UP

- A. Remove all construction material, excess excavation, buildings, equipment and other debris remaining on the job as a result of construction operations and shall render the site of the work in a neat and orderly condition.
- B. Work site clean-up shall follow construction operations without delay and in accordance with Section 01710.

3.6 INCIDENTAL WORK

- A. Do all incidental work not otherwise specified, but obviously necessary for the proper completion of the Contract as specified and as shown on the drawings.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 03100
CONCRETE FORMWORK

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Provide concrete formwork for architectural concrete and structural concrete as specified to form concrete to profiles shown.

1. Architectural concrete is defined as concrete for the following exposed reinforced concrete surfaces:

- a. Interior walls
- b. Exterior walls to 6 inches below finish grade
- c. Interior tank walls to 6 inches below normal operating water level
- d. Beams
- e. Columns
- f. Undersides of floor slabs, roof slabs and stairs

2. Provide concrete with smooth rubbed finish.

3. Structural concrete is defined as all concrete that is not architectural concrete.

B. Related Work Specified in Other Sections Includes:

1. Section 03200 - Concrete Reinforcement
2. Section 03250 - Concrete Accessories

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ACI 318 - Building Code Requirements for Reinforced Concrete
2. ACI SP-4 - Formwork for Concrete
3. ACI 303R - Guide to Cast-in-Place Architectural Concrete

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
 - 1. CONTRACTORS Shop Drawings: Proposed form layout drawings and tie pattern layout drawings for Concrete. Review of these drawings does not relieve the CONTRACTOR of responsibility for adequately designing and constructing forms.
 - 2. Samples: Pieces of each type of sheeting, chamfer strips, form ties, form liners and rustication strips

1.4 QUALITY ASSURANCE

- A. Formwork Compliance: Use formwork complying with ACI SP-4, ACI 347 and ACI 303R.
- B. Mock-Up Erection: Erect, on the site where directed, a full size mock-up of a cast-in-place wall or panel a minimum of 10 feet by 10 feet by 12 inches thick as shown. Conform mock-up to requirements of ACI 303R.
 - 1. Reinforce the panel as shown. Use form ties the same as those approved and with the form tie pattern similar to that approved. Use one face of the panel for smooth architectural concrete including "reveal" rustication with form joints, and the opposite face for form liner concrete.
 - 2. Plug the tie holes as specified to determine the correct mortar mixture to match the panel color. If required, remove and replace tie hole plugging mortar until an acceptable color match is obtained. After the sample panels have been approved, intentionally damage and patch portions of the finish surface of the panels for the purpose of determining the correct mixture for patching mortar and patching technique to match the original panel color and surface.
 - 3. Leave the approved mock-up on the job during construction as the standard of workmanship for the project. Remove mock-up from the premises after completion of the work.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.

1. Release Agent
Magic Kote VOC by Symons Corporation
2. Form coating
A.C. Horn Corporation, Brooklyn, NY
3. Form liners
Dura-Tex by Symons Corporation, Des Plaines, IL
4. Rustications
Symons Corporation, Des Plaines, IL

2.2 MATERIALS

- A. Structural Concrete: Provide structural concrete form materials as follows:
 1. Obtain approval for form material before construction of the forms.
 2. Use a barrier type form release agent.
 3. Use form ties, hangers, and clamps of such type that, after removal of the forms, no metal will be closer than one inch from concrete surface. Wire ties will not be permitted.
 4. Provide ties with swaged washers or other suitable devices to prevent seepage of moisture along the ties. Leave the ties in place.
 5. Use lugs, cones, washers, or other devices which do not leave holes or depressions greater than 7/8-inch in diameter.
- B. Architectural Concrete: Provide architectural concrete form materials as follows:
 1. Construct forms using 3/4-inch thick, High Density Overlay (HDO) Plyform, Class 1 or 2, meeting the requirements of the American Plywood Association. Use surfacing materials having a minimum weight of 60-60.
 2. Use form coating, and use thinner as recommended by manufacturer of the form coating, to coat cut or raw edges.
 3. Use she-bolts with water seals for form ties.
 4. Use form liners having one inch deep relief, elastomeric Dura-Tex in a fractured rib pattern to match existing. Furnish form liners in full height lengths with no horizontal joints, except where shown. Use wood for forms to be used with form liners.

5. Use elastomeric vertical "V-groove" rustications in the concrete bands and the horizontal rustication joints shown in the form liner concrete of the profile shown.
6. Use a barrier type VOC compliant form release agent.

PART 3 EXECUTION

3.1 DESIGN

- A. Design Responsibility: Be responsible for the design, engineering and construction of the architectural concrete formwork and the structural concrete formwork. Conform the work to the recommendations of ACI SP-4 and ACI 303R.
- B. Setting Time and Slag Use: The presence of fly ash or ground granulated blast furnace slag in the concrete mix for architectural concrete and structural concrete will delay the setting time. Take this into consideration in the design and removal of the forms.
- C. Responsibility During Placement: Assume and take sole responsibility for adequate design of all form elements for support of the wet concrete mixtures specified and delivered.
- D. Consistency: Design forms to produce concrete members identical in shape, lines and dimensions to members shown.

3.2 CONSTRUCTION DETAILS FOR FORMWORK

- A. Structural Concrete Details: Follow the following details for all structural concrete:
 1. Provide forms which are substantial, properly braced, and tied together to maintain position and shape and to resist all pressures to which they may be subjected. Make forms sufficiently tight to prevent leakage of concrete.
 2. Determine the size and spacing of studs and wales by the nature of the work and the height to which concrete is placed. Make forms adequate to produce true, smooth surfaces with not more than 1/8-inch variation in either direction from a geometrical plane. Provide horizontal joints which are level, and vertical joints which are plumb.
 3. Supply forms for repeated use in sufficient number to ensure the required rate of progress.

4. Thoroughly clean all forms before reuse and inspect forms immediately before concrete is placed. Remove deformed, broken, or defective forms from the work.
 5. Provide temporary openings in forms at convenient locations to facilitate cleaning and inspection.
 6. Coat the entire inside surfaces of forms with a suitable form release agent just prior to placing concrete. Form release agent is not permitted on the reinforcing steel.
 7. Assume and take responsibility for the adequacy of all forms and remedying any defects resulting from their use.
- B. Architectural Concrete Details: Follow the following details for all Architectural Concrete:
1. Conform all construction details for formwork to "Construction Details for Formwork," subsections A1, A2, A3, A4, A6 and A7 and the requirements of this section.
 2. Thoroughly clean and lightly recoat HDO plywood panels before each additional use. Do not use forms more than three times.
 3. Install form liners and rustication strips in strict accordance with the manufacturer's written instructions and recommendations. Clog the ends of the form liner pattern and tape all form joints and edges using 1/8-inch thick by 3/4-inch wide foam tape centered on the joints, then caulk in accordance with the manufacturer's recommendations each time forms are set. Have a representative of the manufacturer present at the site to supervise the installation of the form liner for the entire project.
 4. Install forms for smooth concrete in such a manner that there will be no horizontal form joints, and align the forms so that vertical joints occur only at "V-Groove" rustications. Space form ties in a uniform pattern vertically and horizontally. Position form ties in smooth concrete bands and in panels between "reveal" rustications, if any.
 5. Erect beam and girder soffits with a camber of 1/2-inch in 20 feet and sufficiently braced, shored, and wedged to prevent deflection. Clamp column sides in accordance with this specification with metal column clamps, spaced according to the manufacturer's directions.
 6. Provide external angles of walls, beams, pilasters, columns, window openings and girders with 3/4-inch bevel strips.

7. Give surfaces of concrete panel forms one thinned coat of form film.
8. Apply the release agent in strict accordance with the manufacturer's instructions.

3.3 FORM REMOVAL

A. Structural Concrete Form Removal: Do not remove forms for structural concrete until the concrete has hardened sufficiently to support its own load safely, plus any superimposed load that might be placed thereon. Leave the forms in place for the minimum length of time indicated below or until the concrete has reached the minimum strength indicated as determined by testing, whichever time is reached first.

1. The times indicated represent cumulative days or hours, not necessarily consecutive, during which the air surrounding the concrete is above 50 degrees F. These times may be decreased if reshores are installed.

	<u>Minimum Time</u>	<u>Minimum Strength (psi)</u>
a. Columns	12 hrs.	1300
b. Columns	12 hrs.	1300
c. Side forms for girders and beams	12 hrs.	1300
d. Walls	12 hrs.	1300
e. Bottom forms of slabs		
Under 10 feet clear span	4 days	2300
10 to 20 feet clear span	7 days	2700
Over 20 feet clear span	10 days	2900
f. Bottom forms of beams and girders		
Under 10 feet clear span	7 days	2700
10 to 20 feet clear span	14 days	3000
Over 20 feet clear span	21 days	3500

2. Increase form removal times as required if concrete temperature following placement is permitted to drop below 50 degrees F or if fly ash or ground granulated blast furnace slag is used in the concrete mix.
3. Withdraw the removable portion of form ties from the concrete immediately after the forms are removed. Clean and fill holes left by such ties with grout as specified in Cast-In-Place Concrete, Subsection Structural Concrete Surfaces.

4. Plug tie holes flush with the surface using portland cement mortar. Prewet tie holes with clean water and apply a neat cement slurry bond coat. Densely tamp mortar of a dry-tamp consistency into the tie holes exercising care so as not to smear mortar onto the finished concrete surface. Include sufficient white cement in the mortar mix to cause the plugged holes to blend in with the adjacent surfaces. Make sample patches with different mixes to assure that this requirement is met.
- B. Architectural Concrete Form Removal: Remove forms for architectural concrete in accordance with the above subsection 3.3 A, except that do not remove forms for vertical surfaces sooner than 12 hours nor longer than 36 hours after placement of concrete.

3.4 RESHORING

- A. Reshoring Method: Develop a system for reshoring and early removal of forms, in the event early stripping of forms becomes necessary. Include details and schedules in this system for each element which is to be reshored.
- B. Construction Load Support: Do not support construction loads upon any unshored portion of the structure exceeding the structural design loads.

3.5 TOLERANCES

- A. Tolerance Limits: Design, construct and maintain concrete form and place the concrete to provide completed concrete work within the tolerance limits set forth in ACI SP-4.

3.6 SURVEY OF FORMWORK

- A. Field Survey: Employ an engineer or surveyor to check by instrument survey the lines and levels of the completed formwork before concrete is placed and make whatever corrections or adjustment to the formwork are necessary to correct deviations from the specified tolerances.
- B. Placement Surveying Requirements: Check formwork during the placement of the concrete to verify that the forms, braces, tie rods, clamps anchor bolts, conduits, piping, and the like, have not been knocked out of the established line, level or cross section by concrete placement or equipment.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 03200
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing concrete reinforcement as shown and specified herein. Reinforcement includes all steel bars, wire and welded wire fabric as shown and specified.

- B. Related Work Specified in Other Sections Includes:
 - 1. Section 03100 - Concrete Formwork
 - 2. Section 03410 - Precast Concrete Structures

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ACI SP66 - ACI Detailing Manual
 - 2. ACI 318 - Latest edition "Building Code Requirements for Reinforced Concrete"
 - 3. ASTM A 185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - 4. ASTM A 615/A615M - Deformed and Plains Billet-Steel Bars for Concrete
 - 5. ASTM A 706/A706M - Low Alloy Steel Deformed Bars for Concrete Reinforcement
 - 6. ASTM A 775/A775M - Epoxy Coated Reinforcing Steel Bars
 - 7. AWS D1.4 - Structural Welding Code - Reinforcing Steel

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
 - 1. Product Data and Information: Submit manufacturers literature with product data, and material description of fusion bonded epoxy coating for reinforcement and reinforcement accessories, including manufacturer's

recommendations for field touch-up of mars and cut ends when epoxy coated reinforcement is specified to be used.

2. CONTRACTORS' Shop Drawings: Submit checked Working Drawings, including bar lists, schedules, bending details, placing details and placing plans and elevations for fabrication and placing reinforcing steel conforming to "ACI Detailing Manual - 88".
 - a. Do not bill wall and slab reinforcing in sections. Show complete elevations of all walls and complete plans of all slabs, except that, when more than one wall or slab are identical, only one such elevation or plan is required. These plans and elevations need not be true views of the walls or slabs shown. Bill every reinforcing bar in a slab on a plan. Bill every reinforcing bar in a wall on an elevation. Take sections to clarify the arrangement of the steel reinforcement. Identify all bars, but do not bill on such sections.
 - b. For all reinforcing bars, unless the location of a bar is clear, give the location of such bar or bars by a dimension to some structural feature which will be readily distinguishable at the time bars are placed.
 - c. Make the reinforcing steel placing drawings complete for placing reinforcement including the location of support bars and chairs, without reference to the design drawings.
 - d. Submit Detailer certification that every reinforcing steel placing drawing and bar list is completely checked and corrected before submittal for approval.
 - e. If, after reinforcing steel placing drawings and bar lists have been submitted for approval, a review reveals that the drawings and lists obviously have not been checked and corrected they will be returned for checking and correcting by the Detailer.
3. Samples: Submit the following samples when epoxy coated reinforcement is specified to be used.
 - a. 12-inch long epoxy-coated steel reinforcing bar, of any size typical to this Project
 - b. One of each type of epoxy-coated reinforcement accessory used on this Project
 - c. 12-inch long, nylon coated tie wire

4. Certificates: Test certificates of the chemical and physical properties covering each shipment of reinforcing steel bars.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 (and as follows:)
 1. Delivery Requirements: Have reinforcing steel delivered to the work in strongly tied bundles. Identify each group of both bent and straight bars with a metal tag giving the identifying number corresponding to the reinforcing steel placing drawings and bar lists.
 2. Storage: Properly store all bars in an orderly manner, with all bars completely off the ground. Keep bars clean after delivery to the site of the work.

PART 2 PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
 1. Mechanical connections
 - a. Dowel Bar Splicer/Dowel-In System and Coupler Splice System of the Richmond Screw Anchor System
 - b. Cadweld Rebar Splice by Erico Products Inc.
 - c. Bar Grip Splice by Barsplice Products Inc.

2.2 MATERIALS

- A. Steel Bars: Use new billet steel bars, deformed bars, meeting the requirements of ASTM A 615/A625M Grade 60 for reinforcing steel bars.
 1. Roll all reinforcing steel bars with special deformations or identifying marks indicating the ASTM Specification and Grade.
 2. Use bars free from defects, kinks and from bends that cannot be readily and fully straightened in the field.
 3. Supply reinforcing bars in lengths which will allow convenient placement in the work and provide the required lap of joints as shown. Provide dowels of

proper length, size and shape for tying walls, beams, floors, and the like together.

- B. Epoxy Coating: Conform fusion bonded epoxy coated reinforcing steel bars to ASTM A 775/A775M when used. Leave portions of the reinforcing steel bars uncoated where mechanical connections are shown.
- C. Welded Wire Fabric: Use welded wire fabric of the electrically welded type, with wires arranged in rectangular patterns, of the sizes shown or specified and meeting the requirements of ASTM A 185.
- D. Supports and Accessories: Provide bar supports and other accessories and, if necessary, additional supports to hold bars in proper position while concrete is being placed.
 - 1. Use side form spacers against vertical or sloping forms to maintain prescribed side cover and cross position of bars.
 - 2. Use individual hi-chairs with welded cross ties or circular hoops to support top bars in slabs thicker than 8 inches.
 - 3. Bolsters, chairs and other accessories:
 - a. Use hot-dipped galvanized or provide plastic coated legs when in contact with forms for surfaces of concrete other than architectural surfaces.
 - b. Use stainless steel when in contact with forms for architecturally exposed surfaces.
 - c. Use epoxy coated bolsters, chairs and accessories including wire ties for epoxy coated reinforcing bars.
 - d. Use chairs of an approved type and space them properly to support and hold reinforcing bars in position in all beams and slabs including slabs placed directly on the subgrade or work mat. Do not use continuous hi-chairs for supporting of top bars in slabs over 8 inches in thickness.
- E. Mechanical Connections: Provide mechanical connections that develop at least 125 percent of the specified yield strength of the bar in tension.
- F. Stirrups and Ties: Provide stirrups and ties as shown and specified and meeting the requirements of ASTM A 185.

2.3 FABRICATION

- A. Drawing Review Prior to Fabrication: Do not fabricate any material before final review and approval of shop drawings.
- B. Bending and Cutting: Cut bars to required length and bend accurately before placing. Bend bars in the shop unless written approval for field bending is obtained. If field bending is permitted, do it only when the air temperature, where the bending operation is performed, is above 30 degrees F. Do not field bend bars which have been partially embedded in concrete.
- C. Splices: Use lapped splices for tension and compression splices unless otherwise noted.
- D. Cleaning: Clean and bend reinforcement in accordance with ACI 315 and ACI 318.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Placement: Place all bars in accordance with CRSI "Recommended Practice for Placing Reinforcing Bars".
- B. Tolerances: Place bars used for top reinforcement in slabs to a vertical tolerance of plus or minus 1/4-inch. Place all other reinforcement to the tolerances given to ACI 318.
- C. Cleaning: Have reinforcing steel delivered without rust other than that accumulated during transportation to the work. At all times, fully protect reinforcing steel from moisture, grease, dirt, mortar and concrete. Before being placed in position, thoroughly clean reinforcing steel of all loose mill scale and rust and of any dirt, oil, grease coatings, or other material that might reduce the bond. If there is a delay in depositing concrete, inspect and satisfactorily clean the steel immediately before the concrete is placed.
- D. Bar Positioning: Place bars in the exact positions shown with the required spacing and cross wire bars securely in position at intersections to prevent displacement during the placing of the concrete. Fasten the bars with annealed wire of not less than 17 gauge or other approved devices.
- E. Bar Extension Beyond Formwork: On any section of the work where horizontal bars extend beyond the length of the forms, perforate the form or head against which the work ends or at the proper places to allow the bars to project through a distance at least equal to the lap specified.

- F. Unacceptable Materials: Do not place reinforcing steel with damaged, unsuitably bonded epoxy-coating or rusting. If approved, mars, exposed threads of mechanical connections and cut ends may be field coated with approved epoxy coating material.
- G. Review of Placement: Have reinforcing placement reviewed by the ENGINEER before concrete is placed.
- H. Welding - Not Approved: Do not use reinforcing bar assemblies made by welding of any kind, or accessories of any kind which require field welding to reinforcing bars.
- I. Welding - Approved: Where welding of reinforcing steel is shown, AWS D1.4 "Structural Welding Code - Reinforcing Steel" applies.
- J. Tension and Compression Lap Splices: Conform tension and compression lap splices to ACI 318 with all supplements. Avoid splices at points of maximum tensile stress wherever possible. Provide temperature bars with the clear spacing shown. Stagger all bar splices in hoop tension bars in circular tanks with not more than 50 percent of the bars spliced in any one direction. Have welded splices made by certified welders in accordance with AWS D1.4.
- K. Welded Wire Fabric: Place welded wire fabric in the positions shown, specified or required to fit the work. Furnish and place suitable spacing chairs or supports, as specified for bars, to maintain the fabric in the correct location. Where a flat surface of fabric is required, provide flat sheets, when available. Otherwise reverse roll the fabric or otherwise straighten to make a perfectly flat surface before placing. Obtain approval for the length of laps not indicated.
- L. Concrete Cover: Place reinforcing steel and welded wire fabric and hold in position so that the concrete cover, as measured from the surface of the bar or wire to the surface of the concrete, is as shown or specified.

END OF SECTION

SECTION 03250
CONCRETE ACCESSORIES

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing concrete accessories shown and specified herein such as waterstops, dovetail anchor slots, cast-in-place reglets, inserts, joint filler, preformed joint seal, joint sealant and neoprene pads.
- B. Products Installed: Waterstops, dovetail anchor slots, cast-in-place reglets, inserts, joint filler, preformed joint seal, joint sealant and neoprene pads.
- C. Related Work Specified in Other Sections Includes:
 - 1. Section 03100 - Concrete Formwork
 - 2. Section 03200 - Concrete Reinforcement

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. AASHTO - Standard Specifications for Highway Bridges
 - 2. ASTM A 240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
 - 3. ASTM A 536 - Standard Specifications for Ductile-Iron Castings
 - 4. ASTM D 412 - Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
 - 5. ASTM D 3545 - Test Methods for Alcohol Content and Purity of Acetate esters by Gas Chromatography
 - 6. ASTM D 3575 - Test Methods for Flexible Cellular Materials Made From Olefin Polymers
 - 7. CRD-C513 - Specifications for Rubber Waterstops
 - 8. CRD-C572 - Specifications for Polyvinyl Chloride Waterstop
 - 9. Fed. Spec.

TT-S-00227 - Sealing Compound, Elastomeric Type, Multicomponent (for Calking, Sealing, and Glazing in Buildings and Other Structures)

10. Fed. Spec.
TT-S-00230 - Sealing Compound, Elastomeric Type, Single Component (for Calking, Sealing, and Glazing in Buildings and Other Structures)

1.3 SUBMITTALS

- A. General: Provide all Work related submittals, including the following, as specified in Division 1.
- B. Product Data and Information:
 - 1. Manufacturer's Data and Specifications: Submit printed manufacturer's data and specifications for each item used on this project.
 - 2. Samples: Provide one sample of each item used.
 - 3. Joint Sealant and Preformed Joint Seal: Indicate special procedures, surface preparation and perimeter conditions requiring special attention. All products in contact with potable water, shall be "NSF Standard 61" certified. Submit certified material records indicating approval for use with potable water.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 (and as follows:)

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturers are listed below. Other manufacturers of equivalent products may be submitted.
 - 1. Joint Filler
 - a. Sonoflex F Foam by Sonneborn Building Products
 - b. PVC Joint Filler No. 327 by A.C. Horn
 - 2. Sealant Backup Material

- a. Sealtight Backer Rod
- b. Sonofoam Backer Rod
- 3. Preformed Joint Seal
 - a. Evazote 380, ESF by Epoxy Industries
- 4. Wedge Inserts
 - a. Type F-7 by Dayton Superior, Miamisburg, OH
- 5. Dovetail Anchor
 - a. A.A. Wire Products Co.
 - b. Dur-O-Wal Inc.
- 6. Flashing Reglets
 - a. Standard reglets by Beehive Anchoring System

2.2 MATERIALS

- A. Extruded Waterstops: Provide waterstops made of extruded polyvinyl chloride unless otherwise shown or specified.
 - 1. Do not use any reclaimed plastic material in their manufacture.
 - 2. Provide plastic waterstops meeting the requirements of CRD-C572, except as modified herein. Provide a Shore A/10 durometer hardness between 73 and 79, the tensile strength not less than 1850 psi, and specific gravity not more than 1.38.
 - 3. Unless otherwise shown, use waterstops for construction joints which are flat, at least 6 inches wide, and not less than 3/8-inch thick at the thinnest section. Provide these waterstops with ribbed longitudinal strips.
 - 4. Unless otherwise shown, provide waterstops for expansion joints at least 9 inches wide and not less than 1/4-inch thick at the narrowest point and not less than 3/8-inch thick immediately adjacent to the center of the waterstop. Provide the waterstop with ribbed longitudinal strips with a 3/4-inch inside diameter hollow bulb center. Limit joint movement to 1/4-inch under a tensile force of not more than 500 pounds per lineal inch.
- B. Stainless Steel Waterstops: Provide stainless steel waterstops where shown or specified.

1. Fabricate stainless steel waterstops from ASTM A 240 Type 316, 20 gauge stainless steel, conforming to the dimensions and profiles shown.
2. Prefabricate and miter corners and intersections for all stainless steel waterstops. Make only butt joints in the field.

C. Rubber Waterstops: Provide rubber water stops where shown or specified.

1. Provide rubber water stops of either the molded or extruded type, fabricated from a high grade tread type compound, either SBR or natural rubber, conforming to CRD-C513.
2. Provide water stops for construction joints at least 6 inches wide and 3/8-inch thick and with solid end bulbs 3/4-inch in diameter.
3. Provide water stops for expansion joints 9 inches wide and 3/8-inch thick and with solid end bulbs 1-inch in diameter and a hollow center bulb 1-1/2 inches in diameter with a 3/4-inch diameter center cavity.

D. Expansion Joint Filler: Use joint filler for all expansion joints.

1. Provide a closed cell polyethylene or PVC joint filler of the thickness shown.

E. Joint Sealant Requirements: Finish expansion joints with a joint sealant where shown or specified.

1. Joint sealant materials may be either a single component urethane compound meeting the requirements of Fed. Spec. TT-S-00230C, or a 2-component urethane compound meeting the requirements of Fed. Spec. TT-S-00227E, except as modified in this specification.
2. Provide the urethane sealant of 100 percent polymer, non-extended, containing no solvent, lime, or coal tar. Color as selected by the ENGINEER, but not black. Conform sealant properties to the following:

	Property	Value	Test Method
a.	Maximum final cure	3 days	--
b.	Minimum tensile strength	140 to 200 psi	ASTM D 412
c.	Minimum elongation	400%	ASTM D 412
d.	Modulus at 100% elongation	40-60 psi	ASTM D 412
e.	Shore A hardness	25-40	ASTM D 2240

	Property	Value	Test Method
f.	Solid content	98-100%	--
g.	Peel strength	20-40 lb/in.	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-00227E
h.	Minimum recovery	80-90%	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-00227E
i.	Initial tack-free cure	24-48 hrs.	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-00227E

3. Provide primer as recommended by the manufacturer of the sealant, subject to approval.
4. Provide fillers and backup materials in contact with sealant which are nonimpregnated and free from asphalt, creosote, oil or extractable plasticizers. Use a backup material of a closed cell polyethylene foam rod with a diameter 1/4-inch larger than the joint width.

F. Preformed Joint Seal: Provide a preformed joint seal where shown or specified.

1. Provide joint material which is resilient, non-extrudable, impermeable, closed-cell, cross-linked, ethylene vinyl acetate, low density, polyethylene copolymer, nitrogen blown material which is ultraviolet light, weather and wear resistant, and which is concrete beige in color.

2. Conform material properties with the following:

	Property	Value	Test Method
a.	Density, pcf	2.8 to 3.4	ASTM D 3575 Suffix: W, Method A
b.	Water Absorption total immersion 3 months	0.02% by volume	ASTM D 3575 Suffix: L
c.	Tensile Strength	125 psi	ASTM D 3575 Suffix: T
d.	Elongation before breaking	255%	ASTM D 3575 Suffix: T
e.	Working Temperature	-94 to 160 F	--

- G. Neoprene Pads: Use neoprene pads as shown or required where slabs or beams must be prevented from bonding to footings, walls, columns or other rigid parts of the structure.
 - 1. Use neoprene pads of a structural grade meeting the requirements of Section 25, Division 2 of the AASHTO Standard Specifications for Highway Bridges.
 - 2. Do not use neoprene pads thinner than 1/4-inch.
- H. Wedge Inserts: Make wedge inserts for 5/8-inch and 3/4-inch bolts of ductile iron conforming to ASTM A 536.
- I. Dovetail Anchors: Provide dovetail anchors of one of the following types:
 - 1. Dovetail anchors having a 3/16-inch by 1-inch by 1/2-inch stainless steel dovetail section with 3/16-inch diameter stainless steel wire.
 - 2. Dovetail anchor slots of 24 gauge galvanized steel 1-inch by 1-inch by 5/8-inch throat. Fill anchor slots.
- J. Flashing Reglets: Provide flashing reglets of 24 gauge galvanized steel foam filled reglets.

PART 3 EXECUTION

3.1 INSTALLING OF WATERSTOPS

- A. Assembly of Extruded Waterstops: Prefabricate corners and intersections for all waterstops. Make only butt joints in the field. Miter and assemble corners and intersections with approved equipment, as described for field joints.
 - 1. Make field joints by cutting the ends of the sections to be spliced so they will form a smooth even butt joint. Heat the cut ends with the splicing tool until the plastic melts. Press the two ends together until the plastic cools. Do splicing in a way that limits damage to the continuity of the ribbed strips.
 - 2. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.

- B. Prefabricated Stainless Steel Waterstops: Prefabricate corners and intersections for all stainless steel waterstops. Make only butt joints in the field. Miter and weld corners and intersections.
1. Provide field joints having a nominal 1-inch lap joint, with the exposed edge welded or brazed on each side.
 2. Make field joints with PVC waterstops as shown.
 3. At expansion joints, seal the base of the expansion section of the waterstop with at least one layer of 2-inch wide duct tape.
 4. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.
- C. Splices: Use splices made in the manufacturer's plant where possible for rubber waterstops.
1. Use a preformed rubber union or fitting and splicing cement as recommended by the manufacturer when splices are made.
 2. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.
- D. Joint Filler Placement: Place joint filler for expansion joints against the completed portion of the work before the concrete for the next section is placed.
1. Fasten the filler to the hardened concrete with a compatible adhesive in accordance with manufacturer's instructions. Extend the filler through the thickness of the wall or slab and make it flush with the finished surface, except where a preformed joint seal or joint sealant is shown.
 2. In joints having a waterstop, fit the filler accurately on each side of the waterstop to prevent the intrusion of concrete.
- E. Preparation of 2-Component Sealants: Mix 2-component joint sealant using a slotted paddle and slow speed mixer for 5 to 8 minutes, continually working paddle from top to bottom until the sealant color is uniform. Scrape down the side of the

container and paddle blade several times during the mixing operation to ensure uniform mixing.

1. Properly prepare joint surfaces by removing all foreign matter and concrete laitance so that concrete surfaces are structurally sound, clean, dry, and free of all oil, grease, wax, waterproofing compounds or form release materials prior to the application of primer and sealant.
 2. Prime all concrete joint surfaces and all surfaces exposed to water prior to sealing, with no exceptions. Prime all other surfaces as recommended by the manufacturer of the sealant. Provide the prime as recommended by the manufacturer of the sealant, subject to approval. Apply the primer by either brushing or spraying on the joint surfaces. Apply and install the sealant within 2 to 24 hours after the application of primer.
 3. For horizontal joints, install the sealant by pouring directly from a suitable shaped can or by flowing from a bulk-loading gun.
 4. Fill vertical joints from a gun, starting from the bottom, to avoid bridging and the formation of air voids.
 5. Fill overhead joints from a gun, by laying a bead along each side of the joint and then filling the middle. Immediately after installation, tool in the sealant in order to establish firm contact with joint surfaces and to provide a smooth sealant surface. Tool in accordance with the manufacturer's instructions.
 6. Control joint depth with the use of joint fillers and backup materials. Make joint widths and sealant depths as shown. Do not exceed 1/2-inch for sealant depth.
- F. Preformed Joint Seal Surface Preparation: Properly prepare joint surfaces by removing all foreign matter and concrete laitance so that concrete surfaces are structurally sound, clean, dry, and free of all oil, grease, wax, water-proofing compounds or form release materials.
1. Blast clean or saw cut all existing concrete surfaces to expose a clean bare concrete surface. Allow new concrete to be well cured, and attain a minimum of 80 percent of the specified strength before installing sealant.
 2. Apply bonding adhesive, as recommended by the manufacturer to the concrete surfaces in strict compliance with the manufacturer's recommendations. Install the joint material under a compression of 25 percent and in one continuous operation, in accordance with manufacturer's recommendations. Do all splices and directional changes using heat welding method as recommended by the manufacturer.

- G. Unbonded Joints: Use unbonded horizontal joints as shown or required where slabs of beams must be prevented from bonding to footings, walls, columns or other rigid parts of the structure.
1. Prevent bonding by use of structural grade neoprene pads placed over the bearing surface of the footing, wall or other supporting part of the structure so as to isolate it from the new concrete being placed.
- H. Encasing Inserts: Encase wedge inserts, flashing reglets and dovetail anchor slots in the concrete as shown. Take special care to place and maintain them to the proper lines and grades and to compact concrete thoroughly around them to prevent the passage of water. Set these items before placing concrete and thoroughly brace them to prevent movement during the progress of the work. Provide dovetail anchor slots spaced not more than 16 inches apart for all concrete walls faced with masonry.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 03311

CONCRETE FOR NON-PLANT WORK

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. The extent of concrete work is shown on the drawings.

1.2 CODES AND STANDARDS

- A. ACI 347 "Recommended Practice for Concrete Formwork"; ACI 304 "Recommended Practice for measuring, Mixing, Transporting, and Placing Concrete"; comply with applicable provisions.
- B. Reference to standard specifications herein shall be construed as to be in reference to the latest revision or edition.

1.3 STORAGE

- A. Immediately upon receipt at the site, cement that is to be site mixed shall be stored in a dry, weather tight building, properly ventilated and with provisions for prevention of moisture absorption.
- B. Reinforcing shall be protected from the weather.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: Cement shall conform to standard specifications for "Portland Cement", ASTM C150, Type I for concrete not exposed to sewage and ASTM C150, Type II or ASTM C150, Type I with sulfide resistant properties equal to Type II for concrete exposed to sewage.
- B. Aggregate: Concrete aggregate shall conform to the current specifications for "Concrete Aggregate", ASTM Designation C33.
- C. Water: Water used in mixing concrete shall be fresh, clean, and free from injurious amounts of oil, acid, alkali or organic matter.
- D. Ready-Mix Concrete: Ready-mixed concrete may be used at the option of the CONTRACTOR provided that such concrete meets the requirements of these specifications and of ASTM Designation C94 for "Ready-Mixed Concrete".

- E. High-Early-Strength Concrete: Concrete made with high-early-strength Portland cement shall be used only when specifically authorized by the ENGINEER. The 7-day compressive strength of concrete made with high-early-strength cement shall be at least equal to the minimum 28-day compressive strength specified. All provisions of these specifications shall be applicable to high-early-strength concrete except the cement shall conform to ASTM Designation C150, Type III.

2.2 RELATED MATERIALS

- A. Reinforcing: Deformed Reinforcing Bars, ASTM A615; Grade 60 unless otherwise indicated.
- B. Welded Wire Fabric: ASTM A185.
- C. Liquid Membrane-Forming Curing Compound: ASTM C309, Type I.
- D. Form Materials:
 - 1. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.
 - 2. Exposed Concrete Surfaces: Suitable material to suit project conditions.
- E. Waterstops: To be used in joints shall be #10 gage steel sheet, 4" wide, welded continuous through the joint, unless detailed otherwise.
- F. Chemical Floor Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 lbs. of fluosilicates per gallon.
 - 1. Apply to exposed concrete slabs not indicated or scheduled to receive subsequent finishes.

2.3 QUALITY

- A. Strength: The minimum 28-day compressive strength of reinforced concrete shall be 4,000 psi, unless shown otherwise on the drawings.
 - 1. Each cubic yard of 4,000 psi concrete shall contain no less than 517 lbs. of cement. The total water content per bag of cement shall not exceed 6.0 gallons.
- B. Strength: The minimum 28-day compressive strength of non-reinforced concrete shall be 2,500 psi, unless shown otherwise on the drawings.

Each cubic yard of 2,500 psi concrete shall contain no less than 440 lbs. of cement. The total water content per bag shall not exceed 7.5 gallons.

C. Mix Proportions: All concrete materials shall be proportioned so as to produce a workable mixture with a slump between 2" and 4".

D. Tests:

1. The CONTRACTOR shall provide, for test purposes, one set of three cylinders taken from each day's pour or each 50 cubic yards placed, whichever is least or as directed by the ENGINEER. The CONTRACTOR at his expense shall supply test samples and an independent testing laboratory at the CONTRACTOR's expense will make tests. Sampling and testing of concrete shall be made in accordance with ASTM C-143 and ASTM C-31. The standard age of test shall be at 7 days and 28 days; and, when approved by the ENGINEER, a 45 day test may be used. If the test strength of the cylinders falls below the minimum allowable compressive strength, the ENGINEER shall have the right to order the CONTRACTOR to remove and renew that day's pour of concrete or the CONTRACTOR shall accept such deductions in the final payment as the OWNER may deem reasonable.
2. Sampling and testing of concrete materials shall be made in accordance with ASTM Designations. The CONTRACTOR at his expense shall supply test samples, and an independent testing laboratory at the CONTRACTOR's expense shall make tests. The source from which concrete aggregates are to be obtained shall be selected by the CONTRACTOR well in advance of the time when they will be required in the work; and suitable samples, as they are to be used in the concrete, shall be furnished in advance of the time when the placing of the concrete is expected to begin.

PART 3 EXECUTION

3.1 FORMING AND PLACING CONCRETE

A. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation and position, complying with ACI 347.

Clean and adjust forms prior to concrete placement. Apply form release agents for wet forms, as required. Retighten forms during and after concrete placement if required to eliminate mortar leaks.

3.2 REINFORCEMENT

- A. Position, support and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- B. Install welded wire fabric in lengths as long as possible, lapping at least one mesh.
- C. Installation of Embedded Items: Set and build into the work anchorage devices and other embedded items required for other work that is attached to, or supported by cast-in-place concrete. Use setting diagrams, templates and instructions provided by others for locating and setting.

3.3 CONCRETE PLACEMENT

- A. Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.
- B. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into all parts of the forms.
- C. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement and curing. Concrete shall not be placed when the surrounding air temperature is below 40°F. and dropping.
 - 1. In cold weather comply with ACI 306.
 - 2. In hot weather comply with ACI 305.

3.4 CONCRETE FINISHES

- A. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete and sidewalks.
 - 1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with the ENGINEER before application.

3.5 BONDING AND GROUTING

- A. Before depositing new concrete on or against concrete that has set, existing surfaces shall be thoroughly roughened and cleaned of glaze, foreign matter, and

loose particles. An epoxy coating shall be applied for bonding the new concrete to the old.

3.6 CURING

- A. Concrete shall be kept continuously (not periodically) wet for a period of at least five consecutive days by covering with water or with an approved water saturated covering. Water for curing shall be clean and free from any elements, which might cause staining, or discoloration of the concrete surface.
- B. Sidewalks and floor slabs may be cured by spraying with a Membrane-Forming curing compound, applied as per manufacturer's recommendations. This material shall not be used on any interior slabs to which an applied finish is to be bonded.

3.7 PATCHING

- A. Any concrete which is not formed as shown on the drawings, or is out of alignment or level or shows a defective surface, shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the CONTRACTOR at his expense, unless the ENGINEER grants permission to patch the defective area. This shall be done in accordance with the procedures above. Honeycomb consisting of 1/2" diameter holes or greater shall be considered a defective surface. Permission to patch any such area shall not be considered a waiver of the ENGINEER's right to require complete removal of the defective work if the patching does not, in his opinion, satisfactorily restore the quality of the concrete and appearance of the surface.
- B. As the forms are removed, fins, rough edges, and offsets shall be ground smooth. Holes to 1/2", slight honeycomb, and minor defects shall be wet and filled with a 1:2 mix of cement mortar, matching color of surrounding concrete, and then troweled to a uniform plane. As soon as they have been troweled, the patched areas shall be sprayed with a curing compound, which will not destroy future bonding properties. Three days after application of curing compound, the entire surface shall be finished by wetting and applying a 1:2 mix of cement mortar with a cement brick. Using the brick, mortar shall be rubbed into pits or indentations and excess mortar rubbed off to provide a uniformly textured surface. When the surface has dried, all loose sand and dust shall be removed and the surface then hosed down with water.

3.8 TOLERANCES

- A. Tolerances for concrete work shall be in accordance with ACI 347.

END OF SECTION

(NO TEXT FOR THIS PAGE)

SECTION 03410

PRECAST CONCRETE STRUCTURES

PART 1 GENERAL

1.1 SCOPE OF WORK

- A. Furnish all materials, labor, and equipment and construct manholes, wet wells, valve pits, meter pits, and accessory items, consisting of precast sections as shown on the Drawings and as specified herein.
- B. The forms, dimensions, concrete, and construction methods shall be approved by the ENGINEER in advance of construction.
- C. These specifications are intended to give a general description of what is required, but do not purport to cover all of the structural design details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, shop testing, delivery, and complete installation of all precast structures whether specifically mentioned in these specifications or not.
- D. The supplier of the precast manholes, wet wells, valve pits, meter pits, and accessory items shall coordinate his work with that of the CONTRACTOR to the end that the unit will be delivered and installed in the excavation provided by the CONTRACTOR, in accordance with the CONTRACTOR's construction schedule.
- E. Coordinate the precast structures fabrication with the equipment supplied to achieve the proper structural top slab openings, spacings, and related dimensions for the selected equipment frames and covers. The top slabs, frames, covers, and subsurface structures shall be capable of supporting a live load of 150 pounds per square foot.

1.2 SUBMITTALS

- A. Submit to the ENGINEER, as provided in the General Conditions, shop drawings showing details of construction, reinforcing and joints.
- B. Shop Drawings
 - 1. Content
 - a. Dimensions and finishes
 - b. Estimated camber
 - c. Reinforcing and connection details

- d. Anchors
 - e. Lifting and erection inserts
 - f. Other items cast into members
- 2. Show location of unit by same identification mark placed on member.
 - 3. Include design calculations.
- C. Manufacturer's Literature: Manufacturer's recommended installation instructions.
 - D. Manufacturer's certificates of material conformance with specifications.
 - E. Test Reports: Reports of tests on concrete.
 - F. Testing
 - 1. Manholes and Valve Vaults: Four (4) concrete test cylinders shall be taken for every 50 cubic yards (cu. yds) for each type of precast structure.
 - 2. Pump Stations: Four (4) concrete test cylinders shall be taken for each pump station wet well. Four (4) concrete test cylinders shall be taken for each pump station's top and bottom slabs.
 - 3. Certification: The supplier shall provide the certified results of testing (7 day, 28 day) for the test cylinders stated herein. Random test cylinders may be taken at any time by the ENGINEER at the OWNER's expense.

1.3 INSPECTION

- 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 representatives of the OWNER. Such inspection may be made at the place of manufacture, or at the site after delivery, or at both places, and the sections shall be subject to rejection at any time on account of failure to meet any of the Specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Sections rejected after delivery to the job shall be marked for identification and shall be removed from the job at once. All sections which have been damaged after delivery will be rejected, and if already installed, shall be repaired, if permitted and accepted by ENGINEER, or removed and replaced, entirely at the CONTRACTOR's expense.
- B. At the time of inspection, the sections will be carefully examined for compliance with ASTM C478 designation and these Specifications, and with the approved manufacturer's drawings. All 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 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 the end of 7 days and 5,000 psi at the end of 28 days, Epoxy mortar may be utilized for repairs subject to the approval of the ENGINEER.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE WET WELLS AND VALVE VAULTS

- A. Precast submersible pump station wet wells shall consist of precast base, precast wet well sections, and top cover slab. Precast valve vaults shall consist of precast base, sidewalls and top slab. Concrete shall be air entrained at the time of delivery and shall have a minimum compressive strength of 4,000 psi at the end of 28 days.
- B. Joints between precast concrete sections shall be set by plastic shims and fitted with non-metallic non-shrink grout as shown on the drawings.
- C. The top slab sections shall be fitted with water tight hatches. The frames and covers will be sized for the openings shown on the drawings.
- D. The various precast sections should have the inside dimensions and minimum thickness of concrete as indicated on the drawings. All precast and cast-in-place concrete members shall conform to the Building Code Requirements for Reinforced Concrete ACI 318.
- E. A vent pipe shall be furnished and installed as shown on the drawings.
- F. Fillets shall be provided and installed in the wet wells as shown on the drawings.
- G. Precast structures shall be constructed to the dimensions as shown on the drawings and as specified in these Specifications.
- H. Type II cement shall be used except as otherwise approved.
- I. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on the inside of each precast section.

- J. Sections shall be cured by an approved method and shall not be shipped until the minimum 7-day compressive strength has been attained.
- K. Each pre-cast section manufactured in accordance with the drawings shall be clearly marked to indicate the intended pump station installation location. The CONTRACTOR shall be responsible for the installation of the correct pre-cast sections in their designated pump station locations.
- L. Paint all exterior surfaces with two coats of coal tar bitumastic, each coat to be 9 mils each. All interior surfaces of valve vaults shall be coated with two coats of coal tar epoxy (9 mils each).

2.2 PRECAST CONCRETE SECTIONS FOR CIRCULAR WET WELLS

- A. Wet wells shall meet the requirements of ASTM C478, Specification for Precast Reinforced Concrete Manhole Sections, with the exclusion of Section 10(a), except as modified herein. Cement shall meet the requirements of ASTM C150-74, Specification for Portland Cement, Type II. Concrete shall meet the minimum requirement for 4000 psi concrete. Minimum wall thickness shall be 8 inches or 1/8 the inside manhole diameter as shown, whichever is greater. The required minimum strength of concrete shall be confirmed by making and testing three standard cylinders at seven days. Rings shall be custom made with openings to meet indicated pipe alignment conditions and invert elevations. Submit shop drawings, consisting of manufacturers' standard details of various sections for approval prior to placing order for wet wells. Drawings of individual wet wells showing invert elevations, pipe sizes and similar details will not be required.

- B. Joints

Form joint contact surfaces with machined castings. Surfaces shall be exactly parallel with nominal 1/16 inch clearing and the tongue equipped with a proper recess for the installation of an O-ring rubber gasket. Gaskets shall meet the requirements of Specification for Joint for Circular Concrete Sewer and Culvert Pipe, Using Rubber Gaskets. "RAM-NEK" sealing compound conforming to Federal Specification SSS-00210 (GSA-FSS), Sealing Compound, Preformed Plastic, for Expansion Joints and Pipe Joints may be used in lieu of O-ring rubber gaskets. If joints are sealed with "RAM-NEK" sealing compound the recess in the tongue for an O-ring gasket may be omitted.

- C. Wet Well Liners and Coatings

Coat or line the interior of all wet wells with OWNER approved system as follows:

- 1. G U Liner

2. Agru Liner
3. IET Coating System

Furnish, install, test and inspect liners and coating in accordance with manufacturer's recommendations. Extend coating and liner and seal onto wet well hatch frame, around pipe openings and other protrusions to prevent contact of wet well surface with corrosive sewer gases.

2.3 PIPE CONNECTIONS AT STRUCTURES

- A. Where pipes are to extend into or through structures from the exterior, flexible connections (mechanical or push-on type joints) shall be provided at the exterior wall face.
- B. For pipes passing through structural walls, wall pipes with water stops shall be installed where the location is below the surface of the ground or at any point where fluid levels will exceed that elevation. Neoprene sleeves with watertight caulking and 316 Series SS stainless steel clamps will be suitable at other locations.

PART 3 EXECUTION

3.1 INSTALLATION

- A. The CONTRACTOR shall be responsible for control of ground water to provide firm, dry subgrade for the structure, shall prevent water rising on new poured in place concrete or grouted joint sections within 24 hours after placing, and shall guard against flotation or other damage resulting from ground water or flooding.
- B. A minimum of a 12 inch layer of crushed stone or shell as specified under Section 02223 shall be placed as a foundation for the wet well base slabs, valve pits, and meter pits.
- C. Backfill material around the wet well and above the pipe bedding shall be selected material as specified in Section 02223.
- D. Precast bases, conforming to all requirements of ASTM C478 and above listed requirements for precast sections, may be used. The base shall be set in place on a thoroughly compacted crushed stone sub-base and adjusted in grade for the correct structure elevation.
- E. The station shall not be set into the excavation until the installation procedure and excavation have been approved by the ENGINEER.

- F. The base may be cast-in-place concrete as specified in Division 3, placed on a thoroughly compacted crushed stone sub-base. The tops of the cast-in-place bases shall be shaped to mate with the precast barrel section, and shall be adjusted in grade so that the top slab section is at the approximately correct elevation.
- G. Precast concrete structure sections shall be set so as to be vertical and with sections in true alignment with a 3 inch maximum tolerance to be allowed. The outside and inside joint shall be filled with a non-shrink grout and finished flush with the adjoining surfaces. Allows 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 leaks appear in the structures, 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.
- H. Holes in the concrete sections required for handling or other purposes shall be plugged with a non-shrinking grout or by grout in combination with concrete plugs.
- I. Where holes must be cut in the precast sections to accommodate pipes, cutting shall be done by core drilling prior to setting them in place to prevent any subsequent jarring which may loosen the mortar joints.

END OF SECTION

SECTION 05540
METAL CASTINGS

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Miscellaneous ferrous and nonferrous castings.

1. This classification includes wheel guards, valve boxes, manhole frames and covers, manhole steps, stop plank grooves, brackets and supports for piping and gutter inlets, floor drains, cleanouts and special malleable iron castings and inserts.

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM A 27/A27M - Specification for Steel Castings, Carbon for General Applications
2. ASTM A 47 - Specification for Ferric Malleable Iron Castings
3. ASTM A 48 - Specifications for Gray Cast Iron Castings
4. ASTM A 148/A148M - Specifications for Steel Castings
5. ASTM A 536 - Specifications for Ductile Iron Castings
6. ASTM B 26/B26M - Aluminum
7. ASTM B 148 - Aluminum Bronze Sand Castings
8. ASTM B 584 - Manganese Bronze

PART 2 PRODUCTS

2.1 WORKMANSHIP

A. Provide castings accurately made to the approved dimensions, and plane or grind castings where marked or where otherwise necessary to secure flat and true surfaces. Make allowance in the patterns so that the specified thickness is not reduced. Provide manhole covers which conform to the details shown and which are true and seat at all points. Supply castings showing the name of the manufacturer

and the country of manufacture. No plugging or welding of defective castings will be permitted.

2.2 WEIGHTS

- A. Reject castings with a weight which is less than the theoretical weight based on required dimensions by more than 5 percent. Provide facilities at the site for weighing castings in the presence of the ENGINEER, or furnish invoices showing true weights, certified by the supplier.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Erect all castings to accurate grades and alignment, and when placing in concrete carefully support castings to prevent movement during concreting.

3.2 PAINTING

- A. Clean metal castings thoroughly before painting. Give manhole frames and covers and valve boxes one coat of primer and two coats of an approved asphaltum varnish or other approved coating at the point of manufacture. Deliver all other castings to the job site unpainted. Paint all other castings as specified in Section 09900.

END OF SECTION

SECTION 13511

TELEVISIONING AND INSPECTION

PART 1 GENERAL

1.1 DESCRIPTION OF WORK

A. Work specified herein:

Furnish all labor, tools, test equipment and materials, including any and all permits required to televise, inspect, video tape, still photograph, and document the pipe conditions at the following times:

1. Prior to preparing the pipe / lateral interior for the liner
2. Prior to the liner installation
3. Two weeks after liner installation and reinstatement of services

1.2 QUALITY ASSURANCE

- A. The CONTRACTOR shall provide a minimum of five (5) separate references within the last five (5) years, in Florida, proving competence in the field of TV/video inspection of water and wastewater pipe systems.
- B. CONTRACTOR shall do all work with the OWNER'S REPRESENTATIVE present. CONTRACTOR shall schedule all work with OWNER'S REPRESENTATIVE.
- C. Equipment used shall be in good working order and provide continuous operation during TV/video tape inspection.
- D. VHS video tapes or DVD's shall be of good visual quality capable of slow motion and pausing without significant reduction of visual quality.

1.3 SUBMITTALS

- A. CONTRACTOR shall submit to the OWNER a list of equipment and materials to be used on the project, including all permits obtained prior to commencing with the Work.
- B. CONTRACTOR shall submit to the ENGINEER and OWNER a copy of all television inspection log sheets and completed VHS video tapes and DVD's.
- C. The CONTRACTOR shall submit shop drawings and other information in accordance with Section 01300 – Submittals. The CONTRACTOR's submittals shall include description of the software to be used and a sample of the video titles to be used, along with a sample of the television survey log to be used.

1.4 QUALIFICATIONS

- A. The Qualifications of the CONTRACTOR shall be submitted with submittal. These Qualifications shall include detailed descriptions of the following:
 - 1. The CONTRACTOR shall sign and date the information provided and certified that to the extent of his knowledge, the information is true and accurate, and that the supervisory personnel and/or methods will not be allowed without written authorization of the OWNER.
 - 2. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certification shall be submitted to the OWNER.
 - 3. The CONTRACTOR shall provide his references of previous projects lists going back five years including his customers' name, addresses and telephone numbers.
 - 4. To be qualified, the CONTRACTOR shall have a minimum of five years previous experience in the work required in this section.

PART 2 MATERIALS

2.1 GENERAL

- A. Equipment used shall be designed for use in wastewater systems. CONTRACTOR has the option of an approved equal device or other material than that which is specified. Submittals are required prior to commencement of work.

2.2 TELEVISION CAMERA

- A. Camera used shall be a COLOR RVC camera capable of panning 275° and rotating 360°. Camera shall be operative in 100% relative humidity and be specifically designed for the environment. Camera shall have an integral lighting system capable of producing clearly focused, well defined images of the entire periphery of the pipe. The quality of video picture and definition provided shall be to the satisfaction of the OWNER'S REPRESENTATIVE and, if unsatisfactory, equipment shall be removed and replaced with satisfactory equipment.
- B. The camera system shall be able to inspect 3-, 4-, and 6-in lateral connections up to 100 feet from the sewer mainline. The launcher shall be mounted on a tread tractor that moves through main sewer and position the inspection camera launcher opposite the lateral line connection.

- C. The camera system shall have mini black and white or color, fixed position, “positioning” camera to observe and place the mini color, push, “inspection” camera at the lateral. The inspection camera shall be attached to an 80-foot long push cable with a fiberglass rod core for cable rigidity. The camera head shall point forward while traveling through the sewer mainline.
- D. The camera used from a cleanout shall be able to be launched from the cleanout and travel down to the sewer mainline, up to 100 feet. The camera system shall be able to inspect 3-, 4-, and 6-inch lateral connections
- E. A Sonde shall be provided for locating unmarked sewer laterals. A sonde is a transmitter tied on a line and moved through a sewer or duct. A receiver on the surface follows its movement, documenting the line location. The pipe position is then marked on the ground. The sonde is pushed farther into the pipe, the receiver relocates the sonde and the pipe position is marked again. This process is repeated until the desired section of pipe is traced. It is pulled out on completion of the locate. The sonde will be inserted into the lateral through a sewer cleanout or, in case of no cleanout, through a roof vent to locate the cleanout as well as unmarked sewer lateral. The sonde may also be attached to the lateral television camera.

2.3 MONITOR

- A. A high resolution TV monitor screen shall be used. Quality of monitor shall be to the satisfaction of the OWNER.

2.4 VIDEO EQUIPMENT

- A. Video equipment shall be furnished by the CONTRACTOR to provide a visual and audio recording of all areas in the pipe. Video system at the site shall be capable of rewind, play back, slow motion, and stop motion. The video tape shall be extra high grade T-120 1/2-inch color VHS or DVD, with an audio channel for clearly recording the camera locations and operator observations (cracks, leaks, service connections, etc.). For wastewater pipes, the system shall continuously indicate distance, in feet, from manhole to manhole and the manhole to manhole runs shall be numbered on the video recording. For water pipes, the system shall continuously indicate distance, in feet, from the point of entry to the extent of the pipe surveyed. All recordings shall be performed at SP (Standard Play Speed).

2.5 WINCHES

- A. Variable speed powered remote controlled winches shall be furnished for upstream and downstream manhole locations to control two-way movement of the camera. If a self-propelled camera is used, winches are not necessary.

2.6 POWER SUPPLY

- A. Power supply shall be continuous. If night operations occur, CONTRACTOR shall supply all labor, power and lighting equipment for operations, traffic safety, permits, etc.

PART 3 EXECUTION

3.1 GENERAL

- A. All lines / laterals shall be televised at the CONTRACTOR's expense; and a videotape of the subject mains provided prior to acceptance by Lee County Utilities. The Engineer and/or a Lee County Utilities representative may be present during the televising. The sewer video inspection shall include rotating the camera lens to inspect the interior of each sewer lateral. Additionally, the CONTRACTOR shall provide by tabular form utilizing "Remote Televising Form" (see Lee County Utilities Operations Manual, Section 11).
- B. The CONTRACTOR shall demonstrate the ability of the TV/video equipment (camera/light/video tape/audio/ photograph system) to the satisfaction of the OWNER. Distance meter shall be furnished on the video tape recording. Meter shall be checked using distances between manholes and/or mainline to property line / cleanout. Meter distances and actual distances shall be consistent.

3.2 TELEVISIONING/INSPECTION

- A. Inspection shall be done one manhole section / lateral at a time. Flow into the section being inspected shall be stopped prior to video inspection, unless otherwise approved in writing by the OWNER. CONTRACTOR shall not begin inspection without the OWNER'S REPRESENTATIVE present unless prior written approval is obtained from the OWNER.
- B. CONTRACTOR shall locate video vehicle on upstream side of manhole or insertion point. CONTRACTOR shall always video tape in the downstream direction such that camera movement is with the flow.
- C. CONTRACTOR shall insert the camera in the upstream manhole or insertion point after all required flow restrictions have been accomplished. Flow into the system being inspected shall be stopped, with the exception of service laterals into the system being inspected. Camera shall be moved through the pipe lines at a moderate speed not exceeding 30 feet per minute. Camera shall be stopped at locations where one or more of the following conditions is observed:
 - 1. Infiltration/inflow sources.
 - 2. Service Laterals.

3. Structural defects including broken pipe; collapsed or collapsing pipe, cracks, deterioration, punctures, etc.
 4. Abnormal joint conditions such as misalignments, open joints and joints not sealed.
 5. Unusual conditions such as root intrusion, protruding pipes, in-line pipe size changes, mineral deposits, grease and obstructions.
- D. Camera shall be temporary halted for a minimum of ten (10) seconds for a thorough visual inspection of the conditions. All such conditions as specified above shall be audio recorded on video tape and the inspection log sheet. The camera shall be moved and rotated to obtain optimum view of the conditions. If requested by the OWNER's representative, problem areas shall be viewed in the opposite direction by pulling the TV camera from the opposite direction at no additional cost to the OWNER.
- E. While the camera is stopped at each service connection, the camera shall be rotated so as to be able to view the service connection for a length of time that enables a good visual inspection of the service connection for damage and infiltration. The CONTRACTOR will be responsible for measurements such as service lateral locations, if used for subsequent rehabilitation work.
- F. When, during the inspection operation, the television camera will not pass through the entire manhole to manhole section and or lateral, CONTRACTOR shall set up his equipment so that the inspection can be performed from the opposite manhole / end at no additional cost to the OWNER.

3.3 DOCUMENTATION

- A. CONTRACTOR shall furnish a detailed report and video tapes of the system inspected. The minimum information supplied shall be the following:
1. Name and address of CONTRACTOR and the ENGINEER.
 2. Name of OWNER, system(s) inspected, and OWNER's representative involved.
 3. Log reports:
 - a. Log sheet for each section of pipe and laterals within the section.
 - b. Separate line for each deficiency and location
 - c. Corresponding video tapes and location of each section of pipe / lateral and deficiencies on tape.
 4. Video tapes shall be labeled with the following information:

- a. System that is video taped (street name and manhole to manhole numbers & Distance to Lateral) and log report number corresponding to video tape
 - b. Pipe Size (Diameter) and Material
 - c. Date/Time video was taped
 - d. CONTRACTOR's name and representative
 - e. OWNER's name
 - f. Ongoing Footage Counter
- B. All tapes shall be rendered unable to be taped over after they are completed.

3.4 MAINTENANCE OF TRAFFIC

- A. CONTRACTOR is responsible for all maintenance of traffic around work site. CONTRACTOR shall maintain traffic in accordance to all federal, state and local regulations. At no additional cost to OWNER, CONTRACTOR shall submit a Maintenance of Traffic Plan, for review and approval by LCDOT as necessary, prior to commencing work. CONTRACTOR shall also obtain all necessary permits prior to commencing work, at no additional cost to the OWNER.
- B. MOT shall also include construction and maintenance of any necessary detour facilities, furnishings, installing and maintaining of traffic control and safety devices during construction, control of dust, and any other special requirements for safe and expeditious movement of traffic around or through the work site.
- C. The CONTRACTOR shall be responsible for coordination with Lee County sheriff's department, fire department, public service, LCDOT, Lee County school board, and other affected agencies when roadways will be closed or traffic will be detoured. No detours or roadway closings shall be permitted unless specifically approved in writing by the OWNER or ENGINEER.

END OF SECTION

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