PART 1 - GENERAL

1.1 GENERAL

A. The Work to be performed under this Contract shall consist of furnishing all tools, equipment, materials, supplies, and manufactured articles and for furnishing all transportation and services, including fuel, power, water, and essential communications, and for the performance of all labor, work, or other operations required for the fulfillment of the Contract in strict accordance with the Contract Documents. The Work shall be complete, and all work, materials, and services not expressly shown or called for in the Contract Documents which may be necessary for the complete and proper construction of the Work in good faith shall be performed, furnished, and installed by the CONTRACTOR as though originally so specified or shown, at no increase in cost to the OWNER.

B. The term “OWNER” as used throughout these contract documents shall mean the actual OWNER or a third-party representative who may be designated by the OWNER to take responsibility for various functions under this contract.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

A. The Project consists of furnishing all labor, materials and equipment for performing sanitary sewer repairs.

B. In order to obtain representative unit prices for sewer system rehabilitation technologies and construction services, four groups have been developed. Interested contractors are requested to submit price proposals for one or more of those groups which they are qualified to perform. Interested contractors are not required to bid every group but must bid all items within any group they elect to bid. Each group will be awarded, as a separate contract, to the lowest responsible bidder for that specific group.

1. **Group “A” - Excavated Point Repairs:** Point repairs, installation, bypass pumping, surface restoration, and post repair TV survey.

2. **Group “B” - Manhole Rehabilitation:** Replacing manhole frames and covers and performing other miscellaneous manhole repairs, installing cementitious and epoxy manhole liners, installing poured-in-place concrete/polyethylene liners, replacing entire manholes, and bypass pumping.

3. **Group “C” – Mainline Lining:** Cured-in-place pipe lining for gravity mains, and associated work such as cleaning and preparation, lateral reinstatement, cleanout installation, bypass pumping, traffic control, and post repair TV survey.

4. **Group “D” - Lateral Lining and Mainline Sectional Lining:** Cured-in-place lateral lining, sectional lining of mains, and mainline/lateral connection interface seal installation. Television survey on service lateral pipes using special camera systems and associated cleanout installation and bypass pumping, and associated work such as cleaning and preparation, lateral reinstatement, traffic control, and post repair TV survey.
C. Prior to construction, the CONTRACTOR shall identify existing utilities. The CONTRACTOR will be responsible for the coordination of his work with the associated utility owner and permitting agencies having jurisdiction over the specific locations to be verified.

D. Repairs shall be continuously generated under individual work orders during the contract period as the results of the ongoing sewer system evaluation survey become available. Groups of work orders of the Project will be issued to the CONTRACTOR in the order in which the OWNER wishes the lines repaired. The CONTRACTOR shall view the available video inspection tapes to familiarize himself with pipe’s condition. The groups shall be worked upon and completed in the order they are issued, and the work of a given group of work orders shall be completed, prior to beginning the work of a subsequent group of work orders, unless otherwise specifically permitted by the OWNER. The OWNER and CONTRACTOR shall agree on a schedule for the completion of each group of work orders prior to initiation of the work. A work order will consist of a single repair of a sewer element.

E. Upon receipt of any work order, the CONTRACTOR shall evaluate the work site and determine whether any foreseeable item of expense is not covered by a pay item under this contract. 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 orders will be considered or approved.

F. The Work also includes providing temporary sanitary sewer service of service laterals, bypass pumping or plugging, if needed, and other appurtenant and miscellaneous items and work for a completed project.

G. Work shall be performed to ensure a minimum of traffic disruption or sewer down time as necessary, and work must be coordinated with affected residents and utility personnel. Whenever the property owners' use of the sanitary sewer must be interrupted by the Work, the CONTRACTOR shall notify the residents well in advance of the interruption. This notification shall be accomplished with door hanger notification cards to be placed at the addresses of affected customers. Property owners shall be informed when service interruption will take place and the approximate duration. This notice shall be provided a minimum of 24 hours in advance of commencement of service interruption, unless otherwise specified. The CONTRACTOR shall make every effort to minimize inconvenience to the public and property owners.

H. When CONTRACTOR requires police presence for work to be completed for this project, CONTRACTOR will be required to contact the North Miami Police Department for the hiring of off-duty North Miami police officers. This item will be on an as need basis. Prior to requesting police presence CONTRACTOR must receive written approval from the North Miami Department of Public Works. Payment shall be made on an hourly basis.

I. The CONTRACTOR shall perform all work in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving
man entry in confined spaces. Prior to entering manholes and other confined spaces, the atmosphere shall be evaluated by the CONTRACTOR to determine the presence of toxic, flammable or explosive vapors or lack of oxygen in accordance with local, state, or federal safety regulations. CONTRACTOR shall follow all procedures outlined by OSHA’s Confined Space Entry requirements.

J. It is the intent of the OWNER to select and retain contractors to perform wastewater collection system rehabilitation services. The contractors will be selected based upon qualifications, cost, technologies and their ability to perform the required services during the stipulated contract period.

K. The CONTRACTOR shall warrant to the OWNER that the equipment used on this Contract where covered by patents or license agreements is furnished in accordance with such agreements and that the prices included herein cover all applicable royalties and fees in accordance with such license agreements. The CONTRACTOR shall defend, indemnify and hold the OWNER harmless from and against any and all costs, loss, damage or expense arising out of or in any way connected with any claim of infringement of patent, trademark or violation of license agreement.

L. As the results of the ongoing sewer system evaluation survey become available, specific collection system rehabilitation work orders will be developed for the technologies and remedial construction services in this proposal. The OWNER reserves the right to select the technology and scope of work for each work order. Contractor unit prices established under this selection process will determine the total cost of each work order.

1.3 WORK BY OTHERS

A. The CONTRACTOR’s attention is directed to the fact that work may be conducted at the sites by other contractors during the performance of the Work under this Contract. The CONTRACTOR shall conduct its operations so as to cause a minimum of interference with the Work of such other contractors, and shall cooperate fully with such contractors to provide continued safe access to their respective portions of the sites, as required to perform their respective contracts.

B. 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.

C. Interference with Work on Utilities: The CONTRACTOR shall cooperate fully with all utility forces of the OWNER or forces of other public or private agencies engaged in the relocation, altering, or otherwise rearranging of any facilities which interfere with the progress of the Work, and shall schedule the Work so as to minimize interference with said relocation, altering, or other rearranging of facilities.
1.4 FIELD LAYOUT OF WORK

A. All work under this Contract shall be constructed in accordance with the requirements of each work order or as directed by the OWNER. Information provided concerning existing ground, structures and appurtenances is believed to be reasonably correct but not guaranteed to be absolute and therefore is presented only as an approximation. Any error or apparent discrepancy in the data shown or omissions of data required for accurately accomplishing the work shall be referred immediately to the OWNER for interpretation or correction.

B. All survey work for construction control purposes shall be made by the CONTRACTOR at his expense. The CONTRACTOR shall establish all base lines for the location of the principal component parts of the work together with bench marks and batter boards adjacent to the work. Based upon the information provided, the CONTRACTOR shall develop and make all detail surveys necessary for construction. The OWNER will furnish information and location of existing bench marks.

C. The CONTRACTOR shall have the responsibility to carefully preserve the bench marks, reference points and stakes. In case of destruction thereof by the CONTRACTOR or resulting from his negligence, he shall be held liable for any expense and damage resulting there from and shall be responsible for any mistakes that may be caused by the unnecessary loss or disturbance of such bench marks, reference points and stakes.

D. Existing or new control points, property markers, and monuments that will be established or are destroyed during the normal causes of construction shall be re-established by the CONTRACTOR; and all reference ties recorded therefore shall be furnished to the OWNER. All computations necessary to establish the exact position of the work shall be made and preserved by the CONTRACTOR.

E. The OWNER 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.

1.5 CONTRACTOR USE OF PROJECT SITE

A. The CONTRACTOR's use of the project site shall be limited to its construction operations, including on-site storage of materials, on-site fabrication facilities, and field offices as applicable. Off-site storage of materials, if required, shall be arranged for by the CONTRACTOR and a copy of an agreement for use of other property shall be furnished to the OWNER.

1.6 OWNER USE OF THE PROJECT SITE

A. The OWNER may utilize all or part of the existing facilities during the entire period of construction for the conduct of the OWNER's normal operations. The CONTRACTOR shall cooperate with the OWNER to minimize interference with the CONTRACTOR's operations and to facilitate the OWNER's operations.
1.7 PARTIAL UTILIZATION OF THE WORK BY OWNER

A. The CONTRACTOR is hereby advised that the OWNER may accept the responsibility for the maintenance and protection of a specific portion of the project if utilized prior to completion. However, the CONTRACTOR shall retain full responsibility for satisfactory operation of the total project.

1.8 PROJECT MEETINGS

A. Preconstruction Conference: Prior to the commencement of Work at the site, a preconstruction conference will be held at a mutually agreed time and place which shall be attended by the CONTRACTOR, its superintendent, and its subcontractors as appropriate. Other attendees will be:

1. Representatives of OWNER.
2. Governmental representatives as appropriate.
3. Others as requested by CONTRACTOR or OWNER.
4. Unless previously submitted to the OWNER, the CONTRACTOR shall bring to the conference one copy each of the following:
   a. Preliminary schedule.
   b. Preliminary procurement schedule of major equipment and materials and items requiring long lead time.
   c. Preliminary Shop Drawing / Sample / Substitute or "Or Equal" submittal schedule.
   d. Schedule of Payment Items (lump sum price breakdown) for progress payment purposes.
   e. Traffic Maintenance Plan

5. The purpose of the conference is to designate responsible personnel and establish a working relationship. Matters requiring coordination will be discussed and procedures for handling such matters established.

6. The agenda will include:
   a. CONTRACTOR's tentative schedules.
   b. Transmittal, review, and distribution of CONTRACTOR's submittals.
   c. Processing applications for payment.
   d. Maintaining record documents.
   e. Critical work sequencing.
f. Field decisions and Change Orders.

g. Use of project site, office and storage areas, security, housekeeping, the OWNER's needs.

h. Major equipment deliveries and priorities.

i. CONTRACTOR's assignments for safety and first aid.

7. The OWNER will preside at the preconstruction conference and will arrange for keeping the minutes and distributing the minutes to all persons in attendance.

B. Progress Meetings: The OWNER will schedule monthly progress meetings. The CONTRACTOR and OWNER, and all subcontractors active on the site shall be represented at each meeting. CONTRACTOR may at its discretion request attendance by representatives of its suppliers, manufacturers, and other subcontractors.

C. The OWNER will preside at the meetings and provide for keeping and distribution of the minutes. The purpose of the meetings will be to review the progress of the Work, maintain coordination of efforts, discuss changes in scheduling, and resolve other problems which may develop.

D. The CONTRACTOR shall attend meetings held to coordinate work between other contracts that may be on-going on the project site. The General Superintendent, Job Superintendent, and/or other key representatives of each prime contractor shall attend these conferences.

1.9 SITE CONDITIONS

A. The CONTRACTOR acknowledges that he has investigated prior to bidding and satisfied himself as to the conditions affecting the Work, including but not restricted to those bearing upon transportation, disposal, handling and storage of materials, availability of labor, water, electric power, roads and uncertainties of weather, river stages, tides, water tables or similar physical conditions at the site, the conformation and conditions of the ground, the character of equipment and facilities needed preliminary to and during prosecution of the Work. The CONTRACTOR further acknowledges that he has satisfied himself as to the character, quality and quantity of surface and subsurface materials or obstacles to be encountered insofar as this information is reasonably ascertainable from an inspection of the site, or any contiguous site, as well as from information presented by any Drawings and Specifications made a part of this Contract, or any other information made available to him prior to receipt of Bids. Any failure by the CONTRACTOR to acquaint himself with the available information will not relieve him from responsibility for estimating properly the difficulty or cost of successfully performing the Work. The OWNER assumes no responsibility for any conclusions or interpretations made by the CONTRACTOR on the basis of the information made available by the OWNER.

B. CONTRACTOR shall also take 4" x 6" color photographs and video tapes to document pre-existing above-ground conditions and shall provide the OWNER with a set of photographs, negatives and video tapes. These photographs and tapes may be used for purposes of restoration documentation. Digital photographs supplied on a CD are
also acceptable.

1.10 DIFFERING SITE CONDITIONS

A. The CONTRACTOR shall promptly and before such conditions are disturbed, notify the OWNER in writing of: (1) subsurface or latent physical conditions at the site differing materially from those indicated in this contract, or (2) unknown physical conditions at the site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for this contract. The OWNER will promptly investigate the conditions, and if he finds that such conditions do materially so differ and cause an increase or decrease in the CONTRACTOR's cost of, or the time required for, performance of any part of the work under this contract, whether or not changed as a result of such conditions, an equitable adjustment shall be made and the contract modified in writing accordingly.

B. No claim of the CONTRACTOR under this clause shall be allowed unless the CONTRACTOR has given the notice required in Paragraph A.

C. No claim by the CONTRACTOR for an equitable adjustment hereunder shall be allowed if asserted after final payment under this contract.

PART 2 - PRODUCTS - (Not Used)
PART 3 - EXECUTION - (Not Used)

- END OF SECTION -
PART 1 - GENERAL

1.1 SCOPE OF WORK

A. Payments to the CONTRACTOR shall be made on the basis of the Bid Proposal as full and complete payment for furnishing all materials, labor, tools and equipment, and for performing all operations necessary to complete the work included in the Contract Documents. Such compensation shall also include payments for any loss or damages arising directly or indirectly from the work, or from any discrepancies between the actual quantities of work and those shown in the Contract Documents.

B. The prices stated in the Bid Proposal include all costs and expenses for taxes, labor, equipment, materials, commissions, transportation charges and expenses, patent fees and royalties, labor for handling materials during inspection, together with any and all other costs and expenses for performing and completing the work as shown on the details and specified herein. The Basis of Payment for an item at the price shown in the Bid Proposal shall be in accordance with its description of the item in this Section and as related to the work specified. Unit prices will be applied to the actual quantities furnished and installed in conformance with the Contract Documents. The items listed below, refer to and are the same pay items listed in the Bid Proposal. They constitute all of the pay items for the completion of the work. 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 underground utility locating, 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.

C. The CONTRACTOR’s attention is called to the fact that the quotations for the various items of work are intended to establish a total price for completing the work in its entirety. Should the CONTRACTOR feel that the cost for any item of work has not been established in the Bid Proposal or this Section, the cost for that Work shall be included in some other applicable Bid Item, so that the Proposal for the project reflects the total price for completing the work in its entirety. It is intended that all work required to complete this Contract will be included in the various items as described herein.

D. In the event of any conflict among sections of these contract documents, the OWNER’S front end documents shall take precedence, followed by this section (Section 01025, Measurement and Payment) and then the remaining sections of these Technical Specifications.

E. In the event that repairs to laterals, mains, manholes, force mains, utilities, or any other public or private property are required due to damage caused by the CONTRACTOR’s operations, the CONTRACTOR shall provide and employ all necessary labor, equipment, and materials, at no additional cost, to complete such repairs in accordance with applicable provisions of these specifications. This shall include but not be limited to materials for repair, if required, including 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 sewers to maintain service; complying with the State of Florida Trench Safety Act, including shoring; removal, transportation and disposal of existing sewer 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 sewers, laterals and structures; placing and compacting bedding and backfill; furnishing and installing additional suitable backfill material, if required; furnishing all materials and equipment required to clean and test the sewer; cleaning and testing the sewer; 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.

F. The OWNER will not provide any space or place to store materials for this project. No payment will be made for stored materials.

G. Whenever “Limits of Construction” is referred to, the limit of construction shall be within an area 7.5 feet each side of the centerline of the pipe and no more than five feet beyond the end of the new pipe installed.

1.2 CONTRACT DURATION
A. As specified in the Instructions to Bidders.

1.3 PERFORMANCE AND PAYMENT BONDS
A. As specified in the Instructions to Bidders.

1.4 MEASUREMENT
A. The quantities for payment under this Contract shall be determined by actual measurement of the completed items, in place, ready for service and accepted by the OWNER unless otherwise specified. The OWNER will witness all field measurements.

B. When depth of cuts is indicated in the bid items, they shall be measured vertically from the existing grade at excavation point, paved or unpaved, to the pipe invert.

C. The quantities stated in the Bid Proposal are approximate only and are intended to serve as a basis for the comparison of bids and to fix the approximate amount of the cost of the Project. The OWNER does not expressly or impliedly agree that the actual amount of the 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 OWNER 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.
I. Television inspection performed to document a completed repair is not considered a separate pay item. Costs for such TV inspection shall be included in the contract unit cost for each particular repair. Lateral repair/replacement inspection shall be performed using a camera launched from the main unless conditions within the sewer require lateral inspection from the cleanout.

J. For Groups C and D, the Owner may request inspection for the purpose of locating or confirming defects in sewer mains and laterals for subsequent repair under this Contract. Where such mains and laterals are subsequently assigned to the Contractor for lining during this Contract, the initial inspection cost shall be deducted from the lining cost.

K. Items to be paid for separately, where OWNER agrees that such separate payment is required, include the following:

1. Traffic control.

2. Bypass pumping (other than because of damage caused by the CONTRACTOR).

1.5 GROUP "A" (EXCAVATED POINT REPAIRS) PAYMENT ITEMS

A. Items A1 to A12 – 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 post-construction television inspection; 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. Multiple payments can be made under this item if the repair exceeds 15 feet.

2. Surface restoration will be paid for separately.

B. Item A13 – Install lateral connection to lined main (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 lateral connections to lined mains (Fernco flexible
tap saddle, LMT Saddle from LMK Technologies, or approved equal) in accordance with the manufacturer’s recommendations, complete and in place.

2. The starting point for this item of work will be measured and paid 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 unit price per each will provide complete compensation for lifting, removing, cleaning and recoating the cast iron frame; removing and replacing the mortar bedding on the top of the manhole wall; reseating the frame in its correct position; patching as required; surface restoration; cleanup; labor, tools and equipment; and all incidentals as necessary to attain a water-tight junction between manhole wall and cast iron frame, including the installation of an aromatic urethane internal manhole sealing system, complete in place.

C. Items A 41-1 to A41-27 – Time-and-materials items

1. Reference Part 1.9, T. Time-and-materials items for work not covered by other pay items of this section.

1.6 GROUP "B" (MANHOLE REPAIRS AND REPLACEMENTS) PAYMENT ITEMS

A. Items B1 to B2 – Realign, grout and seal manhole casting

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 unit price per each will provide complete compensation for lifting, removing, cleaning and recoating the cast iron frame; removing and replacing the mortar bedding on the top of the manhole wall; reseating the frame in its correct position; patching as required; surface restoration; cleanup; labor, tools and equipment; and all incidentals as necessary to attain a water-tight junction between manhole wall and cast iron frame, including the installation of an aromatic urethane internal manhole sealing system, complete in place.

B. Item B3 – Install manhole chimney seal

1. This item of work will be measured and paid for at the unit price per each seal installed. Payment of the unit price per each will provide complete compensation for furnishing and installing manhole chimney seals, labor, tools, equipment and incidentals necessary for a complete in place, acceptable installation, with no leakage through or around the seal.

C. Items B4 to B5 – Seal visible infiltration through manhole walls, bench and invert

1. This item of work will be measured and paid for at the unit price per each manhole, regardless of depth or size (or number and flow rate of visible leaks encountered). Payment shall be made per unit price per each for sealing or patching all visible leaks by injecting chemical grout; including dewatering (or other means acceptable to the OWNER) to relieve hydrostatic pressure outside the manhole.

D. Item B6 – 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.
E. Item B7 - 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 and applying them; isolation of the manhole by plugging entering lines; removal and re-installing flow channel and benches; testing labor, tools and equipment; and all incidentals necessary to obtain a watertight, sealed manhole bench and invert.

F. Item B8 - Replace standard manhole frame and cover

1. This item of work will be measured and paid for at the unit price per each, regardless of size. Payment of the unit price per each will provide compensation for furnishing and installing the new frame and cover; salvaging and transporting to the location designated by the OWNER of all replaced cast iron materials; cutting, removal and replacement of surface materials as necessary; cleanup; labor, tools and equipment; and all incidentals necessary to obtain a new cast iron cover, including the installation of an aromatic urethane internal manhole sealing system, complete in place.

G. Item B9 - Replace watertight manhole frame and cover

1. This item of work will be measured and paid for at the unit price per each, regardless of size. Payment of the unit price per each will provide compensation for furnishing and installing the new frame and cover; salvaging and transporting to the location designated by the OWNER of all replaced cast iron materials; cutting, removal and replacement of surface materials as necessary; cleanup; labor, tools and equipment; and all incidentals necessary to obtain a new watertight cast iron cover, including the installation of an aromatic urethane internal manhole sealing system, complete in place.

H. Items B10 to B13 - Cementitious manhole liner or cementitious manhole liner with polymeric overlay

1. This item of work will be measured and paid at the unit price per vertical foot of manhole wall. 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 will provide compensation for cleaning of the wall; furnishing and supplying of all materials or combination of materials making up the cementitious lining or cementitious lining and polymeric overlay and applying them; furnishing and applying an aromatic urethane sealant to the top portion of the cone and the manhole ring; manufacturer's representative's presence or assistance if required; isolation of the manhole by plugging entering lines; testing labor, tools and equipment; and all incidentals necessary to obtain a watertight, sealed manhole wall and bench complete.

I. Item B14 - Polyethylene manhole liner

1. This item of work will be measured and paid for at the unit price per vertical foot of manhole liners installed. Measurement will be made from the bench, at its highest point, to the bottom of the frame. Payment will provide compensation for cleaning of
the wall and surface preparation, furnishing and installing all materials including manhole liner; manufacturer's representative's presence or assistance if required; isolation of the manhole by plugging entering lines; testing; safety equipment for personnel; labor, tools and equipment; and all incidentals necessary to obtain a water-tight, sealed manhole complete in place.

J. Items B15 to B23 - 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 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.

2. Items B22 and B23 will be paid, in addition to one of Items B15 through B21, where manholes with external drop connections are specified. Item B22 is intended to cover the additional cost of the pre-cast portion, and Item B23 is intended to cover the additional cost of the cast-in-place portion.

3. Surface restoration will be paid for separately.

K. Items B24 to B42 - Items in common

1. Reference Part 1.09 of this section.

1.7 GROUP "C" (MAINLINE PIPE LINING) PAYMENT ITEMS

A. Items C1 to C17 - Install C.I.P. mainline liner

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, 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; 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.

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 95 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:

   \[
   \text{Value Factor} = \text{thickness} \times \text{flexural strength} \times \text{flexural modulus of elasticity}
   \]

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

3. Reinstatement of service lateral connections will be paid for separately.

B. Items C18 to C19 - CIP liner cure temperature monitoring and reporting
   1. This work will be measured and paid at the unit price per linear foot of liner as delineated by the pipe size 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.

   2. Each unit price bid shall include, but not be limited to, all necessary or required labor and expense to procure temperature sensors along with necessary computer software and hardware; install temperature sensors between the host pipe and liner in the bottom of the host pipe at intervals no greater than 20-feet for pipe sizes up to 15-inches in diameter and no greater than 10-feet for pipe sizes 18-inches and larger; test the temperature monitoring system’s proper functioning prior to installing the liner in the host pipe; monitor the temperatures inside the tube wall of the installed liner to verify proper curing using a computer and associated software with a tamper-proof database which can record the temperatures at this interface throughout the processing of the liner; and deliver to the OWNER (via certified report or secure website access) an output report that identifies each sensor by its station in the reach and shows the maximum temperature achieved during the processing of the CIPP and the time sustained at or above the Manufacturer’s required curing temperature at each sensor.
C. Items C20 to C33 - Items in common.

1. Reference Part 1.09 of this section.

1.8 GROUP "D" (LATERAL LINING AND MAINLINE SECTIONAL LINING) PAYMENT ITEMS

A. Items D1 to D2 - Install cured-in-place sectional pipe liners

1. Items with Bid form units of “EA” 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 Bid Form. Each unit price bid shall provide full compensation for all work including, but not limited to, furnishing and installing section of epoxy impregnated fiberglass liner; pipe cleaning; television inspections; all labor, materials and equipment specified or not which will provide a complete and acceptable liner installation.

2. Items with Bid Form units of “L.F.” will be paid for in addition to the price paid under corresponding Items with Bid Form units of “EA” 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 with Bid Form units of “EA”.

B. Items D3 to D6 - Install T-liner in various-sized mains with 4-inch to 6-inch laterals

1. Items with Bid form units of “EA” will be measured and paid 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 25 feet of lateral. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for 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.

2. Items with Bid form units of “L.F.” will be measured and paid for at the unit price per foot of sewer laterals lined beyond 25 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 25 feet.

C. Item D7 - 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.
D. Item D8 - 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 PE coating in mainline cured-in-place liners prior to the installation of a mainline/lateral connection interface seal. Payment for this item, when authorized by the OWNER, shall be in addition to a mainline/lateral connection interface seal.

E. Item D9 - Lateral grouting (if required in preparation for T-liner, 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 T-liner, 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 T-liner, 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 T-liner, lateral liner, or mainline/lateral connection interface seal.

F. Items D10 to D11 - Install CIP liner in 4-inch to 6-inch laterals, all depths

1. Items with Bid Form units of “EA” will be measured and paid at the unit price per each and shall include up to 25 feet of lateral. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for 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.

2. Items with Bid form units of “L.F.” will be measured and paid for at the unit price per foot of sewer laterals lined beyond 25 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 25 feet.

G. Item D12 - Install CIP mainline/lateral connection interface seal in any size 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 8 inches into the lateral and has a minimum 3-inch “brim” to create a watertight seal inside the main. Each unit price bid shall include, but not be limited to, all necessary or required labor, equipment, tools, and materials for 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.

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

H. Items D13 to D31 - Items in common

1. Reference Part 1.09 of this section.

1.9 ITEMS IN COMMON

A. Lateral reinstatement

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; performing all repairs required due to damage caused by the CONTRACTOR, and all appurtenant and miscellaneous items and work.

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.

B. Recut lateral insufficiently reinstated by others

1. This item of work will be measured and paid at the unit price per each lateral recut and shall include, but not be limited to, blocking or plugging incoming line; removal, transportation and disposal of material generated by cleaning and preparation; pre- and post-television surveys, furnishing the equipment necessary to internally cut out the liner to at least 95 percent of the area 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; performing all repairs required due to damage caused by the CONTRACTOR, and all appurtenant and miscellaneous items and work.

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.
C. Grout annular space following recut of lateral insufficiently reinstated by others

1. This item of work will be measured and paid at the unit price per each recut lateral grouted and shall include, but not be limited to, blocking or plugging incoming line; removal, transportation and disposal of material generated by cleaning and preparation; pre- and post-television surveys, furnishing the equipment necessary; 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; performing all repairs required due to damage caused by the CONTRACTOR, and all appurtenant and miscellaneous items and work.

2. If grouting of the annular space at the reinstated lateral results in residual grout in greater than 50 percent the area of the lateral, such grout shall be removed at no additional cost.

D. 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.

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.

E. Exploratory excavation

1. This item 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.

F. 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.

2. These items shall include, but not be limited to: 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.

G. 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.
   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.

H. 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.

I. Asphalt roadway replacement
   1. The unit price bid for this item 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, base and subgrade removed or damaged under this Contract; limerock base, prime coat, tack coat, asphalt, and compaction. Asphalt shall be type SP 9.5 or SP 13.5 as directed by the City.
   2. Payment will only be made if this item is encountered within the “Limits of Construction” as previously 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.
   3. 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.

J. Pavement overlay

1. Item for construction pavement repairs (1-inch thick asphaltic concrete wearing surface overlay) 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.

K. 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.

2. Payment will only be made if this item is encountered within the "Limits of Construction" as previously 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.

L. 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 of all labor, equipment and material required for cutting, removing, replacing all existing concrete curbs and gutters removed or damaged under this Contract, concrete, formwork, reinforcing, placing, finishing and curing.

2. Payment will only be made if this item is encountered within the "Limits of Construction" as previously 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.

M. 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.

2. Payment will only be made if this item is encountered within the "Limits of Construction" as previously 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.
N. 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.

2. Payment will only be made if this item is encountered within the "Limits of Construction" as previously 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.

O. Replace concrete slabs and/or aprons

1. The unit price for Concrete Slab and/or Apron 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 removed or damaged under this Contract, concrete, formwork, reinforcing, placing, finishing and curing.

2. Payment will only be made if this item is encountered within the "Limits of Construction" as previously 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.

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 sod removed or damaged under this Contract.

2. Payment will only be made if this item is encountered within the "Limits of Construction" as previously 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.

Q. Installation in rear-yard easement

1. Payment shall be at the unit price bid, per easement work authorization 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. The CONTRACTOR shall advise the OWNER in advance as to the traffic control measures deemed necessary for each Work Authorization.

2. When the OWNER agrees in advance as to the measures required, such measures shall be compensated on a site-specific basis using the pay items provided.

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 mobilize and actively initiate the repair work within 24 hours of the OWNER's request.

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

T. Police presence

1. When CONTRACTOR requires police presence for work to be completed for this project, CONTRACTOR will be required to contact the North Miami Police Department for the hiring of off-duty North Miami police officers. This item will be on an as need basis. Prior to requesting police presence CONTRACTOR must receive written approval from the North Miami Department of Public Works. Line Item A41-27 “Police presence” shall be used to pay for these services with the allowance provided in the bid form. Payment shall be made on an hourly basis.

U. Time-and-materials items for work not covered by other pay items

1. When field conditions require work for which there are no pay items in the contract, the OWNER may request the CONTRACTOR to provide a Not-to-Exceed estimate for such work using the unit prices bid for labor, equipment, materials, and services and estimated amounts for items not listed on the bid form that must be rented or purchased.

2. Upon completion of work, the CONTRACTOR shall bill the OWNER using unit prices bid for labor, equipment, materials, and services based on actual quantities used; and actual cost for items not listed on the bid form with an allowable fifteen (15) percent markup. Copies of invoices for such items not listed on the bid form shall be submitted with the CONTRACTOR's invoice for payment. In cases where the contractor manufactures his own parts, he will charge the OWNER a price no higher than he charges his most favored customer. The OWNER reserves the right to request cost verification for parts, materials, or permit fees. The OWNER also reserves the right to purchase and
supply pipe, fittings, equipment, or other items or material directly for use by the CONTRACTOR at no cost to the OWNER.

3. Should the CONTRACTOR elect to subcontract any portion of an individual project, the CONTRACTOR must first check with the OWNER to identify if any OWNER contracts can be utilized for required services. If not available, the CONTRACTOR shall obtain a minimum of three quotes and the cost shall be the lowest of the provided quotes, subject to approval of the OWNER.

4. Subcontractor may not charge labor or equipment rates higher than the CONTRACTOR and any purchased items or materials provided by the subcontractors shall also be subject to the specified allowable markup. The CONTRACTOR will not be reimbursed for hourly rates charged by its subcontractors that are higher than the hourly rates bid by the CONTRACTOR. Invoices and documentation must be provided with copies of subcontractor’s invoices pursuant to the same requirements specified for the CONTRACTOR.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -
SECTION 01090 - REFERENCE STANDARDS

PART 1 - GENERAL

1.01 GENERAL

A. **Titles of Sections and Paragraphs**: Captions accompanying specification sections and paragraphs are for convenience of reference only, and do not form a part of the Specifications.

B. **Applicable Publications**: Whenever in these Specifications references are made to published specifications, codes, standards, or other requirements, it shall be understood that wherever no date is specified, only the latest specifications, standards, or requirements of the respective issuing agencies which have been published as of the date of the opening of bids, shall apply; except to the extent that said standards or requirements may be in conflict with applicable laws, ordinances, or governing codes. No requirements set forth herein shall be waived because of any provision of, or omission from, said standards or requirements.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. Without limiting the generality of other requirements of the specifications, all work specified herein shall conform to or exceed the requirements of all applicable codes and the applicable requirements of the following documents to the extent that the provisions of such documents are not in conflict with the requirements of these Specifications nor the applicable codes.

B. References herein to "Building Code" or SFBC shall mean the locally applicable edition of the South Florida Building Code. The latest edition of the code as approved and used by the local agency as of the date of award, as adopted by the agency having jurisdiction, shall apply to the Work herein, including all addenda, modifications, amendments, or other lawful changes thereto.

C. In case of conflict between codes, reference standards, Drawings and the other Contract Documents, the most stringent requirements shall govern. All conflicts shall be brought to the attention of the OWNER for clarification and directions prior to ordering or providing any materials or labor. The CONTRACTOR shall bid the most stringent requirements.

D. **Applicable Standard Specifications**: The CONTRACTOR shall construct the Work specified herein in accordance with the requirements of the Contract Documents and the referenced portions of those referenced codes, standards, and Specifications listed herein.

E. References herein to "OSHA Regulations for Construction" shall mean Title 29, Part 1926, Construction Safety and Health Regulations, Code of Federal Regulations (OSHA), including all changes and amendments thereto.

F. References herein to "OSHA Standards" shall mean Title 29, Part 1910, Occupational Safety and Health Standards, Code of Federal Regulations (OSHA), including all changes and amendments thereto.
### ABBREVIATIONS AND ACRONYMS

A. Wherever in these specification references are made to the standards, specifications, or other published data of the various national, regional, or local organizations, such organizations may be referred to by their acronym or abbreviation only. As a guide to the user of these specifications, the following acronyms or abbreviations which may appear in these specifications shall have the meanings indicated herein.

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tbody>
<tr>
<td>AAMA</td>
<td>Architectural Aluminum Manufacturer's Association</td>
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<tr>
<td>AASHTO</td>
<td>American Association of the State Highway and Transportation Officials</td>
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<td>ACI</td>
<td>American Concrete Institute</td>
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<tr>
<td>ACPA</td>
<td>American Concrete Pipe Association</td>
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<tr>
<td>AFBMA</td>
<td>Anti-Friction Bearing Manufacturer's Association, Inc.</td>
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<td>American Gear Manufacturer's Association</td>
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<td>AHGDA</td>
<td>American Hot Dip Galvanizers Association</td>
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<tr>
<td>AI</td>
<td>The Asphalt Institute</td>
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<td>AIA</td>
<td>American Institute of Architects</td>
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<td>American Institute of Steel Construction</td>
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<td>American Institute of Timber Construction</td>
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<td>AMCA</td>
<td>Air Moving and Conditioning Association</td>
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<td>BCVDNRP</td>
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<td>Florida Department of Transportation</td>
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<td>FS</td>
<td>Federal Specifications</td>
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IEEE Institute of Electrical and Electronics Engineers
IES Illuminating Engineering Society
IPCEA Insulated Power Cable Engineers Association
ISA Instrument Society of America
ISO International Organization for Standardization
MBMA Metal Building Manufacturer's Association
MTI Marine Testing Institute
NAAM National Association of Architectural Metal Manufacturer's
NACE National Association of Corrosion Engineers
NASSCO National Association of Sewer Service Companies
NBS National Bureau of Standards
NEC National Electrical Code
NEMA National Electrical Manufacturer's Association
NFPA National Fire Protection Association
NRCA National Roofing Contractors Association
OSHA Occupational Safety and Health Administration
PCA Portland Cement Association
SFBC South Florida Building Code
SMACCNA Sheet Metal and Air Conditioning Contractors National Association
SSPC Steel Structures Painting Council
SSPWC Standard Specifications for Public Works Construction
SFWMD South Florida Water Management District
UL Underwriters Laboratories, Inc.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not used)

-END OF SECTION-
SECTION 01300 - SUBMITTALS

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. This section specifies the means of all submittals. All submittals shall be submitted to the OWNER. A general summary of the types of submittals and the number of copies required is as follows:

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<thead>
<tr>
<th>Copies to OWNER</th>
<th>Type of Submittal</th>
</tr>
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<tbody>
<tr>
<td>4</td>
<td>Qualification documentation</td>
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<td>Construction schedule</td>
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<td>Schedule of payment items</td>
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<td>Progress estimates</td>
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<td>Shop drawings</td>
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<td>Product samples</td>
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<td>Certificates of compliance</td>
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<td>Warranties</td>
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B. Qualification documentation specified throughout these contract documents shall be submitted prior to contract award. The OWNER reserves the right to require the submittal of additional documentation to evaluate the technical suitability of proposed products as well as a bidder’s qualifications and ability to satisfactorily perform the work outlined in these contract documents.

1.02 SUBMITTAL PROCEDURES

A. Transmit each submittal with a form acceptable to the OWNER, clearly identifying the project and the CONTRACTOR, the enclosed material and other pertinent information specified in other parts of this section. Identify variations from Contract Documents and Product or system limitations which may be detrimental to successful performance of the completed Work.

B. Revise and resubmit submittals as required, identify all changes made since previous submittals. Resubmittals shall be noted as such.

C. Distribute copies of reviewed submittals to concerned parties. Instruct parties to promptly report any inability to comply with provisions.

1.03 CONSTRUCTION SCHEDULE

A. The construction schedule shall be prepared for each group of work orders in the form of a horizontal bar chart showing in detail the proposed sequence of the work and identifying construction activities for each major component, structure or facility. The schedule shall be time scaled, identifying the first day of each week, with the estimated date of starting and completion of each stage of the work in order to complete the project within the Contract
time. Three copies of the schedule shall be submitted within ten calendar days after the date of the Notice to Proceed.

B. The construction schedule shall be revised to reflect comments by the OWNER and updated monthly, depicting progress to the last day of the month. Three copies shall be submitted with each request for monthly progress payments.

C. Changes to the schedule shall be accompanied by a letter of explanation with appropriate reference and revision date on the schedule.

D. The following additional requirements shall apply to the schedule.

1. The CONTRACTOR shall provide notification to the OWNER by e-mail a minimum of 24 hours in advance of any schedule change.

2. Toward the close of each working day, the CONTRACTOR shall deliver notification to the OWNER as to the location at which the next day of work will be conducted.

3. At the completion of each task order, the CONTRACTOR shall notify the OWNER of such fact.

1.04 SCHEDULE OF PAYMENT ITEMS

A. The CONTRACTOR shall submit a Schedule of Payment Items for review within ten calendar days after the date of the Notice to Proceed. The schedule shall contain the installed value of the component parts of Work for the purpose of making progress payments during the construction period.

B. The schedule shall be given in sufficient detail for the proper identification of Work accomplished. Each item shall include its proportional share of all costs including the CONTRACTOR’s overhead, contingencies and profit. The sum of all scheduled items shall equal the total value of the Contract.

C. No payment will be made for materials stored on the project site.

D. The CONTRACTOR shall expand or modify the above schedule as required by the OWNER’s initial or subsequent reviews.

1.05 PROGRESS ESTIMATES

A. Progress estimates shall be submitted in accordance with the General Conditions and shall be accompanied by the revised Construction Schedule.

1.06 SHOP DRAWINGS

A. General: The CONTRACTOR shall submit for review shop drawings for concrete reinforcement, structural details, materials fabricated especially for this Contract, and materials for which such Drawings are specified or specifically requested by the OWNER.

B. Shop drawings shall show the principal dimensions, weight, structural and operating features, type and/or brand of finish or shop coat, grease fittings, etc., depending on the subject of the Drawings.
C. When so specified, or if considered by the OWNER to be acceptable, the manufacturer's specifications, catalog data, descriptive matter, illustrations, etc., may be submitted for review in place of shop drawings. In such case, the requirements shall be as specified for shop drawings, insofar as applicable.

D. The CONTRACTOR shall be responsible for the prompt submittal of all shop drawings so that there shall be no delay to the Work due to the absence of such Drawings. The OWNER will review the shop drawings within 14 calendar days of receipt of such Drawings. Reviewed shop drawings will be returned to the CONTRACTOR by regular mail, posted no later than 14 days after receipt.

E. Time delays caused by rejection of submittals are not cause for extra charges to the OWNER or time extensions.

F. Requirements: All shop drawings shall be submitted to the OWNER through the CONTRACTOR. The CONTRACTOR is responsible for obtaining shop drawings from his subcontractors and returning reviewed Drawings to them. All shop drawings shall be prepared on standard size, 24-inch by 36-inch sheets, or smaller. All Drawings shall be clearly marked with the name of the project, OWNER, CONTRACTOR, Bid Package number, and structure to which the drawing applies. Drawings shall be suitably numbered and stamped by the CONTRACTOR. Each shipment of Drawings shall be accompanied by a letter of transmittal giving a list of the drawing numbers and the names mentioned above.

G. Product Data: Where manufacturer's publications in the form of catalogs, brochures, illustrations, or other data sheets are submitted in lieu of prepared shop drawings, such submission shall specifically indicate the particular item offered. Identification of such items and relative pertinent information shall be made with indelible ink. Submissions showing only general information will not be accepted.

H. Product data shall include materials of construction, dimensions, performance characteristics and capacities, etc.

I. Sample Warranties: When warranties are called for, a sample of the warranty shall be submitted with the shop drawings. The sample warranty shall be the same form that will be used for the actual warranty.

J. Work Prior to Review: No material or equipment shall be purchased, fabricated especially for this Contract, or delivered to the project site until the required shop drawings have been submitted, processed and marked either "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED". All materials and Work involved in the construction shall be as represented by said Drawings.

K. The CONTRACTOR shall not proceed with any portion of the Work for which the design and details are dependent upon the design and details of equipment for which submittal review has not been completed.

L. CONTRACTOR's Review: Only submittals which have been checked and corrected should be submitted to the CONTRACTOR by his subcontractors and vendors. Prior to submitting shop drawings to the OWNER, the CONTRACTOR shall check thoroughly all such Drawings to satisfy himself that the subject matter thereof conforms to the Drawings and Specifications in all respects. Drawings which are correct shall be marked with the date, checker's name and indications of the CONTRACTOR's approval, and then shall be submitted to the
OWNER; other Drawings submitted to the OWNER will be returned to the CONTRACTOR unreviewed.

M. CONTRACTOR's Responsibility: The review of shop drawings will be general and shall not relieve the CONTRACTOR of the responsibility for details of design, dimensions, etc., necessary for proper fitting and construction of the Work required by the Contract and for achieving the specified performance.

N. CONTRACTOR's Modifications: For submissions containing departures from the Contract Documents, the CONTRACTOR shall include proper explanation in his letter of transmittal. Should the CONTRACTOR submit for review equipment that requires modifications to the structures, piping, layout, etc. detailed on the Drawings, he shall also submit for review details of the proposed modifications. If such equipment and modifications are accepted, the CONTRACTOR, at no additional cost to the OWNER, shall do all Work necessary to make such modifications.

O. Substitutions: Whenever a particular brand or make of material, equipment, or other item is specified, or is indicated on the Drawings, it is for the purpose of establishing a standard of quality, design, and type desired and to supplement the detailed specifications. Any other brand or make which, in the opinion of the OWNER, is equivalent to that specified or indicated may be offered as a substitute subject to the following provisions:

1. CONTRACTOR shall submit for each proposed substitution sufficient details, complete descriptive literature, and performance data together with samples of the materials, where feasible, to enable the OWNER to determine if the proposed substitution is equal.

2. CONTRACTOR shall submit certified tests, where applicable, by an independent laboratory attesting that the proposed substitution is equal.

3. CONTRACTOR shall submit a list of installations where the proposed substitution is equal.

4. Where the acceptance of a substitution requires revision or redesign of any part of the Work, all such revision and redesign, and all new Drawings and details required, therefore, shall be provided by the CONTRACTOR at his own cost and expense, and shall be subject to review of the OWNER.

5. In all cases, the OWNER shall be the sole judge as to whether a proposed substitution is to be accepted. The CONTRACTOR shall abide by the OWNER's decision when proposed substitute items are judged to be unacceptable and shall in such instances furnish the item, or substitute, as specified. No substitute items shall be used in the Work without written acceptance of the OWNER.

6. Acceptance of any proposed substitution shall in no way release the CONTRACTOR from any of the provisions of the Contract Documents.

P. Complete Submittals: Each submittal shall be complete in all aspects incorporating all information and data required to evaluate the products' compliance with the Contract Documents. Partial or incomplete submissions shall be returned to the CONTRACTOR without review.
Q. Shop Drawing Distribution: The CONTRACTOR shall submit a minimum of 9 copies of all shop drawings to the OWNER for review. Shop drawings will be reviewed, stamped and distributed with the appropriate box checked either "FURNISH AS SUBMITTED", "FURNISH AS CORRECTED" or "REVISE AND RESUBMIT". The distribution of processed shop drawings will be as follows:

1. Drawings Marked "FURNISH AS SUBMITTED" or "FURNISH AS CORRECTED"
   - 3 copies returned to the CONTRACTOR
   - 4 copies remain at the OWNER's office
   - 1 copy remains with the shop drawing reviewer
   - 1 copy for the OWNER's field representative

2. Drawings Marked "REVISE AND RESUBMIT"
   - 2 copies returned to the CONTRACTOR
   - 2 copies remain at the OWNER's office
   - 1 copy remains with the shop drawing reviewer
   - 4 copies will be discarded, unless picked up by the CONTRACTOR

R. If the CONTRACTOR requires additional copies of returned shop drawings, he shall include extra Drawings in his original submittal. The OWNER will process the Drawings and return them to the CONTRACTOR.

1.07 PRODUCT SAMPLES

A. CONTRACTOR shall furnish for review all product samples as required by the Contract Documents or requested by the OWNER to determine compliance with the specifications.

B. Samples shall be of sufficient size or quantity to clearly illustrate the quality, type, range of color, finish or texture and shall be properly labeled to show complete project identification, the nature of the material, trade name of manufacturer and location of the Work where the material represented by the sample will be used.

C. Samples shall be checked by the CONTRACTOR for conformance to the Contract Documents before being submitted to the OWNER and shall bear the CONTRACTOR's stamp certifying that they have been so checked. Transportation charges on samples submitted to the OWNER shall be prepaid by the CONTRACTOR.

D. OWNER's review will be for compliance with the Contract Documents, and his comments will be transmitted to the CONTRACTOR with reasonable promptness.

E. Acceptable samples will establish the standards by which the completed Work will be judged.

1.08 CERTIFICATES OF COMPLIANCE

A. Copies of certificates of compliance and test reports shall be submitted for requested items to the OWNER prior to request for payment.
1.09 WARRANTIES

A. Original warranties, called for in the Contract Documents, shall be submitted to the OWNER. When warranties are required for an item, warranty shall be submitted prior to request for payment of that item.

B. When warranties are requested, a sample of the warranty to be provided shall be submitted with, and considered part of, the shop drawings.

C. The CONTRACTOR shall warrant to the OWNER that all material and labor used in the construction are covered by his warrantee for a minimum of a one-year period upon approval and acceptance by the OWNER. The CONTRACTOR shall replace or repair defects at no cost to the OWNER during the warrantee period. No visible or potential leakage shall be allowed during the warrantee period.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION - (Not Used)

- END OF SECTION -
SECTION 01400 - QUALITY CONTROL

PART 1 - GENERAL

1.01 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.

1.02 PRODUCT EVALUATION

A. The OWNER will employ and pay for the services of an independent testing laboratory for specified testing as specified by the OWNER.

B. The work or actions of the testing laboratory shall in no way relieve the CONTRACTOR of his obligations under the Contract. The laboratory testing work will include such inspections and testing required by the Contract Documents, existing laws, codes, ordinances, etc. The testing laboratory will have no authority to change the requirements of the Contract Documents, nor perform, accept or approve any of the CONTRACTOR's Work.

C. The CONTRACTOR shall allow the OWNER ample time and opportunity for evaluation and testing materials to be used in the Work. The CONTRACTOR shall advise the OWNER promptly upon placing orders for materials so that arrangements may be made, if desired, for evaluation before shipment from the place of manufacture. The CONTRACTOR shall at all times furnish the OWNER and his representatives, facilities including labor, and proper time for evaluation and testing materials, and workmanship. The CONTRACTOR must anticipate that possible delays may occur in the execution of its work due to the necessity of materials being inspected and accepted for use. The CONTRACTOR shall furnish, at his own expense, all samples of materials required by the OWNER for testing, and shall make his own arrangements for providing water, electric power, or fuel for the various evaluation and tests of structures and materials.

D. The OWNER will bear the cost of all tests, evaluation, or investigations undertaken by the order of the OWNER for the purpose of determining conformance with the Contract Documents if such tests, evaluation, or investigations are not specifically required by the Contract Documents, and if conformance is ascertained thereby. Whenever nonconformance is determined by the OWNER as a result of such tests, evaluation, or investigations, the CONTRACTOR shall bear the full cost of any additional tests, evaluations and investigations, which are ordered by the OWNER to ascertain subsequent conformance with the Contract Documents.
1.03 EVALUATION AT PLACE OF MANUFACTURE

A. Unless otherwise specified, all products and materials shall be subject to evaluation by the OWNER at the place of manufacture.

B. The presence of the OWNER at the place of manufacture however, shall not relieve the CONTRACTOR of the responsibility for furnishing products, materials, and equipment, which comply 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.

1.04 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.

1.05 SITE INVESTIGATION AND CONTROL

A. The CONTRACTOR shall verify all dimensions in the field and shall check field conditions continuously during construction. The CONTRACTOR shall be solely responsible for any inaccuracies built into the Work due to its failure to comply with this requirement.

B. The CONTRACTOR shall inspect related and appurtenant Work and shall report in writing to the OWNER any conditions which will 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.

1.06 RIGHT OF REJECTION

A. The OWNER shall 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 defects in such articles or materials are detected at the point of manufacture or after completion of the Work at the site. 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, no matter in what stage or condition of manufacture, delivery, or erection, may be subsequently rejected by the OWNER.

B. The CONTRACTOR shall promptly remove rejected articles or materials from the site of the Work after notification of rejection. All costs of removal and replacement of rejected articles or materials as specified herein shall be borne by the CONTRACTOR.

1.07 WATER-TIGHTNESS 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 water-tightness shall be achieved by quality construction and proper sealing of all pipes and manholes.

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.

1.08 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.

1.09 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.

1.10 REMOVAL OF EXISTING PIPELINES

A. General: The scope of work requires the CONTRACTOR to interface with existing piping which will be removed as part of the work. Prior to beginning any work associated with existing facilities to be removed, the CONTRACTOR shall inform the OWNER of his intent
so that all arrangements can be made with the OWNER for disconnecting or isolating pipelines (where possible) from service to the extent possible. The CONTRACTOR shall not proceed without written authorization from the OWNER.

B. **Pipelines:** The CONTRACTOR shall remove existing pipelines or segments of existing pipelines shown to be replaced as part of the contract work. Piping indicated as being replaced with new piping, shall be excavated and removed using methods which will not disturb adjacent piping or other facilities. After piping has been removed and new piping installed, the CONTRACTOR shall backfill the evacuated area in accordance with requirements set forth in other sections of these specifications.

C. Where new piping is to be connected to existing piping, the existing piping shall be cut square and the ends properly prepared for the connection. Any damage to the lining and coating of the existing piping shall be repaired by the CONTRACTOR.

D. **Disposal of Debris:** All debris, materials, piping, and miscellaneous waste products from the work shall be removed from the project as soon as possible. They shall be disposed of in accordance with applicable federal, state, and local regulations. The CONTRACTOR is responsible for determining these regulations and shall bear all costs or retain any profit associated with disposal of these items.

### 1.11 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 un-inspected 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.

### 1.12 TIME OF OBSERVATION AND TESTS

A. Samples and test specimens required under these Specifications shall be furnished and prepared for testing in ample time for the completion of the necessary tests and analyses before said articles or materials are to be used. The CONTRACTOR shall furnish and prepare all required test specimens within the scope of the Contract. Except as otherwise
provided in the Contract Documents, performance of the required tests will be by the OWNER, and all costs therefore will be borne by the OWNER at no cost to the CONTRACTOR, except that the costs of any test which shows unsatisfactory results shall be borne by the CONTRACTOR. Whenever the CONTRACTOR is ready to backfill, bury, cast in concrete, hide, or otherwise cover any Work under the Contract, the OWNER shall be notified not less than twenty-four hours in advance to request inspection before beginning any such Work of covering. Failure of the CONTRACTOR to notify the OWNER at least twenty-four hours in advance of any such inspections shall be reasonable cause for the OWNER to order a sufficient delay in the CONTRACTOR's schedule to allow time for such inspections and any remedial or corrective Work required, and all costs of such delays, including its effect upon other portions of the Work, shall be borne by the CONTRACTOR.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -
PART 1 - GENERAL

1.01 THE REQUIREMENT

A. It shall be the CONTRACTOR's responsibility to provide equipment that is adequate for the performance of the Work under this Contract within the time specified. All equipment shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required Work, and shall be subject to inspection and review by the OWNER's representative at any time within the duration of the Contract. All Work hereunder shall conform to the applicable requirements of the OSHA Standards for Construction.

B. The CONTRACTOR shall provide for utilities and services for its own operations. The CONTRACTOR shall furnish, install and maintain all temporary utilities during the contract period including removal upon completion of the Work.

1.02 POWER AND LIGHTING

A. Power: The CONTRACTOR shall provide all necessary power required for its operations under the Contract, and shall provide and maintain all temporary power lines required to perform the Work in a safe and satisfactory manner.

B. Construction Lighting: All Work conducted at night or under conditions of deficient daylight shall be suitably lighted to insure proper Work and to afford adequate facilities for inspection and safe working conditions. Temporary lighting shall be maintained during nonworking periods if the area is subject to access by the public.

C. Electrical Connections: All temporary connections for electricity shall be subject to review by the OWNER and the power company representative, and shall be removed in like manner at the CONTRACTOR's expense prior to final acceptance of the Work.

D. Separation of Circuits: Unless otherwise permitted by the OWNER circuits separate from lighting circuits shall be used for all power purposes.

E. Construction Wiring: All wiring for temporary electric light and power shall be properly installed and maintained and shall be securely fastened in place. All electrical facilities shall conform to the requirements of Subpart K of the OSHA Safety and Health Standards for Construction.

1.03 WATER SUPPLY

A. General: The CONTRACTOR shall supply, and pay for all costs for all water used for construction, flushing and testing. The CONTRACTOR shall provide and maintain all meters, piping, fittings, adapters, and valving required.

B. Potable Water: All drinking water on the site during construction shall be furnished by the CONTRACTOR and shall be bottled water or water furnished in suitable dispensers. Notices shall be posted conspicuously throughout the site warning the CONTRACTOR's personnel that piped water may be contaminated.

C. Water Connections: The CONTRACTOR shall not make connection to, or draw water from, any fire hydrant or pipeline without first obtaining permission of the authority having jurisdiction over the use of said fire hydrant or pipeline and from the agency owning the affected water system. For each such connection made, the CONTRACTOR shall first
attach to the fire hydrant or pipeline a valve and a meter, if required by the said authority, of a size and type acceptable to said authority and agency.

D. **Removal of Water Connections**: Before final acceptance of the Work on the project, all temporary connections and piping installed by the CONTRACTOR shall be entirely removed, and all affected improvements shall be restored to their original condition, or better, to the satisfaction of the OWNER and to the agency owning the affected utility.

E. **Fire Protection**: The construction, and all other parts of the Work shall be adequately protected against damage by fire. Hose connections and hose, water casks, chemical equipment, or other sufficient means shall be provided for fighting fires in the temporary structures and other portions of the Work, and responsible persons shall be designated and instructed in the operation of such fire apparatus so as to prevent or minimize the hazard of fire. The CONTRACTOR's fire protection program shall conform to the requirements of Subpart F of the OSHA Standards for Construction.

1.04 **SANITATION**

A. **Toilet Facilities**: Fixed or portable chemical toilets shall be provided wherever needed for the use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.

B. Such facilities shall be made available when the first employees arrive on the Work, shall be properly secluded from public observation, and shall be constructed and maintained in suitable numbers and at such points and in such manner as may be required.

C. The CONTRACTOR shall maintain the sanitary facilities in a satisfactory and sanitary condition at all time and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the OWNER, or an adjacent property.

D. The OWNER shall have the right to inspect any building or other facility erected, maintained, or used by the CONTRACTOR, to determine whether or not the sanitary regulations have been complied with.

E. **Sanitary and Other Organic Wastes**: The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the OWNER and in accordance with all laws and regulations pertaining thereto.

1.05 **TEMPORARY VENTILATION**

A. The CONTRACTOR shall provide and maintain adequate ventilation for a safe working environment. In addition, forced air ventilation shall be provided for the curing of installed materials, humidity control and the prevention of hazardous accumulations of dust, gases or vapors.
SECTION 01530 - PROTECTION OF EXISTING FACILITIES

PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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.

1.04 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. 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 restoration requirements have been called for in the Contract Documents or in the requirements of the agency issuing the permit.

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.

1.05 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 utility 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.

1.06 **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. Tree trimming and replacement shall be accomplished in accordance with the following paragraphs.
B. **Trimming:** Symmetry of the tree shall be preserved; no stubs or splits or torn branches left; clean cuts shall be made close to trunk or large branch. Spikes shall not be used for climbing live trees. All cuts over 1-1/2 inches in diameter shall be coated with an asphaltic emulsion material.

C. **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.

1.07 **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.
PART 1 - GENERAL

1.01 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.

1.02 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.

G. **Temporary Bridges:** Wherever necessary or required for the convenience of the public or individual residents at street or highway crossings, private driveways, or elsewhere, the CONTRACTOR shall provide suitable temporary bridges or steel plates over unfilled excavations, except in such cases as the CONTRACTOR shall secure the written consent of the individuals and authorities concerned to omit such temporary bridges or steel plates, which written consent shall be delivered to the OWNER prior to excavation. All such bridges or steel plates shall be maintained in service until access is provided across the backfilled excavation. Temporary bridges or steel plates for street and highway crossing shall conform to the requirements of the authority having jurisdiction in each case, and the CONTRACTOR shall adopt designs furnished by said authority for such bridges or steel plates, or shall submit designs to said authority for approval, as may be required.

1.03 **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. Off-site storage of materials, if required, shall be arranged for by the CONTRACTOR and a copy of an agreement for use of other property shall be furnished to the OWNER.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -
SECTION 01560 - TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 - GENERAL

1.01 EXPLOSIVES AND BLASTING

A. The use of explosives on the Work will not be permitted.

1.02 DUST ABATEMENT

A. 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.

1.03 RUBBISH CONTROL

A. During the progress of the Work, the CONTRACTOR shall keep the site of the Work and other areas used in a neat and clean condition, and free from any accumulation of rubbish. 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.

1.04 SANITATION

A. Toilet Facilities: Fixed or portable chemical toilets shall be provided wherever needed for use of employees. Toilets at construction job sites shall conform to the requirements of Part 1926 of the OSHA Standards for Construction.

B. Such facilities shall be made available when the first employees arrive on the Work, shall be properly secluded from public observation, and shall be constructed and maintained in suitable numbers and at such points and in such manner as may be required.

C. The CONTRACTOR shall maintain the sanitary facilities in a satisfactory and sanitary condition at all times and shall enforce their use. He shall rigorously prohibit the committing of nuisances on the site of the Work, on the lands of the OWNER, or an adjacent property.

D. The OWNER shall have the right to inspect any building or other facility erected, maintained, or used by the CONTRACTOR, to determine whether or not the sanitary regulations have been complied with.

E. Sanitary and Other Organic Wastes: The CONTRACTOR shall establish a regular daily collection of all sanitary and organic wastes. All wastes and refuse from sanitary facilities
provided by the CONTRACTOR or organic material wastes from any other source related to the CONTRACTOR's operations shall be disposed of away from the site in a manner satisfactory to the OWNER and in accordance with all laws and regulations pertaining thereto.

1.05 CHEMICALS

A. 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.

1.06 NOISE CONTROL

A. Noise resulting from the CONTRACTOR's work shall not exceed the noise levels and other requirements stated in local ordinances. The CONTRACTOR shall be responsible for curtailing noise resulting from his operation. He shall, upon written notification from the OWNER or the noise control officers, make any repairs, replacements, adjustments, additions and furnish mufflers when necessary to fulfill requirements.

1.07 EROSION ABATEMENT AND WATER POLLUTION

A. 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.

B. 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.

C. 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.

1.08 PRECAUTIONS DURING ADVERSE WEATHER

A. 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.
B. 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.

1.09 HURRICANE AND STORM WARNINGS

A. 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 as indicated below.

B. The CONTRACTOR shall submit to the OWNER, for review and approval, a Plan of Action describing the procedures to be followed by the CONTRACTOR in the event of a Hurricane Alert, Watch, or Warning.

C. Upon Notification of a Hurricane Alert:

1. Upon issuance of a Hurricane Alert by the County Manager, all CONTRACTORS performing work within the right-of-way of a designated evacuation route shall immediately secure their work, backfill all excavations within the right-of-way and suitably prepare the roadway surface for full traffic flow. This work shall be completed within 24 hours of the issuance of the alert. Work shall not recommence until the “All Clear” is issued by the County Manager.

2. CONTRACTORS performing at all other locations shall remove all unnecessary debris, materials, and equipment from the job site. The CONTRACTOR shall also keep his crew on standby on weekends and holidays during the Hurricane Alert period.

D. Upon Notification of a Hurricane Watch:

1. CONTRACTORS shall implement their approved Plan of Action to protect the project and the public.

E. Upon Notification of a Hurricane Warning

1. CONTRACTORS shall implement their approved Plan of Action to protect the project and the public.

2. For work within the public right-of-ways, the CONTRACTOR will be notified by the OWNER to suspend his construction operations. The CONTRACTOR will backfill all open trenches, remove all construction equipment and materials from the right-of-way and secure operations pending further notice.

1.10 PERIODIC CLEANUP AND BASIC SITE RESTORATION

A. 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.
B. 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.

C. 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.

D. The CONTRACTOR’s storage shall be limited to on-site storage only. Off-site storage of materials, if required, shall be arranged for by the CONTRACTOR and a copy of an agreement for use of other property shall be furnished to the OWNER.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -
SECTION 01570 - TRAFFIC REGULATIONS AND MAINTENANCE OF TRAFFIC

PART 1 - GENERAL

1.01 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 regulations. He shall conduct his 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 his operations, and to subject the public to a minimum of delay and inconvenience. Suitable signs, barricades, railing, etc., shall be erected and the work outlined by adequate lighting at night. Danger lights shall be provided as required. Watchmen and flagmen shall be provided as may be necessary for the protection of traffic.

C. 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.

D. 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.

E. 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.

F. 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.

G. 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.

PART 2 - PRODUCTS - (Not Used)

PART 3 - EXECUTION - (Not Used)

- END OF SECTION -
PART 1 - GENERAL

1.01 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 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.

1.02 QUALITY ASSURANCE

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

1.03 PRODUCT DELIVERY-STORAGE-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.
1.04 STORAGE AND PROTECTION

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.

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

D. 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.

E. The CONTRACTOR shall verify that storage facilities comply with supplier's product storage requirements and verify that supplier-required environmental conditions are maintained continually.

F. 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.

G. **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.

H. **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.

1.05 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.

1.06 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -
PART 1 - GENERAL

1.01 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.

1.02 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.

1.03 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 partial 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 (5" x 7").

6. Releases from all parties who are entitled to claims against the subject project, property, or improvement pursuant to the provisions of law.

1.04 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.

1.05 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.

1.06 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

- END OF SECTION -
SECTION 02222 - EXCAVATION AND BACKFILL FOR UTILITIES

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Excavate, grade and backfill as required for the site underground piping systems, as directed. Perform clearing, excavating, backfilling and grading as required for the construction of the utility systems consisting of piping and appurtenances as specified herein. All construction shall adhere to Miami-Dade County Water and Sewer Department and Miami-Dade County Public Works Department Standards.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Piping

1.03 SUBMITTALS

A. General: Submit information and samples to the OWNER for review as specified herein in accordance with the Section entitled "Submittals".

B. Dewatering: The CONTRACTOR shall submit to the OWNER its proposed methods of handling trench water and the locations at which the water will be disposed of. Methods shall be acceptable to the OWNER before starting the excavation.

C. Bedding and Backfill Materials: The CONTRACTOR shall notify the OWNER of the off-site sources of bedding and backfill materials, and submit to the OWNER a representative sample weighing approximately 25 lbs.

D. Sheeting System: Drawings of any proposed sheeting system and design computations shall be submitted to the OWNER; however, the review of these Drawings shall in no way relieve the CONTRACTOR of the responsibility to provide a safe and satisfactory sheeting and shoring system. Sheetig and shoring shall be designed by the CONTRACTOR, and the proposed design shall be sealed by a Professional Engineer registered in the State of Florida. If the OWNER is of the opinion that at any point sufficient or proper supports have not been provided, it may direct the CONTRACTOR to install additional supports at the CONTRACTOR's expense.

1.04 JOB CONDITIONS

A. The OWNER will not assume responsibility for variations of sub-soil quality or conditions. The CONTRACTOR shall examine the site or undertake its own subsurface investigation to identify all conditions that may affect its work.

1.05 QUALITY CONTROL

A. An independent testing laboratory may be retained by the OWNER to do appropriate testing as described in Section entitled "Quality Control". In this event, the CONTRACTOR shall schedule its Work so as to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of its progress.
1.06 GROUNDWATER

A. The CONTRACTOR shall be responsible for anticipating groundwater conditions and shall provide positive control measures as required. Such measures shall ensure stability of excavations, groundwater pressure control, prevention of tanks, pipes, and other structures from being lifted by hydrostatic pressures, and avoiding the disturbance of subgrade bearing materials.

1.07 TRENCH SAFETY ACT COMPLIANCE

A. The CONTRACTOR by signing and executing the contract is, in writing, assuring that it will perform any trench excavation in accordance with the Florida Trench Safety Act, Section 553.60 et. seq. The CONTRACTOR further identified the separate item(s) of cost of compliance with the applicable trench safety standards as well as the method of compliance as noted in the "Bid Forms" Section of the Contract front-end documents.

B. The CONTRACTOR acknowledges that this cost is included in the applicable items of the Proposal and Contract and in the Grand Total Bid and Contract Price.

C. The CONTRACTOR is, and the OWNER is not, responsible to review or assess the CONTRACTOR's safety precautions, programs or costs, or the means, methods, techniques or technique adequacy, reasonableness of cost, sequences or procedures of any safety precaution, program or cost, including but not limited to, compliance with any and all requirements of Florida Statute Section 553.60 et. seq. cited as the "Trench Safety Act". The CONTRACTOR is, and the OWNER is not, responsible to determine if any safety or safety related standards apply to the project, including but not limited to, the "Trench Safety Act".

1.08 PROTECTION OF PROPERTY AND STRUCTURES

A. The CONTRACTOR shall, at its own expense, sustain in place and protect from direct or indirect injury, all pipes, poles, conduits, walls, buildings, and all other structures, utilities, and property in the vicinity of its Work. Such sustaining shall be done by the CONTRACTOR. The CONTRACTOR shall take all risks attending the presence or proximity of pipes, poles, conduits, walls, buildings, and all other structures, utilities, and its Work. It shall be responsible for all damage, and assume all expenses, for direct or indirect injury and damage, caused by its Work, to any such pipe, structures, etc., or to any person or property, by reason of injury to them, whether or not such structures, etc., are identified in advance by the OWNER.

B. Barriers shall be placed at each end of all excavations and at such places as may be necessary along excavations to warn all pedestrian and vehicular traffic of such excavations. Barricades with flashing lights shall also be placed along excavation from sunset each day to sunrise of the next day until such excavation is entirely refilled, compacted, and paved. All excavations shall be barricaded where required to meet OSHA, local and Federal Code requirements, in such a manner to prevent persons from falling or walking into any excavation within the site fenced property limits.
PART 2 - PRODUCTS

2.01 MATERIALS

A. **General:** Materials shall be furnished as required from on-site excavations or from acceptable off-site sources as required. The CONTRACTOR shall notify the OWNER of the sources of each material at least ten calendar days prior to the anticipated use of the materials.

2.02 BEDDING

A. **Pipe Bedding:** In general, clean sandy excavated materials, that is free from organics, clay and construction debris, can be used as pipe bedding when construction is in a dry condition and when the bedding is not sided by muck. Pipe bedding material shall be able to pass through a 3/4-inch sieve. Separation of suitable material for pipe bedding from other material shall be made during the excavation.

B. Sand shall be used for all copper and other service lines.

C. In the case of a “dry” installation, sand shall be used for PVC and ductile iron pipe where the bottom of the trench is located in the limestone zone.

D. In the case of a “wet” installation, pearock shall be used for PVC and ductile iron pipe where the bottom of the trench is located in the limestone zone.

E. Precast concrete items shall use crushed stone.

2.03 PEAROCK

A. Pearock shall consist of hard, durable particles of proper size and gradation, and shall be free from organic material, wood, trash, sand, loam, clay, excess fines, and other deleterious materials. Pearock shall conform to the requirements of ASTM C 33, Size Number 8, graded within the following limits:

<table>
<thead>
<tr>
<th>Sieve Size</th>
<th>Percent Finer by Weight</th>
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<tbody>
<tr>
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<td>100</td>
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<tr>
<td>3/8 inch</td>
<td>85 to 100</td>
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<tr>
<td>No. 4</td>
<td>10 to 30</td>
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<tr>
<td>No. 8</td>
<td>0 to 10</td>
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<td>No. 16</td>
<td>0 to 5</td>
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2.04 CRUSHED STONE (3/4-INCH ROCK)

A. Crushed stone shall consist of hard, durable, subangular particles of proper size and gradation, and shall be free from organic material, wood, trash, sand, loam, clay, excess fines, and other deleterious materials. Crushed stone shall conform to the requirements of ASTM C 33, Size Number 57, graded within the following limits:
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<thead>
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<th>Sieve Size</th>
<th>Percent Finer by Weight</th>
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<tbody>
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<tr>
<td>1 inch</td>
<td>95 to 100</td>
</tr>
<tr>
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<tr>
<td>No. 4</td>
<td>0 to 10</td>
</tr>
<tr>
<td>No. 8</td>
<td>0 to 5</td>
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</tbody>
</table>

PART 3 - EXECUTION

3.01 EXCAVATION

A. The CONTRACTOR shall perform all excavation of every description and of whatever substance encountered, to the dimensions, grades and depths shown on the Drawings, or as directed. All excavations shall be made by open cut and in accordance with the Trench Safety Act. All existing utilities such as pipes, poles and structures shall be carefully located, supported and protected from injury; in case of damage, they shall be restored at the CONTRACTOR’s expense.

B. Pipe trenches for piping shall be excavated to a width within the limits of the top of the pipe and the trench bottom so as to provide a clearance on each side of the pipe barrel, measured to the face of the excavation, or sheathing if used, of 8 inches to 12 inches. Where the pipe size exceeds 12 inches, the clearance shall be from 12 inches to 18 inches. All pipe trenches shall be excavated to a level where suitable material is reached, a minimum of 8 inches below the excavated depth, that will allow for a minimum of 36-inches of covering unless otherwise indicated by the OWNER. Excavation depths in other types of materials and conditions shall be made as hereinafter specified.

C. In areas where trench widths are not limited by right-of-way and/or easement widths, property line restrictions, existing adjacent improvements, including pavements, structures and other utilities, and maintenance of traffic, the trench sides may be sloped to a stable angle of repose of the excavated material but only from a point one foot above the crown of the pipe. A substantially and safely constructed movable shield, “box” or “mule” may be used in place of sheathing when the trench is opened immediately ahead of the shield and closed immediately behind the shield as pipe laying proceeds inside the shield.

D. Ladders or steps shall be provided for and used by Workmen to enter and leave trenches, in accordance with OSHA requirements.

E. Excavation for appurtenances shall be sufficient to provide a clearance between their outer surfaces and the face of the excavation or sheathing, if used, of not less than 12 inches. Manhole excavations shall be carried to sufficient depth to permit their construction on the undisturbed bottom of the excavation.
F. Excavated unsuitable material shall be removed from the site and disposed of by the CONTRACTOR. Materials removed from the trenches shall be stored and in such a manner that will not interfere unduly with any on-site operations, traffic on public roadways and sidewalks and shall not be placed on private property. In congested areas, such materials as cannot be stored adjacent to the trench or used immediately as backfill shall be removed to other convenient places of storage acceptable to the OWNER at the CONTRACTOR's expense.

G. Excavated material that is suitable for use as backfill shall be used in areas where sufficient material is not available from the excavation. Suitable material in excess of backfill requirements shall be either used on the site as directed by the OWNER or disposed of the CONTRACTOR.

H. Barriers shall be placed at excavations in accordance with OSHA requirements.

I. Exploratory Excavation: Exploratory excavation shall mean obtaining the horizontal and vertical position of a subsurface facility using approved methods.

1. The CONTRACTOR shall provide these services as requested in writing by the OWNER to aid in (1) the design of projects, and (2) to facilitate orderly construction of municipal utilities, etc.

2. The CONTRACTOR shall provide all equipment, personnel, and supplies required to perform its locating services. The CONTRACTOR shall determine which equipment, personnel, and supplies are required to perform its locating services.

3. When available, the CONTRACTOR shall secure all plans, plates, maps, or other records of subsurface facilities from their OWNERS.

4. The CONTRACTOR shall obtain all necessary permits from City, County, or other municipal jurisdictions to allow the CONTRACTOR to work in existing streets, roads, and rights of way for the purpose of marking, measuring, excavating, and recording the location of existing underground utilities. The CONTRACTOR shall not be responsible, however, to obtain permits for boring, digging, or other excavating work that is not to be performed by the CONTRACTOR pursuant to this Contract.

5. The CONTRACTOR shall comply with applicable underground utility damage prevention laws.

6. The CONTRACTOR shall coordinate with utility company inspectors as required.

7. The CONTRACTOR shall excavate test holes to expose the utility to be measured in such a manner to ensure the safety of the excavation and the integrity of the utility to be measured. The maximum size opening within the roadway shall not exceed one (1) square foot.

8. Primary Locating Information: Horizontal location referenced to physical structures using a minimum of three swing ties. Depth from paving to top of utility measured in inches. Appropriate data to be shown on test hole sketch.
Outside diameter of pipe or width of duct banks and configuration of non-encased multi-conduit systems. Utility structure material composition, when reasonably ascertainable. Paving thickness and type, and where applicable, the general soil type, site conditions, and depths of any notable horizon changes.

3.02 SHEETING AND BRACING

A. The CONTRACTOR shall furnish, place and maintain sheeting and bracing to support sides of the excavation as necessary to provide safe Working conditions in accordance with OSHA requirements, and to protect pipes, structures and other Work from possible damage. Where wood sheeting or certain designs of steel sheeting are used, the sheeting shall be cut off at a level of 2 feet above the top of the installed pipe and that portion below the level shall be left in place. If interlocking steel sheeting is used, it may be removed providing removal can be accomplished without disturbing the bedding, pipe or alignment of the pipe. Any damage to the pipe bedding, pipe or alignment of the constructed utility caused by the removal of sheeting shall be cause for rejection of the affected portion of the Work. The OWNER may permit sheeting to be left in place at the request and expense of the CONTRACTOR.

B. If the OWNER is of the opinion that at any point sufficient or proper supports, have not be provided, it may order additional supports put in at the CONTRACTOR's expense. The CONTRACTOR shall be responsible for the adequacy of all sheeting used and for all damage resulting from sheeting and bracing failure or from placing, maintaining and removing it.

3.03 REMOVAL OF WATER

A. General: It is a basic requirement of these Specifications that excavations shall be free from water before pipe or structures are installed.

B. The CONTRACTOR shall provide pumps, and other appurtenant equipment necessary to remove and maintain water at such a level as to permit construction in a dry condition. The CONTRACTOR shall continue dewatering operations until backfilling has progressed to a sufficient depth over the pipe to prevent flotation or movement of the pipe in the trench or so that it is above the water table. If at any point during the dewatering operation it is determined that fine material is being removed from the excavation sidewalls, the dewatering operation shall be stopped if acceptable to the OWNER. If any of the subgrade or underlying material is disturbed by movement of groundwater, surface water, or any other reason, it shall be replaced at the CONTRACTOR's expense with crushed stone or gravel.

C. The CONTRACTOR shall use dewatering systems that include automatic starting devices, and standby pumps that will ensure continuous dewatering in the event of an outage of one or more pumps.

D. Disposal: Water from the trenches and excavation shall be disposed of in such a manner as will not cause injury to public health, to public or private property, to the Work completed or in progress, to the surface of the streets, cause any interference with the use of the same by the public, or cause pollution of any waterway or stream. The CONTRACTOR shall submit its proposed methods of handling trench water and locations at which the water will be disposed of to the OWNER for review and shall
receive acceptance before starting the excavation. Disposal to any surface water body will require silt screens to prevent any degradation in the water body. The CONTRACTOR shall have responsibility for acquiring all necessary permits for disposal.

3.04 TRENCH STABILIZATION

A. No claim for extras, or additional payment will be considered for cost incurred in the stabilization of trench bottoms that are rendered soft or unstable as a result of construction methods, such as improper or inadequate sheeting, dewatering or other causes. In no event shall pipe be installed when such conditions exist and the CONTRACTOR shall correct such conditions so as to provide proper bedding or foundations for the proposed installation at no additional cost to the OWNER before placing the pipe or structures.

3.05 PIPE BEDDING

A. Pipe trenches shall be excavated as described in Article 3.01. The resulting excavation shall be backfilled with acceptable pipe bedding material, up to the level of the centerline of the proposed pipe barrel. This backfill shall be tamped and compacted to provide a proper bedding for the pipe and shall then be shaped to receive the pipe. Bedding shall be provided under the branch of all fittings to furnish adequate support and bearing under the fitting.

B. Any excavation below the levels required for installation of the pipe bedding shall be backfilled with acceptable bedding material, tamped, compacted and shaped to provide proper support for the proposed pipe, at the CONTRACTOR’s expense.

3.06 BACKFILL

A. Pipeline trenches shall be backfilled to a level minimum 12 inches above the top of the pipe with select backfill (selected backfill) obtained from the excavation. Such material shall be placed in 6-inch layers, each compacted to the densities specified in Article 3.07. Only hand operated mechanical compacting equipment shall be used within six inches of the installed pipe, or if acceptable to the OWNER, by using excess water and passing a concrete vibrator between the pipe and the side of the trench.

B. After the initial portion of backfill has been placed as specified above, and after all excess water has completely drained from the trench, backfilling of the remainder of the trench may proceed. The remainder of the backfill shall be selected material obtained from the excavation and shall be placed in horizontal layers, the depth of which shall not exceed the ability of the compaction equipment employed, and in no event shall exceed a depth of 9 inches. Each layer shall be moistened, tamped, puddled, rolled or compacted to the densities specified in Article 3.07.

C. Manholes and Vaults: Any excavation below the levels required for the proper construction of manholes or vaults shall be filled with crushed rock or limestone.

3.07 COMPACTION AND DENSITIES

A. Compaction of backfill shall be 98 percent of the maximum density where the trench is located under structures or paved areas, and 95 percent of the maximum density
elsewhere. More thorough compaction may be required when Work is performed in other regulatory agencies jurisdictions, such as the FDOT. Methods of control and testing of backfill construction are:

1. Maximum density of the material in trenches shall be determined by ASTM D 1557.
2. Field density of the backfill material in place shall be determined by ASTM D 1556 or D 2922.

B. Testing: Laboratory and field density tests, which in the opinion of the OWNER are necessary to establish compliance with the compaction requirements of these Specifications, shall be ordered by the OWNER. The CONTRACTOR shall coordinate and cooperate with the testing laboratory. The testing program will be implemented by the OWNER establishing depths and locations of tests. Modifications to the program will be made as job conditions change.

C. Trench backfill which does not comply with the specified densities, as indicated by such tests, shall be reworked and recompacted until the required compaction is secured, at no additional cost to the OWNER. The costs for retesting such Work shall be paid for by the CONTRACTOR.

3.08 ADDITIONAL EXCAVATION AND BACKFILL

A. Where organic material, such as roots, muck, or other vegetable matter, or other material which, in the opinion of the OWNER, will result in unsatisfactory foundation conditions, is encountered below the level of the proposed pipe bedding material, it shall be removed to a depth of two feet below the outside bottom of the pipe or to a depth greater as directed by the OWNER and removed from the site. Sheetin shall be installed as necessary to maintain pipe trenches within the limits identified by the OWNER. The resulting excavation shall be backfilled with suitable backfill material, placed in 12-inch layers, tamped and compacted up to the level of the bottom of the proposed pipe bedding material. Sufficient compaction of this material shall be performed to protect the proposed pipe against settlement. Construction shall then proceed in accordance with the provisions of Article 3.05 "Pipe Bedding".

B. Additional excavation (more than two feet below the pipe) as indicated on the trench detail shall be performed only when ordered by the OWNER. Where organic or other material is encountered in the excavation, the CONTRACTOR shall bring the condition to the attention of the OWNER and obtain his determination as to whether or not the material will require removal, prior to preparing the pipe bedding. The excavation of material up to a depth of two feet below the outside pipe bottom shall be considered as incidental items of construction, and the Work shall be done at the CONTRACTOR's expense. Where ordered by the OWNER, the additional excavation, backfill and additional sheeting, if required, shall be paid in accordance with the OWNER's Change Order procedure.

3.09 FINE GRADING

A. After piping trenches backfilled, the disturbed areas of the site shall be fine graded. Any lumber, undesirable materials and rocks larger than the 3-inch size shall be removed
from the surface. The completed surface shall be to the preconstruction elevation unless otherwise directed by the OWNER. Minor adjustments to line and grade may be required as the work progresses in order to satisfy field conditions.

3.10 ALTERNATE METHOD OF CONSTRUCTION

A. Use of This Method: A combination of conditions in the sub substrate, water table, or method of disposal may be encountered during the course of the work which makes dewatering impossible, or only possible through the use of unusual methods, the cost of which is excessive. When such conditions are encountered, but only after all reasonable means (pumps, well points, etc.) to dewater the excavation have been employed without success, the CONTRACTOR, may request to employ the following Alternate Method of Construction. The concurrence of the OWNER shall be obtained in writing and shall limit the use of the alternate method of construction to such specific portions of the Work as the OWNER shall determine.

B. The requirements set forth in other sections of these Specifications shall establish the required standards of construction quality for this work. Use of the alternate method of construction described hereinafter shall in no way be construed as relieving the CONTRACTOR of the work. No additional payment will be made to the CONTRACTOR for excavation, backfill, sheeting or any cost incurred for Work or materials, or any other costs incurred as a result of the use of this alternate method of construction. The prices established in the Proposal shall be for full payment for the various items of work.

C. Subject to all the requirements stated herein, including written acceptance of the OWNER, construction will be permitted in accordance with the following specifications. All requirements of these Specifications shall apply to this construction unless otherwise specifically modified herein.

D. Removal of Water: The installation of pipe and appurtenances under water will be permitted and the requirements of Article 3.03 will be waived.

E. Excavation shall be performed in accordance with Article 3.01.

F. Pipe Bedding: Pipe bedding shall be placed from 6 inches below the outside bottom of the proposed pipe barrel up to the centerline of the pipe barrel. The bedding material shall be pearock as specified in Article 2.03 "Pearock". Limerock screenings, sand or other fine organic material shall not be used.

G. The bedding material shall be placed and then be shaped to receive the pipe at the intended elevation. Bedding shall be provided under the branch of all fittings to furnish adequate support and bearing under the fitting.

H. Backfill: After the pipe is installed, backfilling shall proceed in accordance with the provisions of Article 3.06 "Backfill" and 3.07 "Compaction and Densities". Select backfill material shall be used to backfill around the pipe and to a level one foot above the crown of the pipe. Under no circumstances will material other than select backfill or specified pipe bedding material be considered satisfactory for this purpose.

I. If the Alternate Method of Construction is used, all backfill material, including specified pipe bedding material, shall be carefully lifted into the trench and not released to fall
freely therein until the bucket or container is at or just above water level. Under no circumstances will backfill material be dumped or pushed into the trenches containing water. Below existing water level, the backfill material shall be carefully rammed into place in uniform layers, of equal depth on each side of the pipe, up to the water level. Above the water level, backfill material shall be placed and compacted for normal backfill as previously specified.

- END OF SECTION -
SECTION 02500 - SURFACE RESTORATION

PART 1 - GENERAL

1.01 THE REQUIREMENT

A. Items specified in this Section include repairs to landscaped and grassed areas that may be damaged by CONTRACTOR activities.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Asphalitic concrete pavement.
B. Pavement curb and sidewalks.
C. Pavement markings and signs.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit submittals for review in accordance with the Section entitled “Submittals”.

1.04 DEFINITIONS

A. The phrase “DOT Specifications” shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction. The DOT Specifications are referred to herein and are hereby made a part of this Contract to the extent of such references, and shall be as binding upon the Contract as though reproduced herein in their entirety.

1.05 PROTECTION OF EXISTING IMPROVEMENTS

A. The CONTRACTOR shall be responsible for the protection of all pavements and other improvements within the work area. All damage to such improvements, as a result of the CONTRACTOR’s operations, beyond the limits of the work of pavement replacement shall be repaired by the CONTRACTOR at his expense.

1.06 GUARANTEE

A. The CONTRACTOR shall guarantee all trees, ground cover or shrubs planted or replanted under this Contract for a period of one year beyond acceptance of the project. In the event that any new tree, plant or shrub dies within the guarantee period, the CONTRACTOR shall be responsible for replacement in kind. In the event that a transplanted (reused) tree dies within the guarantee period, the CONTRACTOR shall be responsible for replacement in kind, except that the maximum height of any new tree shall be eight feet as measured from the ground surface, once planted, to the top of the tree.
PART 2 - PRODUCTS

2.01 SOD
A. Sod shall be Floratam Sod in irrigated areas and Bahia in non-irrigated areas.

2.02 REPLACEMENT TREES, GROUND COVER AND SHRUBS
A. Replacement trees, ground cover and shrubs shall be of the same type and size and sound, healthy and vigorous, well branched and densely foliaged when in leaf. They shall have healthy, well developed root systems and shall be free of disease and insect pests, eggs or larvae.

2.03 MULCH
A. Mulch shall be windproof shredded eucalyptus, mulch shall be clean, fresh, free of branches and other foreign matter. Mulch shall be used around all shrubs, ground covers and tree trunks, and placed to a minimum depth of 2 inches extending from the tree trunk outward two feet.

PART 3 - EXECUTION

3.01 GRADING AND SODDING
A. The CONTRACTOR shall regrade the work areas disturbed by his construction activities to the existing grade prior to commencement of construction.
B. Sod shall be placed on all grassed areas disturbed by construction activities, unless otherwise indicated on the Drawings. Sodding shall be in accordance with Sections 575 - Sodding and 981 – Grassing and Sodding Materials of the DOT Specifications.
C. Maintenance: Sufficient watering shall be done by the CONTRACTOR to maintain adequate moisture for optimum development of the sodded areas. Sodded areas shall receive no less than 1.5 inches of water per week.
D. Repairs to Lawn Areas Disturbed by CONTRACTOR's Operations: Lawn areas damaged by CONTRACTOR's operations shall be repaired at once by proper sod bed preparation, fertilization and resodding, in accordance with these specifications. Regardless of the condition of the lawn area (weed content etc.) prior to the CONTRACTOR working in the area, all repairs shall be made with sod.

3.02 TREES, GROUND COVER AND SHRUBS
A. Excavation and Plant Holes: Plant hole excavations shall be roughly cylindrical in shape, with the side approximately vertical. Plants shall be centered in the hole. Bottoms of the holes shall be loosened at least six inches deeper than the required depth of excavation.
B. Holes for balled and burlapped plants shall be large enough to allow at least eight inches of backfill around the earth ball. For root balls over 18 inches in diameter, this dimension shall be increased to 12 inches. Where excess material has been excavated
from the plant hole, the excavated material shall be disposed of as and where directed by the OWNER.

C. **Setting of Plants:** When lowered into the hole, the plant shall rest on a prepared hole bottom such that the roots are level with, or slightly above, the level of their previous growth and so oriented such as to present the best appearance. The CONTRACTOR, when setting plants in holes, shall make allowances for any anticipated setting of plants.

D. Palms of the sabal species may be set deeper than the depth of their original growth, provided that the specified clear trunk height is attained.

E. The backfill shall be made with planting mixture and shall be firmly rodded and watered-in, so that no air pockets remain. The quantity of water applied immediately upon planting shall be sufficient to thoroughly moisten all of the backfilled earth. Plants shall be kept in a moistened condition for the duration of the Contract.

F. **Staking and Guying:** Plants shall be staked in accordance with the following provisions:

1. **Small Trees:** For trees and shrubs of less than one-inch caliper, the size of stakes and the method of tying shall be such as to rigidly support the staked plant against damage caused by wind action or other effects. Trees larger than one inch and smaller than one and one-half inch caliper shall be staked with a two-inch stake, set at least 24 inches in the ground and extending to the crown of the plant. The plant shall be firmly fastened to the stake with two strands of 14-gauge soft wire, enclosed in rubber hose, or other approved covering. The wire shall then be nailed or stapled to the stake to prevent slippage.

2. **Medium Trees:** All trees, other than palm trees, larger than one and one-half inch caliper and smaller than 2 ½" inch caliper shall be staked with two or more, two-inch by two-inch stakes, eight feet long, set two feet in the ground. The tree shall be midway between the stakes and held firmly in place by two strands of 12-gauge wire, applied as specified above for single stakes. The wires shall be tightened and kept tight by twisting.

3. **Large Trees:** All trees, other than palm trees, larger than 2 ½" inch caliper, shall be braced with three or more two-inch by four-inch wood braces, toenailed to cleats which are securely banded at two points to the palm, at a point at least six feet above the ground. The trunk shall be padded with five layers of burlap under the cleats. Braces shall be approximately equidistantly spaced and secured underground with two-inch by four-inch by 24-inch stake pads. In firm rock soils, Number 4 steel reinforcing rods or one-half inch pipe is acceptable.

4. **Palm Trees:** Palm trees shall be braced with three or more two-inch by four-inch wood braces, toenailed to cleats which are securely banded at two points to the palm, at a point at least six feet above the ground. The trunk shall be padded with five layers of burlap under the cleats. Braces shall be approximately equidistantly spaced and secured underground with two-inch by four-inch by 24-inch stake pads. In firm rock soils, Number 4 steel reinforcing rods or one-half inch pipe is acceptable.
G. **Pruning:** All broken or damaged roots shall be cut off smoothly, and the tops of all trees shall be pruned in a manner complying with standard horticultural practice. At the time pruning is completed, all remaining wood shall be alive. All cut surfaces of one inch or more in diameter, above the ground, shall be treated with an approved commercial tree paint.

H. **Maintenance:** Maintenance shall begin immediately after each plant is planted and shall continue until all work under this Contract has been completed and accepted by the OWNER. Plants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise maintained and protected. Settled plants shall be reset to proper grade position, planting saucer restored and dead material removed. Guys shall be tightened and repaired.

I. Defective work shall be corrected as soon as possible after it becomes apparent. Upon completion of planting, the CONTRACTOR shall remove excess soil and debris, and repair any damage to structures, etc., resulting from planting operations.

- END OF SECTION -
PART 1 - GENERAL

1.01 SCOPE

A. Construct asphaltic concrete pavement in accordance with the lines, grades and typical sections to restore surface to original condition or better, specified herein and as required for a complete installation.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. DOT Specifications: The phrase, "DOT Specification", shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction. The DOT Specifications, are referred to herein and are hereby made a part of this Contract to the extent of such references, and shall be as binding upon the Contract as though reproduced herein in their entirety.

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1.03 SUBMITTALS

A. The CONTRACTOR shall submit his proposed formula for the asphaltic concrete paving for review in accordance with the Section entitled "Submittals".

PART 2 - PRODUCTS

2.01 MATERIALS

A. Limerock Base: The limerock base shall consist of either one or two courses of Miami Oolite limerock conforming to DOT Sections 200 and 911.
B. **Prime Coat:** The material used for the prime coat shall be cut-back Asphalt Grade RC-70 conforming to DOT Sections 300 and 916 for prime to be used on Miami Oolite formation limerock.

C. **Tack Coat:** The material used for the tack coat shall be Emulsified Asphalt Grade RS-2 conforming to DOT Sections 300 and 916.

D. **Asphaltic Concrete:** The materials and construction of the asphaltic concrete patch and surface courses Asphalt shall be type SP 9.5 or SP 13.5 as directed by the City.

E. Reclaimed asphalt shall not be used.

**PART 3 - EXECUTION**

**3.01 PAVEMENT REMOVAL AND REPLACEMENT**

A. **General:** All existing utility castings, including valves boxes, junction boxes, manholes, handholes, pull boxes, inlets and similar structures in the areas of trench restoration and pavement replacement shall be adjusted by the CONTRACTOR to bring them flush with the surface of the finished work, at no additional cost to the OWNER.

B. The CONTRACTOR shall be responsible for the protection from damage from his construction operations, all pavements, including all limerock base courses and asphaltic surface courses, within the work area. Any base course or surface course, damaged as a result of the CONTRACTOR's operation, shall be restored in accordance with the applicable requirements of these Contract Documents, to the satisfaction of the OWNER, and to the satisfaction of the governing authority having jurisdiction over the work area at no additional cost to the OWNER. In order to protect himself from being held liable for any existing damaged pavement, including detour routes, the CONTRACTOR is advised to notify, in writing, the authority having jurisdiction over the street where such defective pavement exists prior to proceeding with any work in the vicinity. A copy of all such notices shall be forwarded to the OWNER.

C. Wherever the line of the nominal repaving for trenches extends to within two feet of the edge of the existing paving, the CONTRACTOR shall repave to this edge.

D. Permanent pavement repair shall be in accordance with the details shown on the Drawings or as directed by the OWNER, with edges straight and parallel and patches rectangular in plan. Any paving replacement required beyond the limits shown in the details, and as called for in the Specifications, shall be at the CONTRACTOR's expense.

E. Pavement markings removed or obliterated by the CONTRACTOR's operations shall be promptly replaced in kind by him at his expense, to the satisfaction of the authority having jurisdiction over the work area.

F. Asphaltic concrete mixtures shall be obtained only from plants which comply with the requirements of DOT Section 320 as applicable, using materials specified herein, and producing the specified mixture. General construction requirements for all hot bituminous mixtures specified herein shall conform to DOT Section 330, as applicable.

G. No mixture shall be spread when the air temperature is less than 40 degrees F, nor when the spreading cannot be finished and compacted during daylight hours.
H. Any mixture caught in transit by a sudden rain may be laid at the CONTRACTOR's risk, if the base is in suitable condition. Under no circumstances shall asphalt material be placed while rain is falling or when there is water on the area to be covered.

I. **Traffic Loops**: Traffic loops removed or damaged during construction, or rendered inoperative because of cutting the traffic loop home run, shall be replaced. New traffic loops shall be provided; splicing will not be allowed.

J. **Temporary Paving**: Prior to commencing excavation, the asphalt surface shall be sawcut within the limits of the allowable trench width. Temporary paving will be required along the entire route where the original paved surface is removed. Temporary paving shall be placed as soon as possible after the trench has been backfilled and compacted per the Specifications. The trench should be backfilled and compacted up to a level 1 inch below the existing pavement surface, and a temporary, cold mixed sand/asphalt pavement shall be constructed up to the level of the existing pavement surface. The liquid asphalt shall be Grade RC-70, conforming to the requirements of DOT Section 916-2. The sand shall conform to the requirements of DOT Section 902 for fine aggregate.

K. The cold mix is to be installed one block at a time, not crossing any intersections, or to a maximum of 1,200 feet. Work in said 1,200 feet shall be completed before the CONTRACTOR may move forward with his excavation work. Backfill, compaction and temporary paving is to keep pace with the pipe installation.

L. The temporary pavement shall be maintained by the CONTRACTOR in a condition satisfactory to the OWNER until its removal. Removal shall include any surplus backfill material. The removed temporary pavement and surplus backfill material shall be properly disposed of by the CONTRACTOR, at his expense.

M. No payment shall be made for temporary paving work. The cost for such work shall be considered incidental to pipeline construction and included in the bid prices for the respective pipe payment items.

N. Sand seal on the limerock base course will not be permitted in lieu of temporary paving.

3.02 **PAVING**

A. **General**: The CONTRACTOR shall remove the temporary pavement and any surplus backfill and shall replace it with the specified compacted limerock base course to the extent required by the Contract Documents. Additionally, when a pipeline is installed in a lane parallel to the roadway, restoration shall be for the width of one full traffic lane.

B. Replacement of temporary pavement with the permanent pavement shall be made within 30 days. This work shall be completed in sections compatible with specified traffic maintenance procedures.

C. All paving work shall be completed according to the Contract Documents and DOT Standards. Where the two are not in agreement, the more stringent requirement shall prevail.

D. **Subgrade**: The backfill previously placed and compacted shall be excavated to the required depth below the existing road surface, and the existing paving shall be cut back to a width of one full lane, using an abrasive disc saw to trim the edges to straight and true lines. The
subbase material shall be stabilized to have a minimum LBR of 40. The minimum acceptable density at any location in the top twelve inches of the subgrade shall be 98% of maximum dry density as determined by AASHTO T-180.

E. **Limerock Base:** The limerock base shall be constructed in accordance with DOT Section 200, to the thickness and width indicated on the Drawings. The limerock base shall have a minimum LBR of 100. The maximum depth of each lift shall be 6 inches. Pavement base shall be constructed in minimum two lifts.

F. After spreading of the base material is completed, the entire surface shall be scarified and shaped so as to produce the exact grade and cross section after compaction. For double course base, this scarifying shall extend to a depth sufficient to penetrate slightly the surface of the first course.

G. When the material does not have the proper moisture content to ensure the required density, wetting or drying shall be required. If the material is deficient in moisture, water will be added and uniformly mixed in by disk ing the base course to its full depth. If the material contains an excess of moisture, it shall be allowed to dry before being compacted. Wetting and drying operations shall involve manipulation of the entire width and depth of the base as a unit. As soon as proper conditions of moisture are attained, the material shall be compacted to an average density not less than 98 percent maximum density as determined in more than one course, the density shall be obtained in each lift of the base.

H. During final compacting operations, if blading of any areas is necessary to obtain the true grade and cross section, the compacting operations for such areas shall be completed prior to making the density determinations on the finished base.

I. Unless otherwise directed by the OWNER, the surface shall be "hand-planed" with a blade grader immediately prior to the application of the prime coat to remove the thin glaze or cemented surface and to allow free penetration of the prime material. The materials planed from the base shall be removed from the base area.

J. If cracks or checks appear in the base, either before or after priming, which in the opinion of the OWNER, would impair the structural efficiency of the base course, the CONTRACTOR shall remove such cracks or checks by rescarifying, reshaping, adding base material where necessary and recompacting, at no additional cost to the OWNER.

K. **Mixing Base and Subgrade:** If at any time the subgrade material shall become mixed with the base course material, the CONTRACTOR shall, reshape and compact the subgrade and replace the materials removed with clean base material, which shall be shaped and compacted as specified above.

L. **Prime Coat:** After the limerock base course has been properly prepared and is clean, dry and ready to receive the wearing surface, a prime coat shall be uniformly applied at a rate of 0.15 gallon per square yard, immediately followed by the asphaltic concrete. The work shall be performed in accordance with Section 300 of the DOT Specifications. The prime coat shall be applied to the entire limerock base course uniformly, and shall thoroughly coat all surfaces. Care shall be taken to apply the prime coat and bond the edges of surrounding pavement. The prime coat shall not advance ahead of the paving by more than 300 feet in business or residential areas, unless otherwise authorized by the OWNER. All work associated with prime coats shall comply with DOT Section 300.
M. **Permanent Asphalitic Concrete Patch:** The spreading, compacting and jointing of the permanent asphaltic concrete patch shall be in accordance with DOT Sections 330 and 331 to the thickness indicated on the Drawings.

N. Where the width of the repair permits, the material shall be placed by means of an acceptable mechanical spreader and finisher. The mixture shall be compacted to true grade and cross section by means of a tandem roller weighing not less than eight tons. The compacted asphaltic concrete mixture shall not be, in any case, less than one inch in thickness. Rolling shall proceed as closely behind the spreader as possible, and all material shall be completely compacted the same day it is placed.

O. **Tack Coat:** After the asphaltic concrete patch has been properly prepared and is clean, dry and ready to receive the asphaltic concrete overlay, a tack coat shall be uniformly applied at a rate of 0.10 gallon per square yard, immediately followed by the asphaltic concrete overlay. The tack coat shall be applied to the entire asphaltic concrete patch uniformly, and shall thoroughly coat all surfaces. Care shall be taken to apply the tack coat and bond the edges of surrounding pavement. The tack coat shall not advance ahead of the paving by more than 300 feet in business or residential areas, unless otherwise authorized by the OWNER. All work associated with tack coats shall comply with DOT Section 300.

3.03 **OVERLAYS**

A. Overlays shall consist of a machine-laid asphaltic concrete wearing surface overlay which shall be nominal one-inch thick asphaltic concrete meeting the material requirements of the previously specified pavement repairs.

B. In general, the overlay will be applied in a full lane width or widths, after the permanent paving repairs over the trench have been made.

C. All longitudinal and transverse asphalt replacement overlay wearing surfaces shall butt into adjacent existing asphalt wearing surfaces in full lane asphalt restoration. The finish elevation of the new full lane overlay shall meet existing elevations adjacent to the new work.

D. The existing asphaltic concrete surface shall be saw cut for its full depth or 1-inch minimum, and then stripped back for at least 2 feet into the area to be overlaid to a second cut which shall also be in clean, straight lines. The second, or interior, cut edge shall be rolled with a tandem roller weighing not less than 8 tons before the overlay is applied. The stripped area shall be used to provide a smooth transition between the overlay and the existing pavement. Before placing the overlay, all cut edges and the stripped area shall be tack coated with emulsified asphalt as specified hereinbelow.

E. If the CONTRACTOR requests in writing to "feather" the longitudinal edge, and if written permission is granted to "feather" the asphalt by the OWNER, a sanded mix of 70-30 type shall be used. "Feathering" shall begin 18 inches from the tapered edge.

F. Prior to installing a full lane width overlay over existing asphalt, the trench and shoulders over the pipe shall be sawcut and filled with asphalt to the required depth and terminating flush with the existing adjacent asphalt in accordance with the municipality having jurisdiction over the work. The overlay shall be installed as detailed above.

G. When a minor amount of asphalt surface will remain, generally with large pipe installations after the pipe is installed and the required longitudinal saw cutting the asphalt, the
CONTRACTOR may request permission to remove all the asphalt in the lane, at his expense, by saw cutting the asphalt adjacent to the existing lane, then placing the overlay flush with the adjacent asphalt. This would require that the previously specified pavement repairs finish elevation be lowered 1 inch to allow for the overlay.

H. Before the overlay is applied, existing surfaces shall be swept clean of dirt and debris, using a power-driven broom if warranted by the size of the location to be overlaid as determined by the OWNER. Pavement edges shall be cleared of all encroaching vegetation, loose sand, rock and all other foreign matter. When the existing surface is thoroughly clean, a tack coat of Emulsified Asphalt shall be applied at the rate of approximately 0.10 gallon per square yard, immediately followed by the asphaltic concrete overlay. The tack coat shall not advance ahead of the paving by more than 300 feet in business or residential areas, unless otherwise acceptable to the OWNER.

I. Machine-laid overlay shall be placed by means of an approved mechanical spreader and finisher, and the mixture shall be compacted to true grade and cross section by means of a tandem roller weighing not less than 8 tons.

J. The compacted overlay shall be thicker as required to produce a smooth, uniform surface, free of any irregularities, but shall not be less than one inch in thickness. Existing depressed areas in the asphalt collecting water after a rainfall shall be corrected before placing the asphalt overlay. Rolling shall proceed as close behind the spreading of the asphalt as possible, and all materials shall be completely compacted the same day it is placed.

3.04 PAVEMENT REPAIR

A. All damage to pavement as a result of work under this Contract shall be repaired in a manner satisfactory to the OWNER and at no additional cost to the OWNER. The repair shall include the preparation of the subgrade, the placing and compacting of the limerock base, the priming of the base, the placing and maintaining of the surface treatment, all as specified herein.

B. The width of all repairs shall extend at least 12 inches beyond the limit of the damage. The edge of the pavement to be left in place shall be cut to a true edge with a saw or other method acceptable to the OWNER so as to provide a clean edge to abut the repair. The line of the repair shall be reasonably uniform with no unnecessary irregularities.

- END OF SECTION -
PART 1 - GENERAL

1.01 SCOPE

A. Damaged concrete pavement, curbs and sidewalks, and other improvements shall be reconstructed as new to existing lines and grades and dimensions. Where pavement, curbs, and sidewalks are partially damaged on private property, the CONTRACTOR shall fully reconstruct the structure in-kind to provide an entirely new structure. Perform all work within the rights-of-way of public thoroughfares in accordance with the requirements of the Governmental agency having jurisdiction. All construction shall to adhere to Miami-Dade County Water and Sewer Department and Miami-Dade County Public Works Department Standards.

1.02 SUBMITTALS

A. Shop drawings for reinforcing, joint material and mix designs shall be submitted for review in accordance with the Section entitled “Submittals”.

PART 2 - PRODUCTS

2.01 CONCRETE

A. Concrete shall be Class B as specified in Division 3, unless noted or specified otherwise.

2.02 REINFORCING AND WELDED WIRE FABRIC

A. Joint reinforcing and welded wire fabric shall conform to the requirements of Division 3.

2.03 PREFORMED JOINT FILLER

A. Preformed joint filler shall be sponge rubber or cork and conform to the requirements of AASHTO Designated M153, Type I or II.

2.04 CURING COMPOUND

A. Curing Compound shall conform to the requirements of AASHTO M148, Type I.

PART 3 - EXECUTION

3.01 SUBGRADE CONDITION

A. The finished subgrade shall be maintained in a smooth, compact condition and any areas which are disturbed prior to placing of the concrete shall be restored at no additional cost to the Owner.

B. The subgrade shall be moist at the time the concrete is placed. Water shall be uniformly applied ahead of the paving operations as directed by the OWNER. If the CONTRACTOR does not maintain the subgrade in the required moist condition, a polyethylene sheet vapor barrier will be required between the subgrade and the concrete.
C. The subgrade shall be accurately trimmed to the required elevation with a ¼-inch tolerance. High areas shall be trimmed to proper elevation. Low areas may be filled with suitable material and compacted to the specified density or filled with concrete integrally with the placing of the pavement.

D. Boulders, rocks or obstructions larger than 1-inch diameter shall be removed to a minimum depth of 6-inches below finished subgrade. The subgrade shall be compacted at optimum moisture content to 98 percent of maximum dry density in accordance with ASTM D1557 method D.

3.02 SETTING FORMS
A. The forms shall be accurately set to line and grade and such that they rest firmly, throughout their entire length upon the compacted subgrade surface. Forms shall be joined neatly and tightly and braced to test the pressure of the concrete and the finishing operations. The alignment and grade of all forms shall be approved before and immediately prior to the placing of concrete.

3.03 MIXING CONCRETE
A. Concrete shall be mixed in accordance with Division 3.

3.04 PLACING CONCRETE
A. The concrete shall be distributed on the subgrade to such depth, that, when it is consolidated and finished, the slab thickness required by the Drawings will be obtained at all points and the surface will at no point be below the grade specified for the finished surface, after application of the allowable tolerance. The concrete shall be deposited on the subgrade in a manner which will require as little rehandling as possible.

B. Fabric reinforcement shall be placed at mid slab depth, and the fabric shall be maintained at this location during the placing and finishing operations.

C. Concrete shall be thoroughly consolidated against and along the faces of all forms, by means of hand-operated, spud-type vibrators. Vibration at any one location shall not continue so long as to produce puddling or the accumulation of excessive grout on the surface. In no case shall the vibrator be operated longer than 15 seconds in any one location.

3.05 STRIKING-OFF, CONSOLIDATING AND FINISHING CONCRETE
A. Immediately after the placing, the concrete shall be struck off, consolidated and finished, to produce a finished pavement conforming to the cross section, width and surface sequence of operations shall be as follows: strike-off; vibratory consolidation; screening; floating; removal of laitance; straight-edging; and final surface finish.

3.06 STRAIGHT-EDGING AND SURFACE CORRECTIONS
A. After floating has been completed and the excess water removed, but while the concrete is still in a plastic state, the surface of the concrete shall be tested for trueness with an accurate 10-foot straight-edge. The straight-edge shall be furnished by the CONTRACTOR. The straight-edge shall be held in successive positions parallel to the road center line, in contact with the surface, and the whole area tested from one side of
the slab to the other as necessary. Any depressions shall be immediately filled with freshly mixed concrete and struck-off; consolidated and refinished. High areas shall be cut down and refinished. Straight-edge testing and surface correction shall continue until the entire surface appears to conform to the required grade and cross section.

3.07 FINAL FINISH

A. As soon as the water sheen has disappeared from the surface of the pavement and just before the concrete becomes nonplastic, a light broom finish shall be given to the surface.

3.08 EDGING

A. After the final finish has been applied, but before the concrete has become nonplastic, the edges of the pavement along each side of the strip being placed, on each side of construction joints and along any structure extending into the pavement, shall be carefully rounded to a ¼-inch radius except as otherwise indicated. A well-defined and continuous radius shall be produced and a smoother, dense mortar finish obtained. All concrete shall be completely removed from the top of the joint filler.

B. All joints shall be checked with a straight-edge before the concrete has become nonplastic and, if one side of the joint is higher then the other or the entire joint is higher or lower then the adjacent slabs, corrections shall be made as necessary.

3.09 JOINTS

A. Construction Joints: Construction joints shall be located as directed by the OWNER.

B. Expansion Joints around Structures: Expansion joints shall be formed by placing premolded expansion joint material about all structures and features projecting through, into or against the pavement. Unless otherwise indicated, such joints shall be ½-inch in width. Expansion joints shall be sealed with a joint sealer. Sealant application procedures shall be as recommended by the manufacturer.

C. Transverse Expansion Joints: Open type transverse expansion joints shall be provided at all sidewalk returns and at 50-foot intervals and wherever specified by Engineer. Open type joints shall be formed by staking a ¼-inch thick metal bulkhead in place and placing concrete on both sides. After the concrete has set sufficiently to preserve the width and shape of the joint, the bulkhead shall be removed. After the sidewalk has been finished over the joint, the slot shall be opened and edged with a tool having a ½-inch radius. Transverse expansion joints shall be cleaned and filled with joint filler strips ¼-inch thick conforming to the requirements of AASHTO M-153 and sealed with a joint sealer. Sealant application procedures shall be as recommended by the manufacturer.

D. Scored Joints: Scored joints shall be either formed or sawed at 5-foot intervals and shall extend to a depth of at least one fourth of the sidewalk slab thickness.

3.10 CURING

A. After the finishing operations have been completed and as soon as the concrete has hardened sufficiently that marring of the surface will not occur, the entire surface and the edges of the newly placed concrete shall be covered and cured with membrane curing compound.
B. Curing compound shall be uniformly applied to the surfaces to be cured, in a single coat, continuous film, at the rate of one gallon to not more than 200 square feet, by a mechanical sprayer.

C. Curing compound shall not be applied during periods of rainfall. Curing compound shall not be applied to the inside faces of joints to be sealed. Should the film become damaged from any cause within the required curing period, the damaged portions shall be repaired immediately with additional compound. Upon removal of side forms the sides of the slabs exposed shall immediately be coated to provide a curing treatment equal to that provided for the surface.

3.11 SIDEWALK CONSTRUCTION

A. The CONTRACTOR shall furnish a template and shall thoroughly check the subgrade prior to depositing concrete. Sidewalks shall be given a light broom finish.

3.12 CURBS

A. Curbs shall be constructed in uniform sections ten feet in length except where shorter sections are necessary for closures or arcs. The sections shall be separated by sheet metal templates set perpendicular to the face and tip of the curve and not less than 2 inches longer than the depth of the curb. The templates shall be held firmly during the placing of the concrete and shall be allowed to remain in place until the concrete has set sufficiently to hold its shape, but shall be removed while the forms are still in place.

B. After the concrete has sufficiently set for a minimum of 12 hours, the CONTRACTOR shall remove the forms and backfill the spaces on each side. The earth shall be compacted in satisfactory manner with out damage to the concrete work. Minor defects shall be filled with a mortar composed of one-part Portland cement and two parts fine aggregate.

3.13 PAVEMENT CURB AND SIDEWALK REPAIR

A. All damage to pavement, curb or sidewalk as a result of work under this Contract shall be repaired in a manner satisfactory to the OWNER and at no additional cost to the Owner. The repair shall include all work as specified herein.

B. The width of all repairs shall extend at least 12 inches beyond the limit of the damage. The edge of the pavement curb or sidewalk to be left in place shall be cut to a true edge with a saw or other approved method so as to provide a clean edge to abut the repair. The line of the repair shall be reasonably uniform with no unnecessary irregularities.

- END OF SECTION -
SECTION 02580 - PAVEMENT MARKING AND SIGNS

PART 1 - GENERAL

1.01 SCOPE

A. This Section consists of reflective pavement markers, traffic stripes and markings and traffic signs as specified herein, and as required for a complete installation.

1.02 SUBMITTALS

A. The CONTRACTOR shall submit Shop Drawings and other information to the OWNER for review in accordance with the Section entitled “Submittals”.

B. Submit certificates stating that materials meet DOT Specifications Sections 706, 711, 971-12, 971-13 and 971-14.

1.03 QUALITY CONTROL

A. The phrase “DOT Specifications” shall refer to the Florida Department of Transportation Standard Specifications for Road and Bridge Construction. The DOT Specifications, are referred to herein and are hereby made a part of this Contract to the extent of such references, and shall be as binding upon the Contract as though reproduced herein in their entirety. Use materials and application methods complying with Florida Department of Transportation Standard Specifications for Road and Bridge, the Manual of Uniform Traffic Control Devices, the Florida Manual on Traffic Control and Safe Practices for Street and Highway Construction, and with Miami-Dade County Public Works Department Specifications and Details.

1.04 CERTIFICATION

A. The CONTRACTOR shall furnish the manufacturer’s certification that all signs furnished conform to these specifications and shall replace or repair at his expense all signs that fail to meet this requirement.

PART 2 - PRODUCTS

2.01 PAVEMENT MARKING

A. CONTRACTOR shall replace any existing reflective pavement markers, traffic stripes and markings damaged during construction.

B. Paint for traffic stripes and markings shall be in conformance with DOT specification “Thermoplastic Traffic Stripes and Markings Paint” 711-12. The colors of the paint shall be yellow or white as existed before the repair.

C. Reflective pavement markers shall be in conformance with DOT specification Section 706-2.
2.02 TRAFFIC SIGNS

A. General: CONTRACTOR shall replace signs damaged during construction. Traffic regulating signs shall conform to the colors, dimensions and requirements of the Manual on Uniform Traffic Control Devices (ANSI).

B. Sign Panels and Support Members: Sign panels and support members shall conform to Aluminum Association Alloy 6061-T6.

C. Bolts: Bolts shall conform to Aluminum Association Alloy 2024-T4 with an anodic coating 0.0002-inches thick minimum and chromate sealed.


E. Reflective Sheeting: Reflective sheeting shall conform to DOT Type A requirements.

F. Construction Warning Signs: The CONTRACTOR shall install traffic and warning signs during construction in accordance with OSHA, DOT and County requirements.

PART 3 - EXECUTION

3.01 PAVEMENT MARKING

A. The surface which is to be painted shall be cleaned, by compressed air or other effective means, immediately before the start of painting, and shall be clean and dry when the paint is applied. Any vegetation or soil shall be removed from the pavement before edge striping is begun.

B. The traffic stripe shall be of the specified width, with clean, true edges and without sharp breaks in the alignment. A uniform coating of paint shall be obtained and the finished stripe shall contain no light spots or paint skips. Any stripes which do not have a uniform, satisfactory appearance, both day and night, shall be corrected.

C. All newly painted stripes, including edge stripes, shall be protected until the paint is sufficiently dry to permit vehicles to cross the stripe without damage from the tires. While the center line stripes are being painted, all traffic shall be routed away from the painting operations and the newly painted stripe. When necessary, a pilot car shall be used to protect the painting operations from traffic interference.

D. Any portions of the stripes damaged by passing traffic or from other cause shall be repainted at the CONTRACTOR’s expense.

1. Thermoplastic Traffic Stripes and Markings: Thermoplastic pavement markings, including stripes, pavement messages, stop bars, directional arrows, reflective pavement markers and other miscellaneous items, will be replaced as existed before the repair was made. The thermoplastic compound shall be as specified in Section 711 of the D.O.T. Specifications. The thermoplastic compound shall be extruded or sprayed onto the pavement surface in a molten state by mechanical means, with surface application of glass spheres, when required, and upon cooling to ambient pavement temperature shall produce an adherent
pavement marking of specified thickness and width and capable of resisting deformation.

E. The portion of the pavement surface or thermoplastic marking to which the marker is attached by the adhesive shall be cleaned of dirt, curing compound, grease, oil, moisture, loose or unsound pavement and any other material which would adversely affect the adhesive. Reflective markers shall be installed in such a manner that the reflective face of the marker is perpendicular to a line parallel to the roadway centerline. No markers shall be installed over longitudinal or transverse joints of the pavement surface. The adhesive shall be spread on the bonding surface (not the marker) so that 100 percent of the bonding area of the marker will be covered. The adhesive application shall be of sufficient thickness so that when the marker is pressed into the adhesive, excess adhesive shall be forced out around the entire perimeter of the marker. All excessive adhesive shall be removed from in front of the reflective faces. If any adhesive or foreign matter adheres to the reflective face of the marker, the marker shall be replaced. The OWNER shall determine the minimum time necessary to cure the adhesive for sufficient set to bear traffic.

F. Reflective pavement markings shall be placed at locations of fire hydrants and watermain valves as required by City standards.

3.02 SIGN FABRICATION

A. Preparation of sign blanks and fabrication of reflectorized faces shall conform to the applicable requirements of DOT Section 700-4 and 700-5.

3.03 INSTALLATION

A. Sign and supports shall be erected in conformance to DOT requirements and as specified herein. All damaged signs and reflective pavement markers and traffic stripes and markings shall be replaced in conformance with this Section, Miami-Dade County Public Works Department Specifications and Details, and DOT requirements.

- END OF SECTION -
SECTION 02722
SANITARY SEWERS (GRAVITY)

PART 1 - GENERAL

1.1 The work to be performed shall consist of the installation of gravity sanitary sewer lines, lateral connections, and collars in accordance with these specifications.

1.2 TRANSPORTATION AND HANDLING

A. Furnish all material, equipment, tools and labor in connection with the sewer line. It shall be the Contractor's responsibility to ensure that all necessary materials are furnished, and those found to be defective in manufacture are replaced at no extra cost to the OWNER. Materials damaged in handling after being delivered by the manufacturer shall be replaced at the CONTRACTOR'S expense. If installed material is found to be defective before the final acceptance of the work, the cost of both the material and labor needed to replace it shall not be passed on to the OWNER.

B. Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, and accessories. Make equipment available at all times for use in unloading. Do not drop or dump materials. Any materials dropped or dumped will be subject to rejection without additional justification. Pipe handled on skids shall not be rolled or skidded against pipe on the ground.

C. Handle pipe, fittings and accessories carefully to prevent shock or damage. Do not use material damaged in handling. Slings, hooks or pipe tongs shall be padded and used in such a manner to prevent damage to the exterior coatings or internal lining of the pipe. Do not use chains in handling pipe, fittings and appurtenances.

1.3 STORAGE AND PROTECTION

A. Store all pipe which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.

B. The CONTRACTOR shall be responsible for safely storing materials needed for the work that have been accepted by him until they have been incorporated into the completed project. Keep the interiors of all pipes, fittings, manholes and other accessories free from dirt and foreign matter at all times.

C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails, or concrete. Pipe in tiers shall be alternated: bell, plain end; bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between pipe in adjacent tiers.

1.4 Stored push-on gaskets shall be placed in a cool location out of direct sunlight. Gaskets shall not come into contact with petroleum products.
1.5 Submittals are required for all products specified in this section, per the provisions of Section 01300 – Submittals.

1.6 Refer to other sections for items affecting gravity sewers. Coordinate this work with that specified by other sections for timely execution.

PART 2 - PRODUCTS

2.1 PIPE

A. Polyvinyl Chloride (PVC)

1. PVC pipes and fittings shall meet and/or exceed the requirements of ASTM D3034, SDR 26 for pipe 4 inches to 15 inches in diameter. Pipe shall meet or exceed the requirements of ASTM F679, wall thickness T-1 for pipe 18 to 24 inches in diameter.

2. PVC pipe joints shall be gasketed, bell-and-spigot, push-on type conforming to ASTM D3212, “Standard Specification for Joints for Drain and Sewer Plastic Pipes Using Flexible Elastomeric Seals.” Joint design shall be tested and certified to result in no leakage under prescribed laboratory test conditions of joint alignment, load conditions, pressure and vacuum, and deflection. Gaskets and lubricant shall be suitable for sewage applications. Gaskets may be factory installed or field installed as recommended by the pipe manufacturer. Lubricant shall be as recommended by the pipe manufacturer.

B. Ductile Iron (DIP)

1. DIP shall be pressure class 350 for 4” through 12”, class 250 for 14” through 20”, class 200 for 24” and class 150 for 30” and greater. The pipe shall be coated on the interior with 40 mils nominal dry thickness of Protecto 401 ceramic epoxy within 8 hours of surface preparation. DIP shall be designed and manufactured in accordance with ANSI A21.51 centrifugally cast in metal or sand lined molds. Exterior surface shall be seal coated with 1 mil thick asphaltic coating in accordance with ANSI/AWWA C151/A21.51.

2. Ductile Iron Pipe Joints shall be gasketed, bell-and-spigot, push-on type conforming to ANSI/AWWA C111/A21.11 “Standard for Rubber Gasket Joints for Ductile Iron Pressure Pipe and Fittings.” Gaskets and lubricant shall be suitable for sewage applications. Lubricant shall be as recommended by the pipe manufacturer.

C. Centrifugally Cast Fiberglass Mortar Pipe (CCFMP)

1. CCFMP shall have a minimum pipe stiffness (SN) of 46, and shall be based on site conditions and application. The pipe shall be manufactured in accordance with ASTM D3262, Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Sewer Pipe; ASTM D4161, Standard Specification for Fiberglass (Glass-Fiber-Reinforced Thermosetting Resin) Pipe Joints Using Flexible Elastomeric Seals; and ASTM D2412, Standard Test Method of External Loading Characteristics of Plastic Pipe by Parallel-Plate Loading.
2. The manufacturer shall use polyester resin with a proven history of performance for the pipe manufacturer. Historical data shall be from composite material of similar construction and composition as proposed product.

3. Reinforcing glass fibers used to manufacture components shall be of highest quality commercial Grade E fiberglass filaments with binder and sizing compatible with impregnating resins.

4. Silica sand shall be a minimum of 98% silica with a maximum moisture content of 0.2%.

5. Curing agents, pigments, dyes, filler and thixotropic agents, when used, shall not detrimentally affect performance of the product.

6. Pipes shall be supplied in nominal lengths of 20 feet.

7. Pipe ends shall be square to pipe axis with a maximum tolerance of 1/8 inch.

8. Joints shall be field connected with fiberglass sleeve couplings that utilize elastomeric sealing couplings that utilize elastomeric sealing gaskets made of EPDM rubber compound as sole means to maintain joint water tightness. Joints shall meet the requirements of ASTM D4161, and be rated for working, test and surge pressures, even under deflected conditions.

9. Tie-ins, when needed, may utilize gasket-sealed mechanical couplings.

10. Gaskets and joint lubricant shall be suitable for service conditions and loads indicated.

11. Change in direction shall be accomplished with manholes as indicated on the Drawings or fittings with manhole risers for pipe larger than 48 inches.

12. CCFMP manufacturers shall be Hobas Pipe USA, Inc. or Amitech USA, Flowtite.

D. Sewer lateral shall be tees of the same material as the main sewer and have a 6-inch inside diameter unless otherwise specified or noted; able to withstand all test pressures involved without leakage

2.2 TRANSITION COUPLINGS

A. Transition couplings shall be designed to join sewer pipes of the same or different materials or sizes. Couplings shall be ductile iron conforming to ASTM A-536. Coupling shall be manufactured by Ford, Dresser, JCM or approved equal.

2.3 CLEANOUTS

A. Cleanouts shall be SDR 35 two-way cleanout as manufactured by Plastic Trends, Inc.
PART 3 - EXECUTION

3.1 EXISTING UNDERGROUND UTILITIES AND OBSTRUCTIONS

A. The plans indicate utilities and obstructions that are known to exist according to the best information available to the OWNER.

B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.

1. Expose the facility, for a distance of at least 100 feet in advance of pipeline construction, to verify its true location and grade. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.

2. Avoid utility damage and interruption by protection with means or methods recommended by the utility owner.

C. Conflict with Existing Utilities

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed piping does not permit safe installation of the piping by the use of sheeting, shoring, tying-back, supporting, or temporarily suspending service of the parallel or crossing facility. The CONTRACTOR may change the proposed alignment of the piping to avoid horizontal conflicts if the new alignment complies with regulatory agency requirements and after a written request to and subsequent approval by the OWNER. Where such relocation of the piping is denied by the OWNER, the CONTRACTOR shall arrange to have the utility, main, or service relocated.

2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between a utility, main, or service and the proposed piping does not permit the crossing without immediate or potential future damage to the utility, main, service, or the piping. The CONTRACTOR may change the proposed grade of the piping to avoid vertical conflicts if the changed grade maintains adequate cover and complies with regulatory agencies requirements after written request to and subsequent approval by the OWNER.

D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Water and Sewer Separation

1. Gravity sewer lines should maintain a minimum 10-foot edge-to-edge separation from potable water mains. If the main cannot be installed providing the 10-foot separation, the separation may be reduced, provided the bottom of the water main is a minimum of 18-inches above the top of the sewer. Should neither of these two separation criteria be possible, the potable water main shall be relocated to provide this separation, or the water line be reconstructed with
ductile iron pipe for a distance of 10 feet on each side of the sewer with a full pipe section of the water main centered over the sewer.

2. If it is impossible to obtain proper horizontal and vertical separation as stipulated above, construct both the water main and the sewer of mechanical joint ductile iron pipe, and pressure test each. The sewer shall be ductile iron from manhole to manhole.

3. No water main shall pass through, or come in contact with, any part of a sanitary manhole.

3.2 PIPE INSTALLATION IN TRENCH

A. Lay no pipe except in the presence of the OWNER or authorized site representative of the OWNER. Do not begin backfilling trenches until the pipe in place has been visually inspected by the OWNER or site representative. Pipe installation shall begin at the lowest elevation.

B. Minimum pipe cover in roadways and other traffic bearing areas is 48 inches for PVC and CCFMP and 30 inches for ductile iron pipe. In no traffic areas, the minimum cover for all pipe is 30 inches.

C. Before placing sewer pipe in position in the trench, carefully prepare the bottom and sides of the trench, and install any necessary bracing and sheeting.

D. Lasers shall be used to install sewer lines, and the type and procedures shall be approved by the OWNER. Reference points for both line and grade shall be set at each manhole. Where grades are 0.6% or less, the beam elevation shall be checked each 100 feet with an offset point or an engineer’s level.

E. Do not allow water to run or stand in the trench while pipe laying is in progress or before the trench has been backfilled. Do not at any time open up more trench than the available pumping facilities are able to dewater.

F. Correct trench bottoms found to be unsuitable for foundations after pipe laying operations have started, bringing them to exact line and grade with minimum ¾ inch material approved by the Owner.

G. Geogrid reinforcement (such as Tensar BX1200) may be placed on the subgrade and refilled with 1-inch to 2-inch compacted crushed stone to minimize unsuitable soils excavation when approved by the OWNER.

H. Carefully inspect each piece of pipe and special fitting before it is placed, and lay no defective pipe in the trench. Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. When pipe laying is not in progress, keep the ends of the pipe tightly closed with an approved temporary plug.

I. As the work progresses, thoroughly clean the interior of the pipe in place. After each line of pipe has been laid, carefully inspect it, and remove all earth, trash, rags, and other foreign matter from its interior.
J. Excavation for bell holes shall be large enough to allow ample room for the pipe joints to be properly made. Cut out bell holes no more than 2-joints ahead of the pipe laying. Carefully grade the bottom of the trench between bell holes so that each pipe barrel rests on a solid foundation for its entire length as specified in Section 02222, Excavation and Backfill for Utilities. Lay each pipe joint so as to form a close concentric joint with adjoining pipe and to avoid sudden offsets or inequalities in the flow line.

K. Compacted clay check dams shall be installed in the bedding and backfill with a minimum spacing of 500 feet. Compacted clay check dams shall be cut into the walls and bottom of the trench two feet, and shall extend at least three feet above the top of the pipe. All stream crossings shall include compacted clay check dams on both sides of the stream.

L. Install tee branches in sewer lines to serve properly each lot adjoining the sewer and at such other locations as may be designated by the OWNER. If tee branches are not to be used immediately, close them with approved plugs that are held in place to prevent infiltration and withstand all test requirements. Furnish the OWNER with a record of the exact location of each tee installed.

M. For all tees that are plugged and laid in rock, blast a minimum of 6 linear feet of ditch line in the direction and to the approximate grade of the future lateral as directed by the OWNER, but do not excavate the material. This shall be done at no extra cost to the OWNER.

N. If the work consists of constructing a new sewer to replace an existing one, existing service lines shall be connected and replaced to the property line. Laterals which have been disconnected, abandoned, or cut shall be plugged and sealed with a backing block securing the plug.

O. New service laterals with cleanouts shall be required for each active service. Cleanouts shall be located on the property line or easement in most cases. However, where a long lateral crosses another private property, the cleanout shall be located at the road right-of-way.

P. Install service laterals to the property line or easement line with a minimum of 6-inch PVC SDR 26 pipe laid at a minimum 1% slope. The two-way directional tee shall be installed at the property line. The riser pipe from the tee shall extend to a cleanout with protective cleanout box.

Q. For new service laterals to be installed on existing lines larger than 6 inches in diameter, a sewer saddle may be used in lieu of a tee. The saddle shall be installed on a clean-cut, properly sized hole on the existing sewer, such that the connection is watertight.

R. When a saddle connection is not appropriate, use transition couplings to connect a tee section to the existing pipe. The tee shall be the same diameter as the existing sewer with short sections of pipe on either end. Wastewater shall be pumped around the construction zone.

S. A minimum 6-inch “Inserta Tee” shall be used to connect services to CCFMP.
T. Connect new service laterals to existing manholes by coring the manhole, and installing a flexible rubber pipe boot for the pipe.

U. Carefully protect from damage all existing sewers, water lines, gas lines, sidewalks, curbs, gutters, pavements, electrical lines, and other utilities or structures in the vicinity of the work at all times. If it is necessary to repair, remove, and/or replace any such utility or structure in order to complete the work properly, do so in compliance with the provisions set forth in other section of these specifications. Any such work shall be considered incidental to the construction of pipe sewers, and no additional payment will be allowed.

V. Water service connections will be repaired or replaced by the CONTRACTOR at his expense as an incidental part of the work.

W. Service or house connections to existing sewers that are damaged or removed shall be repaired or replaced by the CONTRACTOR at his own expense as an incidental part of the work.

X. After the joints have been completed, they shall be inspected, tested, and accepted by the OWNER before being covered. The pipe shall meet the test requirements for water-tightness; immediately repair any leak or defect discovered at any time after completion of the work. Any pipe that has been disturbed after joints were formed shall be taken up, the joints cleaned and remade, and the pipe re-laid at the CONTRACTOR’S expense. Carefully protect all pipe in place from damage until backfilling operations are completed.

Y. Wastewater flow must be maintained in the existing sewers. Whenever pipe laying progresses to the point to where this flow must be interrupted, the CONTRACTOR shall plug the sewer upstream of construction and provide by-pass pumping to the downstream manhole. All downstream pipes, manholes and appurtenances must be tested and acceptable to the OWNER to receive wastewater flow. Discharging raw wastewater to natural waterways will not be permitted. The CONTRACTOR shall notify the OWNER prior to wastewater bypass pumping. When working in areas where interruption of wastewater service may occur, the CONTRACTOR shall have lines and all other equipment ready at the site to provide by-pass pumping. A backup pump and hose are required. The CONTRACTOR shall be responsible for any clean up, fines and any other problems that may occur. All equipment will be checked by the OWNER for proper working conditions.

3.3 TESTING OF GRAVITY SEWERS

A. Visual Tests

1. Upon completion of the construction or earlier if the OWNER deems advisable, the OWNER will make a visual inspection of the sewer and construction site. The visual tests shall include a check for proper grade and alignment, sufficient pipe bedding, pipe condition and general cleanliness. Immediately repair all leaks and defects found by such inspection.

2. Sewers shall be built so as to remain true to line and grade. The inclining grade of the bottom of the sewer after completion shall be such that, after
flooding, the flood water drains off so that no remaining puddle of water is deeper than 1/2 inch on pipe 36 inches internal diameter or smaller and 3/4 inch on pipe larger than 36 inches internal diameter. Any section of pipe that does not comply with the specifications at any time previous to final acceptance of the work shall be replaced or re-laid at the CONTRACTOR'S expense.

3. The CONTRACTOR will be held strictly responsible that all parts of the work bear the load of the backfill. If cracks 1/100 inch develop in the pipe within one year from the date of final acceptance of the work, the CONTRACTOR will be required to replace, at his expense, all such cracked pipe. To this end, the CONTRACTOR is advised to purchase pipe under a guarantee from the manufacturer, guaranteeing proper service of sewer pipe under conditions established by the drawings, specifications, and local conditioning at the site of the work.

B. Air Testing for Sewers 24 Inches and Smaller

1. Perform low pressure air testing as follows:
   a. Furnish all equipment, facilities, and personnel necessary to conduct the test. The test shall be observed by a representative of the OWNER.
   b. This specification provides the proper procedures for acceptance of installed gravity sewer pipe using low-pressure air, to provide assurance that the pipe, as installed, is free from significant leaks. Included are requirements for equipment accuracy, safety precautions, line preparation, test method and minimum holding times. Air test results shall be recorded on the work sheet.
   c. Only lines tested after backfilling to final grade will be considered for acceptability. However, this test may be used as a presumptive test to determine the condition of the line prior backfilling. During sewer construction, all service laterals, stubs and fittings into the sewer test section shall be properly capped and plugged to prevent air loss that could provide an erroneous air test result. It may be necessary and is advisable that the CONTRACTOR restrain gasketed caps, plugs or short pipe lengths with bracing stakes, clamps and tie-rods or wire harnesses over pipe bells.
   d. Unless otherwise specified, the CONTRACTOR shall furnish and be responsible for conducting all low-pressure air tests. In addition, the CONTRACTOR shall be responsible for any necessary for any repair work on sections that do not pass the test.
   e. The OWNER shall witness all low-pressure air tests and verify the accuracy and acceptability of the equipment utilized. For sections that fail to pass the low-pressure air test, the CONTRACTOR shall submit the method of repair to the OWNER for acceptance.
   f. Ensure that all plugs are installed and braced in such a way that
blowouts are prevented. As an example of the hazard, a force of 250 pounds is exerted on an 8-inch plug by an internal pipe pressure of 5-psig, and a force of 2,250 pounds is exerted on a 24-inch plug by an internal pressure of 5-psig. The CONTRACTOR must realize that sudden expulsion of a poorly installed plug, or of a plug that is partially deflated before the pipe pressure is released, can be very dangerous. For this reason, it is recommended that every plug be positively braced against the manhole walls, and that no one be allowed in the manhole adjoining a line being tested so long as pressure is maintained in the line.

(1) It is further recommended that internal pressure of more than 9-psig not be permitted except for leak location equipment where the plugs are firmly tied together.

(2) Use either mechanical or pneumatic plugs. All plugs shall be designed to resist internal testing pressures without the aid of external bracing or blocking. However, the CONTRACTOR should internally restrain or brace the plugs to the manhole wall as an added safety precaution throughout the test.

g. All pressurizing equipment used for low-pressure air testing shall include a regulator or relief valve set no higher than 9-psig to avoid over-pressurizing and displacing temporary or permanent plugs. As an added safety precaution, the pressure in the test section should be continuously monitored to make certain that it does not at any time exceed 9-psig. (It may be necessary to apply higher pressure at the control panel to overcome friction in the air supply hose during pressurization.)

h. To facilitate test verification by the OWNER, all air used shall pass through a single, above ground control panel. The aboveground air control equipment shall include a shut-off valve, pressure relief valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 psi. The continuous monitoring gauge shall be no less than 4 inches in diameter with minimum divisions of 0.10 psi and an accuracy of plus or minus 0.04 psi. Two separate hoses shall be used to: 1) connect the control panel to the sealed line for introducing low-pressure air, and 2) a separate hose connection for constant monitoring of air pressure build-up in the line. This requirement greatly diminishes any chance for over-pressurizing the line.

(1) If pneumatic plugs are utilized, a separate hose shall also be required to inflate the pneumatic plugs from the above ground control panel.

i. After a manhole-to-manhole reach of pipe has been backfilled to final grade and compacted, prepared for testing, and a 24-hour waiting period has elapsed, the plugs shall be placed in the line at each manhole and secured.
(1) The CONTRACTOR is advised to seal test all plugs before use. Seal testing may be accomplished by laying one length of pipe on the ground and sealing it at both ends with the plugs to be checked. The sealed pipe should be pressurized to 9-psig. The plugs shall hold against this pressure without bracing and without any movement of the plugs out of the pipe. No persons shall be allowed in the alignment of the pipe during plug testing. It is advisable to plug the upstream end of the line first to prevent any upstream water from collecting in the test line. This is particularly important to high groundwater situations.

(2) When plugs are being placed, the pipe adjacent to the manhole shall be visually inspected to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole. A probable point of leakage is at the junction of the manhole and the pipe, and this fault may be covered by the pipe plug, and thus not revealed by the air test.

j. Low-pressure air shall be slowly introduced into the sealed line until the internal air pressure reaches 4.0-psig. If the groundwater table is above the sewer being tested, the air pressure shall be increased 0.43 psi for each foot that the water table is above the invert of the sewer, up to a maximum of 9.0-psig. After a constant pressure of 4.0-psig (greater than the average groundwater back pressure) is reached, the air supply shall be throttled to maintain that internal pressure for at least 2 minutes. This time permits the temperature of the entering air to equalize with the temperature of the pipe wall.

(1) When temperatures have been equalized and the pressure stabilized at 4.0-psig (greater than the average groundwater back pressure), the air hose from the control panel to the air supply shall be shut off or disconnected. The continuous monitoring pressure gauge shall then be observed while the pressure is decreased to no less than 3.5-psig (greater than the average back pressure of any groundwater over the pipe). At a reading of 3.5-psig, timing shall commence with a stopwatch.

(2) If the time shown for the designated pipe size and length (see Air Test Time Tables, below) elapses before the air pressure drops 0.5-psig, the section undergoing test shall have passed. The test may be discontinued once the prescribed time has elapsed even though the 0.5-psig drop has not occurred. If the pressure drops 0.5-psig before the appropriate time shown in Table I has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.

(3) If the section fails to meet these requirements, the CONTRACTOR shall determine at its own expense the source, or sources, of leakage and shall repair or replace all defective materials or workmanship to the satisfaction of the OWNER.
The extent and type of repair which may be allowed, as well as results, shall be subject to the approval of the OWNER. The completed pipe installation shall then be retested and required to meet the requirements of this test.

C. Testing for Sewers Larger than 24 Inches

1. Using Existing High Ground Water
   a. Where the natural ground water is 24 inches or more above the top of a section of pipe, measure the flow of water in the pipe and the rates of seepage and infiltration. Measure the flow rate by using a calibrated weir. Leave the weir in the line until the flow rate has stabilized. The CONTRACTOR is responsible for verifying the ground water level by providing sight gauges in manholes or digging test holes at suitable locations.
   b. The total seepage and infiltration of ground water as determined by the test shall in no case exceed 50 gallons per 24 hours per inch-mile of pipe. Make infiltration tests on all sewer construction before placing the lines in service and before making any connections to other sewers. If the amount of infiltration into the sewer(s) is in excess of the maximum quantity specified above, then re-caulk or remake the joints, relay the sewer (if necessary), or perform other remedial construction, at the CONTRACTOR’S expense, in order to reduce ground water infiltration to within the specified limits.
   c. In making infiltration tests, furnish the required equipment and labor and do the necessary pumping under the direction of the OWNER. Tests may be repeated until each sewer individually meets the specifications for infiltration amounts as set out above.

2. Exfiltration Test
   a. Where the ground water is not 24 inches or more above the top of the pipe section being tested, then perform an exfiltration test. Bulkhead the pipe below the lower manhole of the section being tested with a pneumatic plug or other device. Insert a vent pipe 48 inches long in the stopper of the upper end of that section. Then fill the lower manhole with water, or add water until there is a minimum of 4 feet over the upper end; make certain that all air is forced out through the vent tube. Measure the drop in the level of the water in the manhole due to exfiltration over a specific time, and calculate the water loss due to exfiltration. The total exfiltration shall not exceed that specified above for infiltration. Conditions encountered in construction may vary this procedure slightly, but essentially this is the method to be used.

3. Repairs
   a. Regardless of the outcome of any tests, repair any noticeable leak.
D. Air Test Time Tables

1. The following tables indicate the time that must elapse before the air pressure inside the pipe drops 0.5-psig. If the pressure inside the pipe drops 0.5-psig before the time has completely elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.

**MINIMUM SPECIFIED TIME FOR A 0.5 PSIG PRESSURE DROP FOR SIZE AND LENGTH OF PIPE**

<table>
<thead>
<tr>
<th>Pipe Diameter (inches)</th>
<th>Min. Time (min: sec)</th>
<th>Length for Min. Time (min: sec)</th>
<th>Time for Longer Length (sec.)</th>
<th>Specification Time for Length (L) Shown (min: sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100 feet</td>
</tr>
<tr>
<td>4</td>
<td>1:53</td>
<td>597</td>
<td>0.190</td>
<td>1:53</td>
</tr>
<tr>
<td>6</td>
<td>2:50</td>
<td>398</td>
<td>0.427</td>
<td>2:50</td>
</tr>
<tr>
<td>8</td>
<td>3:47</td>
<td>298</td>
<td>0.760</td>
<td>3:47</td>
</tr>
<tr>
<td>10</td>
<td>4:43</td>
<td>239</td>
<td>1.187</td>
<td>4:43</td>
</tr>
<tr>
<td>12</td>
<td>5:40</td>
<td>199</td>
<td>1.709</td>
<td>5:40</td>
</tr>
<tr>
<td>15</td>
<td>7:05</td>
<td>159</td>
<td>2.671</td>
<td>7:05</td>
</tr>
<tr>
<td>18</td>
<td>8:30</td>
<td>133</td>
<td>3.846</td>
<td>8:30</td>
</tr>
</tbody>
</table>
E. Air Test Data Sheet

Identification of Pipe Installation (Job name, location, contract number, etc.)

Field Test Data – To be filled in by Owner’s Site Representative

Date: Specified Pressure Drop:

Identification of Pipe Material Installed:

<table>
<thead>
<tr>
<th>Pipe Under Test</th>
<th>Specification on Time</th>
<th>Field Test Operations Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>US MH Station</td>
<td>DS MH Station</td>
<td>Diam. D (inch)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leng th L (Feet )</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Refer to Air Test Time Table</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Press. Initially Raised to (psig)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Time Allow ed for Press. to Stabilize (min.)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Start Test Press. (psig)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stop Test Press. (psig)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Elapse d time (min:sec)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pass or Fail (P or F)</td>
</tr>
</tbody>
</table>

Owner’s Site Representative’s Name and Title:
Signature of Owner’s Site Representative:

If a section fails, the following items should be completed:

Identify section(s) that failed:

Leak (was) (was not) located. Method used:

Description of Leakage Found:

Description of Corrective Action Taken:

For test results after repair, refer to Test No.:

Owner’s Site Representative:
3.4 DEFLECTION TESTING FOR PVC PIPE

A. The CONTRACTOR is responsible for providing all labor and equipment for deflection testing.

B. Test deflection of the pipe by manually pulling a 9-arm pin go/no-go mandrel (sized in accordance with ASTM D3034) through the pipe. The line shall be tested using a 5% deflection mandrel. Make this acceptance test after backfill consolidation has occurred.

3.5 CLEANUP

A. After completing each section of the sewer line, remove all debris, construction materials, and equipment from the site of the work, grade and smooth over the surface on both sides of the line, and leave the entire right-of-way in a clean, neat, and serviceable condition satisfactory to the OWNER. Cleanup operations shall be kept as close to pipe laying activities as generally possible but less than 300 feet or as approved by the OWNER.

-END OF SECTION-
PART 1 - GENERAL

1.01 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 sewage around a manhole or sewer section in which work is to be performed. The CONTRACTOR shall be prepared to bypass pump sewage as a part of his operations.

B. The work specified in this Section also includes all labor, materials, accessories, equipment and tools for performing all operations required to bypass pump sewage around a section of force main in which work is to be performed, or around a manhole into which a force main discharges if work is to be performed in the manhole. The CONTRACTOR shall be prepared to bypass pump sewage as a part of his operations.

C. 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 OWNER.

1.02 GENERAL

A. When sewer line flows at the upstream manhole of the line being repaired are above the maximum allowable requirements for television survey, or do not allow the proper sewer or manhole repair, the flows shall be reduced to the levels indicated by one of the following methods: manual operation of pumping stations by OWNER forces, by the CONTRACTOR plugging/blocking of the flows, or by the CONTRACTOR pumping/bypassing of the flows as acceptable to the OWNER.

B. In some applications, the wastewater flow may be plugged and contained within the capacity of the collection system. This shall only be done when it has been determined the system can accommodate the surcharging without any adverse impact.

C. For the initial television survey, before and after any repair with the exception of joint testing and sealing, the sewer line shall be blocked completely. No flow, except infiltration/inflow, will be allowed through the respective sewer line being televised on the pre-repair television survey, and the post-repair television survey.

D. For all other television surveys, including warranty surveys and joint testing and sealing operations, the depth of flow within the sewer shall not exceed that shown below for the respective pipe sizes as measured in the manhole.

1. Maximum Depth of Flow – Warranty Television Survey

   6" - 10" Pipe .......................................................... 20% of pipe diameter
   12" - 24" Pipe .......................................................... 25% of pipe diameter
   Above 24" Pipe .......................................................... 30% of pipe diameter
   6” - 12” Pipe.............................................................. 25% of pipe diameter
   15” - 24” Pipe.............................................................. 30% of pipe diameter
   Above 24” Pipe .......................................................... 35% of pipe diameter

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

F. When flows of sewage through a force main being repaired, or discharging by gravity or
   force main to a manhole being repaired, are in the opinion of the OWNER too excessive to
   plug or stop while the rehabilitation is being performed, the CONTRACTOR shall submit a
   written plan and pump/bypass the flow as acceptable to the OWNER.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit complete, detailed plans for this aspect of the work to the
   OWNER for review.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.01 PLUGGING AND BLOCKING

A. A sewer line 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 OWNER. After the work tasks
   have been completed, flows shall be restored to normal.

3.02 PUMPING AND BYPASSING

A. When pumping/bypassing is required, as determined by the OWNER, the CONTRACTOR
   will supply the necessary pumps, conduits and other equipment to divert the flow of sewage
   around the manhole 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 rain storms. 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 manhole section, from the start to finish of work performed in the manhole section.

B. Pumps and equipment shall be continuously monitored by a maintenance person 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.

C. In the case of bypassing force main flows, whether such flows normally discharge into a
   manhole being repaired or pass through a force main being repaired, bypass shall be
   accomplished by one of two methods.
1. In the absence of surface conditions that prevent temporary bypass piping, the force main shall be accessed by excavation and temporary piping shall be installed to bypass the repair in a manner acceptable to the OWNER. In general, for manhole repairs, the CONTRACTOR shall excavate to the force main outside the manhole, cut the force main, attach bypass piping, and bypass flow to the next downstream manhole. For force main repairs, the CONTRACTOR shall excavate to the force main on each side of the repair, cut the force main on each side of the repair, attach bypass piping on each side of the repair, and bypass flow around the repair. Upon the conclusion of bypass activities and repair work, the CONTRACTOR shall install closure pieces to permanently rejoin and restore the force main to full function.

2. Where surface conditions prevent the use of temporary bypass piping, and where the OWNER cannot accomplish the bypass operations in-house, the OWNER shall shut down the associated lift station and the CONTRACTOR shall pump from the wet well into tanker trucks for transport to a designated location. The number of tanker trucks deemed necessary for this operation shall be agreed to in advance by the OWNER.

3.03 FLOW CONTROL PRECAUTIONS

A. Surcharging Sewers. Where the raw sewage flow is blocked or plugged, sufficient precautions must be taken to protect the public health. No septic conditions shall be allowed due to CONTRACTOR’s operations. The sewer lines 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, cleanouts or any other access to the sewers.
3. Users upstream of the repair area shall be able to use all their water and sewer utilities without interruption.

B. If any of the above unallowable conditions occur or are expected to occur, the CONTRACTOR shall bypass pump to alleviate one or all of the conditions. Additionally, the CONTRACTOR is required to observe the conditions upstream of the plug and be prepared to immediately start bypass pumping, if needed. It is CONTRACTOR’s responsibility to pay for all damage claims.

C. 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 sewer shall discharge this material into another manhole, or appropriate vehicle or container acceptable to the OWNER. Under no circumstances shall this material be discharged, stored or deposited on the ground, swale, road or open environment.

D. 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 - Traffic Regulation and Maintenance of Traffic.

E. Sewage Spills. In the event, during any form of "Sewage Flow Control", that raw sewage is 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
disinfection of the area affected. This work will be performed at the CONTRACTOR’s expense with no additional cost to the OWNER. The CONTRACTOR is also responsible for notifying the sewer system maintenance personnel and complying with any and all regulatory requirements in regards to the size spill with no additional cost to the OWNER.

- END OF SECTION -
SECTION 02752 - TELEVISION SURVEY

PART 1 - GENERAL

1.01 SCOPE

A. The work consists of furnishing all labor, materials, accessories, equipment, tools, transportation, services and technical competence for performing all operations required to execute the internal closed-circuit television survey verify repair of the entire barrel of sewers up to 30 inches in diameter.

1.02 GENERAL

A. Post-construction survey video on CD-ROM shall be delivered to the OWNER on a “one line per CD-ROM” basis, accompanied with the corresponding work order, and pre- and post-TV log, for each sewer line surveyed. The video on CD-ROM shall be direct from a live video source into a video file, format MPEG1, and of good quality for viewing. Video tapes shall not be accepted.

B. The television equipment operator shall be certified under the NASSCO (National Association of Sewer Survey Companies) PACP (Pipe Line Assessment and Certification Program).

1.03 SOFTWARE

A. The OWNER plans to utilize a computer-based inspection software to facilitate the complex task of acquiring accurate and detailed field-inspection information. For this and future contracts the OWNER has updated its data collection and data format specifications. The data collection software purchased and utilized by the OWNER is WinCan™. All inspection information furnished by the CONTRACTOR shall be written to digital media and shall be submitted in printed hard copy and electronic data format utilizing WinCan™. The WinCan™ software shall support the NASSCO PACP coding. The WinCan™ system consists of an integrated proprietary software application designed for pipe inspection reporting, DVD/CD control video picture, mini-movie capture and full length (manhole to manhole) capture of underground utilities. The OWNER will not accept data gathered utilizing another format. No “As equal” will be considered due to a proprietary integration between WinCan™ and “Maximo” (OWNER’s CMMS system). These records shall include, but not be limited to the following: Manhole reports, inclination reporting, inspection reports, lateral reports, and infiltration reports. WinCan America Inc., can be contacted at 1730 Montano Road NW, Suite E, Albuquerque, NM 87107, Phone: (505) 341-0109.

1.04 EQUIPMENT

A. The television camera used for the survey shall be one specifically designed and constructed for such survey and shall be of the pan and tilt type. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 700-line resolution color video picture. The CONTRACTOR shall maintain camera in clear focus at all times. Picture quality and definition shall be to the satisfaction of the OWNER; and if unsatisfactory, equipment shall be removed and replaced with adequate equipment at no additional cost to the OWNER.
B. The video camera shall include a titler feature capable of showing on the tape the following information:

1. City and State
2. Date/Time
3. CONTRACTOR's Name
4. Line Size, Material, and Depth
5. Manhole Identification (both manholes)
6. On-going Footage Counter

1.05 SUBMITTALS

A. 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.

PART 2 - PRODUCTS

All inspection information and data (including video) written to digital media (CD-ROM).

PART 3 - EXECUTION

3.01 POST CONSTRUCTION SURVEY

A. Procedure

1. The entire sewer line (from manhole to manhole) shall be televised. The camera shall be placed at the center of the manhole and videotaping shall commence prior to entering the pipe. The CONTRACTOR shall show the inside of the manhole walls and the pipe connection to the wall at both the upstream and downstream manhole.

2. The camera shall be moved through the line in either direction at a moderate rate, stopping when necessary to permit proper documentation of the sewer's condition. In no case shall the television camera be pulled at a speed greater than 30 feet per minute. Manual winches, power winches, TV cable, powered rewinds and tractors or other devices that do not obstruct the camera view or interfere with proper documentation of the sewer conditions shall be used to move the camera through the sewer line. If the camera is being pulled through the sewer line by a hydraulic cleaning unit hose the cleaning nozzle shall be located a minimum of eight (8) feet away from the camera to allow a clear, unobstructed view. Jet nozzle shall be used in front of camera while televising through a dip to draft out water. If, during the survey operation, the television camera will not pass through the entire manhole section, the CONTRACTOR shall set up his equipment so that the survey can be performed from the opposite manhole.
3. Whenever non-remote powered and controlled winches are used to pull the television camera through the line, telephones or other suitable means of communication shall be set up between the two manholes of the section being surveyed to insure good communications between members of the crew.

4. Measurement for location of defects shall be above ground by means of a meter device. Marking on the cable, or the like, which would require interpolation for depth of manhole, will not be allowed. Measurement meters shall be accurate to tenths of a foot over the length of the section being surveyed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, electronic distance meter or other suitable device. Manhole numbers and linear footage shall be shown on screen during taping.

5. Movement of the television camera shall be temporarily halted for a minimum of ten seconds at each visible point source of infiltration and/or inflow until the leakage rate from that source is quantified. The camera shall be stopped at all service connections and the service lateral shall be inspected with the pan and tilt camera. The camera shall also be stopped at active service connections where flow is discharging. If the discharge persists, the property involved shall be checked to determine whether or not the discharge is sewage. If no flows are being discharged from the building, it shall be considered that the observed flow is infiltration/inflow.

B. Field Documentation

1. Television Inspection Forms (Survey Logs). Printed and electronically stored location records shall be kept by the CONTRACTOR and will clearly show the location in relation to an adjacent manhole of each infiltration point observed during survey. Upstream footage at face of manhole (0) and downstream footage at face of manhole (e.g., 250) shall be shown on the log. The television inspection forms to be utilized by the CONTRACTOR shall be those mandated by NASSCO’s PACP. Both the “Header” and “Details” information of the form shall be entered as indicated in the PACP standards. The survey logs shall include, but not be limited to the following information:

   a. Correct pipe segment/manhole numbers
   b. Correct address of manhole location
   c. Pipe size, length and material
   d. Manhole depth (up and downstream)
   f. Lift station service area number
   g. CD number and index
   h. Footage locations and descriptions of repairs

The terminology to be used shall follow NASSCO’s PACP standards. All information will be recorded and a copy of such electronic records and a hard copy will be supplied to the OWNER.
2. **Photographs.** Digital photographs of the television picture of problems shall be taken by the CONTRACTOR upon request of the OWNER.

3. **Video Recordings.** The purpose of video (CD-ROM) recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. CD-ROM recording playback shall be at the same speed that it was recorded. Slow motion or stop motion playback features shall be supplied by the CONTRACTOR. Once recorded, the CD-ROM becomes property of the OWNER. The CONTRACTOR shall have all CD-ROM and necessary playback equipment readily accessible for review by the OWNER during the Project.

The observation terminology utilized during audio narration shall be consistent with NASSCO’s PACP standards. The television inspection shall be video recorded on high quality CD-W. All video burning shall be performed using the Win Can™ system. The CD shall be clearly labeled with the lift station number and individual manhole numbers clearly listed. The CDs are to be furnished to the OWNER with a printed hard copy (Survey Logs) and electronic data inspection report.

Video CDs displaying poor video quality will be deemed unacceptable and no payments will be made until lines are retelevised and a new CD is submitted. Poor video quality refers to, but is not limited to, the following: grease or debris on the lens, camera under water, picture too dark, excessive camera speed through the line, lines improperly cleaned, poor/no audio, etc.

4. **Audio.** All CD-ROM shall have audio record. As a preamble, at the beginning of the CD-ROM, the CONTRACTOR shall state the following: (Contractor’s Name) is performing a post TV survey for Job No. ________ (provided by the OWNER), North Miami™. State date, time, operator’s name, area, upstream manhole number to downstream manhole number, pipe size and material, upstream manhole depth, and TV survey will be from up- to downstream, or down- to upstream. The CONTRACTOR shall verbally state station and position of all laterals and defects. At the end of each line, state: “End of line”, upstream manhole number to downstream manhole number, and total linear footage.

5. **In addition,** the CONTRACTOR shall stop camera at all point repairs, sectional repairs, and reinstated laterals, and inspect entire repaired pipe section.

6. **The CONTRACTOR shall invert white foreground to black as needed in the line section with light background.**

7. **In the case of a post-liner survey,** the CONTRACTOR shall fully televise both ends of the liner at the manhole so that the fit of the liner to the host pipe can be evaluated. At the conclusion of a television survey for a given liner, the CONTRACTOR shall physically turn the camera around to film the liner end, so that the camera is facing back in the direction it just traversed, to ensure an adequate and complete picture.

8. **The post-liner television survey shall be done within 2 weeks of liner installation.**

- END OF SECTION -
SECTION 02753 - MANHOLE REHABILITATION

PART 1 - GENERAL

1.1 SCOPE

A. Work orders will include the various manhole repairs specified in this Section. Manhole rehabilitation shall be accomplished by the application of materials that will improve the overall structural condition of the manhole. The intent of this portion of the work is to provide for aspects of sewer manhole rehabilitation and sealing using various procedures either singularly or in combination, including type of repair, methods of repair, materials and equipment as required for each manhole scheduled for rehabilitation.

1. Manhole Preparation: These work items include cleaning the manhole, sealing walls and patching the interior surfaces.

2. Manhole Repairs - Critical Leak Areas: These work items include repairing leaks in the wall to base areas, pipe penetrations and manhole joints.

3. Manhole Liners: These work items include installation of cementitious liners, cementitious/polymeric liners, and high-density polyethylene (HDPE) liners.

4. Frame and Cover Repairs: These work items include the repair of frame and cover leaks, realigning and grouting frame, and frame and cover replacement.

1.2 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings and other information as specified in accordance with Section 01300, "Submittals".

B. With the bid, the following submittals are required.

1. Name, business address and telephone number of the Manhole Rehabilitation CONTRACTOR.

2. The name of the manhole lining product suppliers and a list of materials to be furnished, as well as CONTRACTOR’s experience with the specified manhole lining products (number of years installing the products, number of manholes lined with the products, and list of references going back five years including customer names, addresses, telephone numbers, and number of manholes). Where the CONTRACTOR proposes to utilize a sub-contractor to apply a manhole lining product, submit all required information for the sub-contractor as well.

3. Five years of previous related experience, as documented by verifiable references, shall be required to be qualified in bidding this project. The Contractor performing the work shall be fully qualified, experienced and equipped to complete this work expeditiously and in a satisfactory manner and shall be an approved installer of the manhole lining systems as certified and licensed by the manufacturers.

4. The Owner reserves the right to approve or disapprove the Contractor, based on the submitted qualifications.
C. Prior to contract award, the following submittals are required.

1. Name(s) of all supervisory personnel to be directly involved with Manhole Rehabilitation for this project. 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 will be directly involved with and used on this project. Substitutions of personnel and/or methods will not be allowed without written authorization of the OWNER.

2. A certified statement from the manufacturer that the CONTRACTOR is a certified and/or licensed installer of the manhole lining products. CONTRACTOR shall initiate and enforce quality control procedures consistent with the manufacturer's recommendations. Applicators shall be completely trained and specialized in all aspects of manhole rehabilitation including grouting/sealing for active leak repair, surface preparation and wastewater corrosion materials applications.

3. Written descriptions of the manufacturer-recommended procedures for surface preparation, installation, curing, and testing of the specified manhole repair and lining products; construction method(s) and equipment to be used; and locations required for equipment and material access.

4. Where CONTRACTOR is proposing use of an alternate product “equal” to those specified, such use shall be subject to OWNER review and approval. The product must meet the OWNER’s new product evaluation criteria or have been previously tested by the Miami-Dade Water and Sewer Department and approved for use in that particular condition.

1.3 GUARANTEE

A. All manhole lining installed shall be guaranteed by the CONTRACTOR for a period of two years from the date of final acceptance. During this period, all defects discovered in the lining, as determined by the OWNER, shall be repaired or replaced in a satisfactory manner by the CONTRACTOR at no cost to the OWNER.

B. The CONTRACTOR is responsible for properly preparing the existing manhole for lining prior to the installation of the lining system, including stopping all leaks, patching voids, removing steps/manhole rungs, cleaning, removing rubble, root removal, etc.

1.4 DELIVERY, STORAGE AND HANDLING

A. Care shall be taken in shipping, handling and placing to avoid damaging the lining products. Any lining product or material damaged in shipment shall be replaced as directed by the OWNER.

B. Any lining product showing deterioration, or which has been exposed to any other adverse storage condition that may have caused damage, even though no such damage can be seen, shall be marked as rejected and removed at once from the work site.

C. While stored, the lining products shall be adequately packaged and protected. The lining products shall be stored in a manner as recommended by the manufacturer.
1.5 SITE CONDITIONS

A. Applicator shall conform to all local, state, and federal regulations including those set forth by OSHA, the EPA, and other applicable authorities.

B. Confined space entry, flow bypass, or maintenance of traffic plans shall be prepared by the CONTRACTOR as required to perform the specified work.

PART 2 - PRODUCTS

2.1 MANHOLE FRAMES AND COVERS

A. All manhole frame and cover material and installation requirements shall be as indicated in the Drawings.

B. Replacement of manhole frames and covers shall be pursuant to requirements outlined in Section 02754.

2.2 RUBBER SEALS

A. The manhole frame-chimney joint area of manholes and the precast manhole barrel joints shall be sealed with internal flexible rubber seals as manufactured by Cretex Specialty Products, or equal.

B. Internal rubber seals used for sealing the joints between the manhole frame and chimney or corbel/cone section, shall consist of the following components:

1. Rubber Sleeve and Extension: The flexible rubber sleeve extensions and wedge strips shall be extruded from a high-grade rubber compound conforming to the applicable requirements of ASTM C 923, with a hardness (durometer) of 48±5.

   a. The sleeve shall be double pleated with a minimum unexpanded vertical height of 8 inches, a minimum thickness of 3/16 inches and shall be capable of a vertical expansion when installed of not less than 2 inches. The top and bottom section of the sleeve shall contain an integrally formed expansion band recess and multiple sealing fins.

   b. The extension, if required, shall have a minimum thickness of 3/16 inches. The top section of the extension shall be shaped to fit into the bottom band recess of the sleeve under the bottom chimney seal band. The bottom section of the extension shall contain an integrally formed expansion band recess and multiple sealing fins matching that of the rubber sleeve.

   c. 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.

   d. The continuous wedge strip used to adapt the rubber sleeve to sloping surfaces shall have the slope differential needed to provide a vertical band recess surface, be shaped to fit into the band recess and have an integral band restraint. The length of the wedge strip shall be such that,
when its ends are butted together, it will cover the entire inside circumference of that band recess needing slope adjustment.

2. **Expansion Bands**: The expansion bands used to compress the sleeve against the manhole shall be 16-gauge stainless steel conforming to ASTM A 240, Type 316, with a minimum width of 1 3/4 inches. The expansion mechanism shall have the capacity to develop the pressures necessary to make a watertight seal and shall have a minimum adjustment range of 2 diameter inches. Studs and nuts used for this mechanism shall be stainless steel conforming to ASTM F 593 and 594, Type 316.

2.3 **PREPARATORY INFILTRATION CONTROL PRODUCTS**

A. **Infiltration Control/Plugging Material**

1. Prior to installing the manhole lining system, active infiltration shall be controlled according to the specifications of the lining manufacturer. Infiltration control materials shall be rapid-setting, high early strength, hand applied cementitious material for stopping infiltrating water and making repairs to concrete, brick or other masonry constructed manholes. The material shall be non-shrinking, non-metallic and non-corrosive. It shall be formulated at the factory and supplied in factory sealed and labeled pre-measured containers. The material shall be compatible with the lining material to be used.

2. Product shall be Permacast-Plug as manufactured by Action Products Marketing Corp., Strong-Plug by Strong Company, Preco-Plug by Fosroc Inc., or equal.

B. **Chemical Grouting Material**

1. Chemical Grouts may be used for stopping very active infiltration and shall be mixed per manufacturer’s recommendations and as specified in Section 02763-Chemical Grouting. The chemical grout shall be an extremely low viscosity acrylamide resin with gel times from 5 seconds to several hours. Product shall be AV-100 Chemical Grout as manufactured by Avanti International, or equal. The chemical grout shall be compatible with the lining material to be used.

C. **Patching Material**

1. Voids in the existing manhole walls or damaged inverts shall be repaired prior to installing the manhole lining system. The patching material shall be a rapid setting, high early strength, corrosion resistant hand mixed and hand applied cementitious material intended for filling voids and repairing inverts in concrete, brick or other masonry constructed manholes. It shall be formulated in the factory and supplied in factory sealed and labeled pre-measured containers. The material shall be compatible with the lining material to be used.

2. Product shall be Permacast-Patch as manufactured by Action Products Marketing Corp., Strong-Seal QSR by Strong Company, Preco-Patch by Fosroc Inc., or equal.
2.4 CEMENTITIOUS LINER MATERIALS

A. Liner Material:

1. The liner material shall be ultra-high strength, high build, corrosion resistant, mortar based on Portland cement and Microsilica fortified with a bacteria inhibitor of pure fused calcium aluminate cementitious liner. The liner shall be used to form the structural/structurally enhanced monolithic liner at a minimum thickness of one inch covering all interior manhole surfaces, including the bench.

2. Product shall be PERMACAST MS- 10,000 with CON-SHIELD as manufactured by AP/M Permaform, SewperCoat as manufactured by Lafarge Calcium Aluminates, or equal.

B. Water: Water shall be clean and potable.

C. Other Materials: No other material shall be used with the above mixes unless approved by the manufacturer and acceptable to the OWNER.

2.5 HIGH DENSITY POLYETHYLENE LINER MATERIAL

A. The CONTRACTOR shall furnish and install all labor, materials, equipment, and incidentals required to rehabilitate existing sewer manholes with a minimum 2 mm (0.079 inches) HDPE liner insert.

B. The HDPE liner rehabilitation system shall be designed to protect the interior surface of the structure from acid corrosion, abrasion, and impact, and to eliminate groundwater infiltration and restore structural integrity to the existing structure.

C. Installation of the liner insert on manholes shall be performed without requiring the removal of any component part of the existing structure or excavation of the site, except for the removal of the existing bench and invert and any loose or corroded material separated from the structure during the pressure cleaning process.

D. Liner attachment to existing structure shall be made using a mechanical bond between the liner anchors and poured new concrete.

E. The CONTRACTOR shall submit shop drawings, manufacturer’s installation instructions, the thermo-welding specifications of the liner manufacturer, and a copy of the liner thermo-welder’s certification issued by the manufacturer.

F. The HDPE liner shall be free of pores, pinholes, voids and foreign bodies. All anchoring studs shall be manufactured during the extrusion process in one piece with the sheet. No welding to attach the studs to the sheet or mechanical finishing work is permitted. Additionally, all welding rod, profile strips, cap strips and polyester backed transition wrap shall be manufactured from the same resins by the same manufacturer.

G. Studded HDPE liner sheets used for manhole rehabilitation shall have a minimum design thickness of 2 mm (0.079 inches) and have a minimum of 39 wedge shaped anchoring studs per square foot of liner. Minimum stud height shall be no less than 13 mm (0.51 inches) with a minimum length of 14 mm (0.55 inches).
H. Transitions from dissimilar materials, such as PVC pipe to HDPE liner, shall be accomplished using a polyester backed HDPE transition wrap.

I. Liner insert shall be constructed with a minimum overall inside dimension six inches less than the original inside dimension of the structure to be rehabilitated. The resulting void will be poured with concrete. The concrete used to anchor the liner shall be Type II Portland cement producing an average 4,000 psi compressive strength in 28 days. Concrete shall be poured or pumped in place and vibrated to eliminate voids. The forming system used to support the liner during the concrete pour shall be capable of bracing the liner against compression that would result from the pouring and vibrating of concrete into the void between the liner and the existing wall.

J. The CONTRACTOR shall utilize an internal steel forming system for placing a new and structurally independent 3-inch concrete wall, within the existing manhole structure.

K. HDPE liner shall be Agru Sure Grip as manufactured by Agru America, Inc. or equal.

2.6 AROMATIC URETHANE SEALANT

A. The flexible sealant shall be a two component, aliphatic, chemically curing, urethane sealant. The sealant shall be designed for flexibility from ground movement and extended water immersion when applied to the inside wall of the adjustment ring area. Manhole seal shall be designed to prevent leakage of water into the manhole through the frame joint area and the area above the manhole cone, including all extensions to the chimney area. Extension shall include, but is not limited to, lifting rings, brick and/or block material that may have been used to achieve grade. The material shall not corrode in municipal sewer environments.

B. The sealant shall be Ring Seal as manufactured by The Rain Stopper, Flex-Seal Utility Sealant as manufactured by Sealing Systems, Inc., or equal.

C. A primer coat of 2-3 mils thickness shall be applied to the prepared surface.

D. The flexible sealant shall be applied on primed surfaces at a thickness of 100 mils or as specified by the OWNER. The overlap of the bottom portion of casting and the top of the lowest adjustment ring should be 3-inches or greater.

2.7 CEMENTITIOUS/POLYMERIC COATING SYSTEMS

A. Cementitious Coating

1. The material applied onto the surface of the manhole shall be a micro-silica and fiber enhanced cement mortar repair product formulated for the application within a sanitary sewer environment. The fiber-reinforced spray-applied cementitious mortar must exhibit suitable corrosion resistance, restore structural integrity, seal rough deteriorated surfaces and resist external hydrostatic water pressure. The mortar shall be capable of being applied over wet surfaces without degrading the final product. The product shall be formulated at the factory, and supplied in factory sealed and labeled pre-measured containers.

2. The cured cementitious base coat shall be continuously bonded to all the brick, mortar, concrete, chemical sealant, grout, pipe and other surfaces inside the
sewer manhole. The cementitious base coat shall be applied to the following minimum total thicknesses:

a. For block and cast concrete manholes in good condition, apply to a minimum thickness of 0.5 inch.

b. For all brick manholes and for block or cast concrete manholes in poor condition, apply to a minimum thickness of 1.0 inch.

3. Product shall be MS-10,000 Mortar as manufactured by AP/M Permaform, Strong-Seal MS-2A as manufactured by The Strong Company, Inc., Renderoc SP 15 as manufactured by Fosroc Incorporated, HD Mortar as manufactured by Epoxytec, or equal.

B. Polymeric Coating

1. The topcoat material shall be specifically made to provide protection against future deterioration and corrosion. Material shall be non-toxic, non-explosive and highly resistant to acids, bases and hydrocarbons.

2. The polymeric material shall be suitable for all the specified design conditions. The polymeric material shall be compatible with the base coat material, as per manufacturer's recommendations.

3. The polymeric material shall be self-priming; moisture tolerant to moisture levels of concrete up to 90 percent; able to react/perform in the presence of water; able to tie back into itself, overcoat or repair itself indefinitely with proper preparation; and capable of curing properly within the specified environment within a short time period.

4. The polymeric lining system shall be installed over the cementitious base coat previously applied on the walls of the designated manholes. The polymeric liner shall be applied only after the cementitious base coat has set sufficiently, per manufacturers recommendations.

5. When cured, the monolithic polymeric lining shall form a continuous, tight-fitting, hard, impermeable surfacing which is suitable for sewer system service and chemically resistant to any chemicals or vapors normally found in domestic sewage. The polymeric lining shall be continuously bonded to the base coat. The cured surface of the polymeric liner shall be smooth and continuous with proper sealing connections to all unsurfaced areas.

6. The polymeric lining shall be installed so as to overlap the bottom of the manhole cover frame by a minimum of 1 inch. The lining shall be continuously bonded to the manhole cover frame around the circumference of the frame. Where the cementitious base coat has been stopped below the manhole frame in traffic areas, additional polymeric material shall be applied to the gap to bring the final surface flush with the surrounding top coat material.

7. The polymeric top coat materials shall be applied to the minimum dry film thickness of 100 mils (0.10 inches).
8. Any polymeric lining system that has failed the testing program conducted by the County Sanitation Districts of Los Angeles County (the Redner Tests) will not be allowed.

9. Product shall be AquataPoxy as manufactured by Raven Lining Systems, Epoxytec Uroflex as manufactured by Epoxytec International Inc., Sauereisen-210 as manufactured by Sauereisen, or equal.

C. Other Materials

1. No other materials shall be used with the above mixes unless approved by the manufacturers and acceptable to the OWNER.

PART 3 - EXECUTION

3.1 GENERAL

A. The CONTRACTOR shall perform all work in strict accordance with all applicable OSHA Standards. Particular attention is drawn to those safety requirements involving man entry in confined spaces.

B. Flow Control: Flow control, as specified in Section 02750, "Wastewater Flow Control" shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the manhole under repair.

C. Prior to beginning work, the OWNER will visually review the manhole and confirm the repair procedure indicated on the Work Order.

D. The CONTRACTOR shall notify all property owners who discharge sewage directly to the manhole being repaired that their service will be discontinued while the lining is being placed, cured and active pipe and service connections reopened. The CONTRACTOR shall notify individual property owners at least 72 hours in advance, giving the date, start time and estimated completion time for the work being conducted. This notification shall be coordinated with the distribution of the door hangers. The CONTRACTOR shall reopen all of the existing active pipe connections in each sewer manhole following the repair.

3.2 PREPARATION

A. General:

1. All manholes listed in Work Orders for repairs shall be cleaned as indicated in Section 02751, "Preparatory Cleaning and Root Removal".

2. The casting and adjusting area of the manhole shall be sandblasted to remove any loose material and rust.

3. Prior to cleaning the manhole, a ¼-inch mesh screen shall be installed at the manhole outlet to catch debris. The CONTRACTOR shall clean all accumulations of debris, such as dirt and grease, loose mortar, bricks and concrete, and dispose of properly.

4. The manhole surface shall be clean, structurally sound and free from oil, grease,
loose mortar, paints, protective coatings, efflorescence, laitance and airing compounds. The condition of the manhole may require the use of an environmentally safe degreasing compound; if so, the surface shall be thoroughly rinsed to eliminate any residue.

5. All existing manhole rungs/steps shall be removed and the void patched or cut off and ground smooth.

6. When a cementitious liner or cementitious/epoxy liner is called for in the Work Order, manhole interior shall be high-pressure (4,000 psi) water cleaned and blasted to remove all deteriorated concrete and other loose material. As a minimum, 4 inches of the manhole cover frame area shall also be cleaned by blasting. After the cleaning process, the concrete structure shall be washed with a 5-10 percent solution of muriatic acid. The structure shall be cleaned again with high pressure water to remove acid residual and any loose material. The CONTRACTOR shall make provisions during blasting operations to contain all blasting abrasive material. No blasting abrasive shall be allowed into the sanitary sewer lines.

B. Sealing of Manhole Walls:

1. After the completion of the cleaning operation, manhole wall leaks shall be sealed by the following methods:

   a. Plugging using the infiltration control material specified in Article 2.03, and/or

   b. Patching using the material specified in Article 2.03, and/or

   c. Chemical Grout Sealing using material specified in Article 2.03.

   i. **Equipment:** The basic equipment shall consist of chemical pumps, chemical containers, injection packers, hoses, valves, and all necessary equipment and tools required to seal manholes. The chemical injection pumps shall be equipped with pressure meters that will provide for monitoring pressure during the injection of the chemical sealants. When necessary, liquid bypass lines equipped with pressure-regulating bypass valves will be incorporated into the pumping system.

   ii. **Sealing Procedures:** At each point of leakage within the manhole structure, a hole shall be carefully drilled from within the manhole and shall extend through the entire manhole wall. In cases where there are multiple leaks around the circumference of the manhole, fewer holes may be drilled, providing all leakage is stopped from these holes. Grout ports or sealant injection devices shall be placed in these previously drilled holes in such a way as to provide a watertight seal between the holes and the injection device. A hose, or hoses, shall be attached to the injection device from an injection pump. Chemical sealing materials as specified shall then be pumped through the hose until material refusal is recorded on the pressure gage mounted on the pumping unit or a
predetermined quantity of sealant has been injected. Care shall be taken during the pumping operation to ensure that excessive pressures do not develop and cause damage to the manhole structure. Upon completion of the injection, the ports shall be removed and the remaining holes filled with mortar and troweled flush with the surface of the manhole walls or other surfaces. The mortar used shall be a non-shrink patching mortar.

2. All materials shall be mixed and applied in accordance with the manufacturer's written instruction. Leaks may be temporarily channeled through "bleed" pipes which are removed and plugged during the final repairs. The manhole sealing repair shall be acceptable to the OWNER before additional work proceeds.

C. Patching: Loose material shall be removed from the area to be patched or repointed exposing a sound subbase. Holes or voids around steps, joints or pipes, spalled areas and cavities caused by missing or broken brick shall be patched and missing mortar repointed using a non-shrink patching mortar specified in Article 2.03. Cracks not subject to movement and greater than 1/16 inch in width shall be routed out to a minimum width and depth of 0.5 inches and patched with non-shrink patching mortar.

3.3 MANHOLE LINERS

A. Cementitious Liner (Spray or Spin Applied): On those manholes identified by the OWNER, the CONTRACTOR shall install the cementitious liner to the wall and bench surfaces of brick or concrete, using the following procedure:

1. Preparatory Repair:
   a. Leakage around pipe entering manhole shall be sealed.
   b. Any service line repairs shall be made using a quick-setting patching mix per manufacturer's recommendations.

2. Mixing: If ambient temperatures are in excess of 95°F, precautions shall be taken to keep the mix temperature at time of application below 90°F. Mix water temperature shall not exceed 80°F. Chill with ice, if necessary.
   a. Should the reconstruction process require application thickness greater than 1-inch, a base coat shall be used to build the substrate to within 1-inch of the finished dimension. For each bag of product, use the amount of water required per manufacturer's recommendation following mixing procedures as noted on product bag and using the manufacturer-approved equipment for mixing and application.
   b. The base coat material is to be applied in multiple passes. Each application thickness shall not exceed 0.5 inches.
   c. The final coat shall be as a whole a minimum thickness of 1-inch throughout. For each bag of product, use the amount of water or water settings required per manufacturer's recommendations following mixing procedures noted on product bag and using the manufacturer-approved
equipment for mixing and application.

d. Prepared mix shall be discharged into a hopper and mixing shall continue to occur in such a manner as to allow spraying continuously without interruption until each application is complete.

3. Application:

a. The surface, prior to spraying base coat applications, shall be clean and free of all foreign material and shall be damp without noticeable free water droplets or running water, but totally saturated, just prior to application of each coat. Materials shall be spray applied from the bottom of the wall to the top, to within 1-inch of the original substrate dimension using as many passes as necessary but each application shall not exceed 0.5 inches. The surface is to be rough troweled after each pass. The light troweling is performed to assure that material penetrates the voids and sets the bond.

b. A final application is applied after the base coat applications have begun to take an initial set (disappearance of surface sheen). The final application shall be a minimum thickness of 1-inch. Again, application shall be from the bottom up. The surface is then troweled to a smooth finish being careful not to over finish or over trowel so as to bring additional water to the surface and weaken it. A brush finish is then applied to the troweled finish or top coat surface. Manufacturer’s recommendations shall be followed whenever more than 24 hours have elapsed between applications.

c. Bench and Invert Application: The bench shall be sprayed with materials mixed per specifications and spray applied in such a manner that a gradual slope is produced from the walls to invert with the thickness at the edge of the invert to be no less than 1 inch. The wall / bench intersection shall be rounded to a uniform radius the full circumference of the intersection. Through the use of flow-through plugs, the CONTRACTOR shall isolate the channel invert, clean and inspect the invert. If the invert has active infiltration, signs of infiltration, cracks or deterioration, the invert shall be sprayed with the materials specified.

d. Where the manhole to be rehabilitated is subject to vehicular traffic, the cementitious lining shall be installed to no closer than 1 inch below the bottom of the manhole frame so as to avoid transfer of impact loads to the new liner. Where the manhole to be rehabilitated is not subject to vehicular loads, the cementitious liner shall be continuous up to the manhole frame.

4. Curing: Caution should be taken to minimize exposure of applied product to sunlight and air movement. If application of additional coat is to be longer than 15 minutes, the manhole shall be covered. At no time should the finished product be exposed to sunlight or air movement for longer than 15 minutes before placing the manhole cover. If ambient humidity level is below 70 percent, it shall be necessary to keep finished product damp for the first seventy-two hours.
a. **Curing Time:** The final application shall have a minimum of eight hours cure time before subjected to active flow, or greater if recommended by the manufacturer.

b. **Traffic:** Traffic shall not be allowed over manholes for twenty-four hours after reconstruction is complete.

5. **Frame-Joint Area Sealing System:** A minimum of 7 days after the cementitious liner has been installed, the CONTRACTOR shall install the aromatic urethane internal manhole sealing system through the frame joint area. As a minimum, 4 vertical inches shall be applied on the frame, and 6 vertical inches on the cone area. Any material left on the frame from the application of the cementitious liner shall be wire-brushed prior to sealant application. Ring Seal or equal may require the proper mixing of agents, as recommended by the manufacturer’s instructions. Ensure casting and structure are clean and dry prior to applying Adhesive Primer. Brush the adhesive primer onto the casting and structure surfaces where the mastic is intended to adhere. After allowing for proper drying of adhesive primer to occur, sealant may be applied by brush as evenly as possible over the chimney area, that includes the frame joint area and the area of the manhole cone, including all extension to the chimney area. Cost for this item shall be included in the bid item for cementitious manhole liner.

6. **Testing:** Six 2-inch cubes shall be cast each day or from every 50 bags of product used. The test specimen shall be properly labeled and given to the OWNER for compression strength testing as described in ASTM C 109.

7. **Warranty:** The manufacturer shall warrant that the products are produced in conformity with its standard specifications or formulations within recognized tolerances, free of adulteration or contamination, and that the product will perform in accordance with representations in the manufacturer’s literature and technical data sheets when properly applied in strict conformance with the printed instructions on container and prescribed in technical data instructions and when applied to a properly prepared surface.

B. **HDPE Liner:** On those manholes identified in the Work Order, the CONTRACTOR shall install an HDPE liner to the wall and bench surfaces.

1. It is the intent of this portion of the specification to provide for reconstruction of the manhole by the utilization of a pre-fabricated thermo-welded liner. The liner shall continuously cover the exposed surfaces of the manhole and provide structural enhancement and corrosion resistance.

2. The finished liner shall be formulated from materials specified in Article 2.05.

3. The existing manhole shall be prepared for the application of the HDPE liner system using methods of cleaning and stoppage of flowing water as specified. Prior to applying the liner, the entire manhole wall surface shall be cleaned to remove corroded and loose material and check for through wall leaks and repair if needed.

4. In manholes with a concrete base, drill hole up to ½-inch diameter to confirm the existence of the base. Once the base is confirmed, remove the benches and
channel and extend the liner to the floor. Flow channel and benches shall be reconstructed after liner installation. If a concrete base does not exist, install liner in the manhole to abut into the existing bench. Once the liner is cured, overlay the bottom 6-inches of the liner from the bench and above with a 3-inch wide concrete ring, within the periphery of the manhole. The concrete mortar shall be fortified with a bacteria inhibitor. An alternate to the concrete ring is to provide and place a flexible and corrosion resistant sealant to seal between the bench and the liner. In addition, a moisture tolerant epoxy mortar (Sauzerizen 201T or approved equal), shall be trowelled on top of the bench and sealant up to the liner with ¼-inch thickness. The alternate application shall be pre-approved by the OWNER.

5. The HDPE liner shall continue from the cone section to include the chimney up to the existing manhole frame. The chimney section shall be applied by means of an appropriate two-part epoxy compound in conjunction with a 3-millimeter HDPE/polyester back liner, compatible with the HDPE material used for the manhole walls. The HDPE/polyester material shall be adhered to the cone/chimney section using the two-part epoxy compound and stainless-steel anchors. All seams and anchors shall be thermal welded and subject to the same holiday testing as the manhole walls.

6. The following steps shall be followed for the installation of manhole liners:
   a. Insert prefabricated HDPE liner into structure. Locate pipes and make cutouts for pipes in liner.
   b. Extend existing pipes by means of HDPE “Top Hat”-style pipe extensions with short pipe sections wrapped with polyester backed HDPE transition wrap. Use mandrel to hold new pipe extensions in place and in alignment with existing pipes. Thermo-weld pipe extensions back to liner.
   c. Install sectional support form, or steel forming method, inside of liner insert.
   d. Pour or pump high flow 4,000 psi concrete mix in void (3 inches wide) between stud side of liner and existing manhole. Vibrate thoroughly to consolidate concrete. Allow curing for a minimum of six hours from time of concrete placement.
   e. Remove forming system, inspect liner, spark test all thermo-welds.
   f. Rebuild concrete bench and invert channel, or fillet, in place.

C. Cementitious/Polymeric Liners

1. Those manholes identified by the OWNER shall be coated with an extremely low shrinkage cementitious repair product to waterproof and enhance the structural integrity of the manhole and then polymeric topcoat for corrosion protection after the manhole has been properly prepared.

2. The material used shall be designed, manufactured, and intended for sewer
manhole rehabilitation and the specific application in which they are used.

3. The selected product or system must bear the manufacturer’s certification that it will fulfill the requirements described herein when applied in accordance with the manufacturer’s recommendations.

4. The materials shall be delivered to the job site in original unopened packages and clearly labeled with the manufacturer’s identification and printed instructions. All material shall be stored and handled in accordance with recommendations of the manufacturer.

5. Preparatory Repair
   a. Any bench, invert or service line repairs shall be made at this time using the quick setting patching material per manufacturer’s recommendations.
   b. Invert repair shall be performed on all inverts with visible damage or infiltration. After blocking flow through the manhole and thoroughly cleaning the invert, the quick setting patch material shall be applied to the invert at a minimum thickness of 1 inch, extending out into the bench sufficiently to tie into the monolithic liner to be spray applied. The finished invert shall be smooth and free of ridges. The flow may be re-established in the manhole within thirty minutes after placement of the material.
   c. Active leaks shall be stopped using quick setting, specially formulated mixes according to manufacturer’s recommendations. Some leaks may require weep holes to localize the infiltration during the application. After application, the weep holes shall be plugged with the quick setting mix prior to application of the final coat. When severe infiltration exists, drilling may be required to pressure grout using grouting procedures. Manufacturer’s recommendations shall be followed when pressure grouting is required.

6. Cementitious Liner Application
   a. The CONTRACTOR shall furnish and place the cementitious base coat in each manhole as and where directed by the OWNER. The installation and curing of the base coat shall be in complete accordance with the manufacturers’ specifications.
      i. Prior to placing the base coat, the OWNER and the CONTRACTOR must inspect and approve the surface preparation work. The CONTRACTOR shall notify the OWNER when the manholes are ready for inspection. The CONTRACTOR is responsible for ensuring proper installation conditions including surface preparation, temperature and moisture.
      ii. All bottom and horizontal surfaces shall have the base coat material applied to the required thickness by hand troweling or spray-on methods. All cementitious linings shall be troweled smooth after application.
      iii. All side vertical surfaces shall have the cementitious base coat
applied to the required thickness in one pass or application. Non-vertical surfaces may be completed in multiple passes to prevent sloughing of material.

iv. Temperature limitations must be handled as appropriate and as approved by the manufacturer.

b. Where the manhole to be rehabilitated is subject to vehicular traffic, the cementitious lining shall be installed to no closer than 1 inch below the bottom of the manhole frame so as to avoid transfer of impact loads to the new liner. Where the manhole to be rehabilitated is not subject to vehicular loads, the cementitious liner shall be continuous up to the manhole frame.

7. Polymeric Topcoat Application

a. The Contractor shall furnish and place polymeric lining as a top coat over the previously installed cementitious base coat in each manhole as and where directed by the OWNER. The installation and curing of the polymeric lining top coat shall be in complete accordance with the applicable provisions of the manufacturers’ specifications.

i. Prior to placing the top coat, the OWNER and the CONTRACTOR must inspect and approve the base coat. The CONTRACTOR shall notify the OWNER when the manholes are ready for inspection. The Contractor is responsible for ensuring proper installation conditions including base coat conditions, temperature and moisture.

ii. All surfaces shall have the monolithic polymeric lining applied by a spray-on method or by hand troweled applications in multiple passes to gradually build up to the required thickness.

iii. CONTRACTOR shall regularly perform and record polymeric coating thickness readings with a wet film thickness gauge to ensure uniform thickness during application.

iv. Temperature limitations must be handled as appropriate and as approved by the manufacturer.

8. Product Testing

a. Four, 2-inch cubes shall be cast each day or from every pallet of product used. The test specimens shall be properly labeled and given to the OWNER for compression strength testing as described in ASTM C 109.

3.4 FRAME AND COVER REPAIRS AND REPLACEMENT

A. Work Orders will identify one of the following repairs:

1. **Realign, Grout, and Seal Manhole Casting (Frame):** Remove the frame by excavating as necessary, lifting off the frame, thoroughly cleaning its bottom
bearing surface, coating it with asphalt paint similar to the original coating, removing the old mortar from the top of the wall and replacing it with a 2-inch (nominal) layer of new mortar consisting of one part of Portland cement to three parts of clean, washed sand, mixed with an adequate amount of water and carefully resealing the frame in its correct position. Realignment may be horizontal or vertical. Where vertical realignment is required, grade rings as described in Section 02754 may be required in order to raise the manhole frame and cover to the existing grade elevation. A minimum of 7 days after the manhole casting has been realigned and grouted, the CONTRACTOR shall install an aromatic urethane internal manhole sealing system through the frame-joint area.

2. Replace Manhole Ring and Cover and Install Seal: Where identified by the OWNER, cast iron rings and covers shall be replaced by the CONTRACTOR. The CONTRACTOR shall remove and replace the entire assembly with a new frame and cover. The frame shall be set on the manhole wall as described in Paragraph 1 entitled "Realign, Grout, and Seal Manhole Casting (Frame)" above. A minimum of 7 days after the manhole casting has been realigned and grouted, the CONTRACTOR shall install an aromatic urethane internal manhole sealing system through the frame-joint area.

3.5 RUBBER CHIMNEY SEAL

A. Where so indicated by the OWNER, a flexible rubber chimney sleeve shall be installed in manhole frame and chimney joint area with stainless steel expansion band to compress the sleeve and seal the chimney area between casting ring and manhole wall, or HDPE manhole liner.

3.6 INVERT REPLACEMENT

A. The CONTRACTOR shall remove existing channel and benches to the base of the manhole. Rebuild channel by reshaping channel invert and building new slope of shelves or benches. Work shall include aligning inflow and outflow ports in such a manner to prevent the deposition of solids at the transition point. All inverts shall follow the grades of the pipe entering the manholes. Changes in direction of the sewer and entering branch or branches shall have a true curve of as large a radius as the size of the manhole will permit, but will be shaped to allow easy entrance of maintenance equipment including buckets, TV camera, etc.

3.7 TESTING

A. After the specified rehabilitation work has been completed, the manholes shall be visually reviewed and tested in accordance with manufacturer’s testing procedures by the CONTRACTOR in the presence of the OWNER and found to be acceptable. The manhole environment shall be properly vented prior to testing to ensure hazardous conditions do not exist.

1. Visual Review:
   a. All rehabilitated manholes shall be visually reviewed for water tightness against leakage of water into the manhole. All visible leaks and defects observed during the review shall be repaired to the OWNER’s satisfaction.
at no additional cost to the OWNER. There shall be no visible infiltration.

b. All pipe connections shall be open and clear.

c. There shall be no cracks, voids, pinholes, uncured spots, dry spots, lifts, delaminations or other type defects in the lining.

d. The polymeric lining top coat shall provide a continuous monolithic surfacing with uniform thickness throughout the manhole interior and be free of pinholes, slumps and drips.

2. **Exfiltration Testing:**

a. Incoming and outgoing sewer and service lines shall be plugged, the plugs restrained and the manhole filled with water to the top of the manhole frame. A soaking period of up to one hour will be allowed if bypassing of the sewage is not required or has been provided for. At the end of this optional soaking period, the manhole shall be refilled with water and the test begun. The time shall then be recorded and after a period of not less than one hour has passed, the manhole again refilled, the amount required being carefully measured. The maximum allowable rate of exfiltration is 0.1 gallon per hour per vertical foot of depth of the manhole.

b. Exfiltration testing shall be done on 10 percent of the manholes, or on one manhole, if less than 10 are being repaired, as chosen by the OWNER, where each of the following type of repairs (sealing) has been performed:

i. Cementitious liner (spray applied).

ii. Cementitious liner with polymeric coating.

iii. HDPE liner.

c. Manholes that fail the exfiltration test shall be reworked and retested by the Contractor at no additional compensation and additional manholes will be retested at the Contractor’s expense. Any manholes that are visually leaking, are unacceptable, or fail the test shall be reworked and retested.

3. **Testing and Verification of Liners:**

a. The OWNER’s inspector shall verify the thickness of cementitious liners and polymeric coatings with a wet gauge. Any area found to be less than the minimum prescribed thickness shall immediately receive the additional material needed. The resultant lined manhole wall shall be leak-free, smooth and free of honeycomb or areas of segregated aggregate.

b. The HDPE plastic liner shall be securely embedded into the concrete to produce a continuous protective barrier.

c. Polymeric coatings and the surface and welds of HDPE liners shall be tested at 10,000 volts with a holiday detector for pinholes and holidays. Any defects shall be promptly repaired and re-tested. All repair procedures
shall follow manufacturer’s recommended procedures. Inspection and
testing shall be performed by the Certified Applicator in the presence of
the OWNER at no additional cost to the OWNER.

B. Field acceptance of the polymeric manhole lining system shall be based on the OWNER
’ s evaluation of the appropriate installation of the base coat and top coat per field
inspections and on observation of the measurements of the wet film thickness. Acceptance
shall also be based on the OWNER ’ s evaluation of the curing test data and final testing.

C. If any defective lining is discovered after it has been installed, it shall be repaired or
replaced in a satisfactory manner within a 72-hour period and at no additional cost to the
OWNER. This requirement shall apply for the entire guarantee period.

-END OF SECTION-
PART 1 - GENERAL

1.1 SCOPE

A. The work specified in this Section includes all labor, materials, accessories, equipment and tools necessary to install and test precast concrete manholes, with or without outside drop connections. Manholes shall be located on existing sewer line segments or at the intersection ("T") of existing sewer lines. Work in this section also includes frame adjustment, connections to existing manholes, and connections to existing sewer.

1.2 REFERENCES

A. American Society for Testing and Materials/Latest Edition

1. ASTM A-48 - Specification for Gray Iron Casting
2. ASTM C-62 - Specification for Sewer and Manhole Brick
3. ASTM C-139 - Specification for Concrete Masonry Units for Construction
4. ASTM C-443 - Specification for Joints for Circular Concrete, Sewer and Culvert
5. ASTM C-478 - Specification for Pre-Cast Reinforced Concrete Manhole Sections
6. ASTM C-923 - Specification for Resilient Connections Between Reinforced Concrete Manhole Structures and Pipes
7. ASTM C-1244 - Air Testing

1.3 SUBMITTALS

A. The CONTRACTOR shall submit Shop Drawings and other information for review in accordance with Section 01300 - Submittals, including: dimensions; elevations; dewatering, sheeting and bracing plans; cement type; concrete strength; reinforcement; lifting hooks; joint material; openings; castings; and other applicable information.

B. Qualification

1. The Qualifications of the Manhole Installation Contractor shall be submitted prior to contract award. These qualifications shall include detailed description of the following:
   a. Name, business address and telephone number of the Manhole Installation Contractor.
   b. Name(s) of all supervisory personnel to be directly involved with Manhole Installation Contractor for this project.
   c. The Manhole Installation 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 will be directly involved with and used on this project. Substitutions of personnel and/or methods will not be allowed without written authorization of the OWNER.
d. The Manhole Installation Contractor shall provide his references of previous project lists going back three (3) years including his customers’ name, address, and telephone number.

e. Three (3) years of previous related experience shall be required to be qualified in bidding this project.

1.4 UPLIFT

A. All precast concrete manhole placed below grade shall have adequate safety factors against uplift (excluding weight of soil and associated skin friction) as follows:

<table>
<thead>
<tr>
<th>Water Elevation</th>
<th>Safety Factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. High water level (H.W.L) -</td>
<td>3.0 feet NGVD</td>
</tr>
<tr>
<td>2. 100-year flood -</td>
<td>7.0 feet NGVD</td>
</tr>
</tbody>
</table>

PART 2 - PRODUCTS

2.1 FRAMES AND COVERS

A. All workmanship and materials shall be of the highest quality. The manhole ring and cover shall be the product of a manufacturer actively engaged in research, development, and manufacturing of watertight manhole rings and covers.

B. Castings for frames and covers for manholes shall be composed of best quality, tough, gray iron, free from cold shuts, blow holes, and other imperfections, and shall meet the requirements of ASTM A-48 for Class No. 30, designed for AASHTO Highway Loading Class H-20.

C. All bearing surfaces shall be machined to fit true and shall be watertight. No plugging or filling will be allowed.

D. The combined weight of the frame and cover shall not be less than 295 pounds and cover shall weigh a minimum of 145 pounds.

E. All manhole covers shall contain two non-penetrating pick holes.

F. Frame and cover shall be set to grade. Lid adapters or adjustment rings shall not be used on new construction.

G. Frames and covers shall be U.S. Foundry 170-CE-ORS or approved equal, bolted and watertight.

2.2 PRECAST MANHOLES

A. Precast concrete manholes or sections (hereinafter referred to as "precast sections") shall be furnished with waterstops, sleeves and openings as noted on the Drawings. Box out for wall pipes shall conform accurately to the sizes and elevations of the adjoining pipes. Precast sections shall be watertight and conform to the requirements of ASTM C 478 with reinforcement of ASTM A 615, Grade 60 bars and the following modifications there to:

1. The minimum wall thickness shall be 6 inches.

2. Cement to be used in precast manholes and grout shall be ASTM C 150, Type II.

3. The date and name of manufacturer shall be marked inside each precast section.

4. No more than 2 lift holes may be cast or drilled in each section.
5. Minimum 28-day concrete strength shall be 4,000 psi.

B. Walls of manholes shall be constructed of reinforced concrete ring sections with a minimum inside diameter of forty-eight (48) inches. Riser sections shall have tongue and groove ends (tongue on top of section). Top sections shall be of eccentric cone or flat slab top design as required by the Drawings. Eccentric cones shall have the same minimum wall thickness and area of circumferential steel reinforcement as the round riser sections. Flat slab tops shall have a minimum thickness of eight (8) inches and shall be reinforced with steel in accordance with the design requirements specified in ASTM C-478. Top sections shall have a top width of such design and dimensions as to properly support the required manhole frame and cover and the lower joint shall be of tongue and groove design.

C. Top sections of cones or flat tops shall have an opening of thirty (30) inches.

2.3 REINFORCED CONCRETE BASES

A. Pre-cast reinforced concrete bases shall normally be used in lieu of cast-in-place concrete bases.

B. The base, for either type, shall extend six (6) inches beyond the outside face of the manhole wall and shall be at least eight (8) inches thick.

C. Bottom section walls shall be monolithically cast with the base section to a minimum height of three (3) feet from the bottom of the base slab.

D. Pre-poured flow lines in base are generally not accepted and will be approved only after inspection of a completed example.

2.4 MANUFACTURER

A. Manhole structure and liner shall be manufactured by U.S. Precast Corporation, or approved equal.

2.5 PRE-CAST CONCRETE GRADE RINGS

A. Grade rings shall be pre-cast; reinforced concrete in solid rings a minimum of 8” wide from 1” to 4” thick.

B. Pre-cast concrete (grade) rings shall be manufactured in accordance with ASTM C-478.

C. Rings shall have dimensions matching inside diameter of cone or flat top sections and be of adequate outside diameter to support full manhole frame.

D. Field molding of grade rings is prohibited.

2.6 GRADE RING SEALANTS

A. Grade rings shall be installed using modified polymer sealant/adhesive between each sealing face, Evergrip 990 Series or equal with approved submittal.

2.7 MANHOLE CHIMNEY SEALS

A. The frame chimney joint area of new manhole shall be sealed with flexible rubber chimney sleeve as specified in Section 02753 - Manhole Rehabilitation.
2.8 GASKETS AND FINISH

A. Sections shall be joined with a mastic compound set into the annular space cast into the spigot ends of bell and spigot type joints to form a watertight seal. Sealing compound shall be of either bituminous or butyl rubber. Material shall be in strip or rope form, supplied with a two-piece cover to preclude adhesion until use. Approved sealing compounds:

1. Ramneek
2. Lockstop
3. Equal with approved submittals.

B. Finish for interior and exterior of new concrete manhole sections shall be Kop-Coat 300M Coal Tar Epoxy or approved equal.

2.9 PIPE OPENINGS

A. Adapter couplings are required on all pipe connections to the structure, sized for respective pipe.

B. Pipe opening shall be fitted with seals cast integrally with manhole section, sized to fit pipe specified, and set at correct elevation and location, or,

C. Pipe openings shall be pre-cast four (4) inches larger than the pipe with a keyway all around the opening.

D. Approved pipe seal manufacturers:

1. Dura Tech, Inc. - DUAL SEAL II-III
2. Press Seal Gasket Corporation - PRES SEAL
3. A-Lok Products Corporation - A-Lok MH Pipe Seal
4. Equal with approved submittals

2.10 PIPE-TO-MANHOLE SLEEVE

A. Sewer pipe shall be connected to new manhole by using a flexible manhole sleeve made from ethylene propylene rubber and conformed to ASTM C-923. The sleeve shall be secured to the pipe by a clamp and shall be grouted in place.

B. The sleeve shall be manufactured by Chardon Rubber Company, (440) 285-2161, or approved equal.

PART 3 - EXECUTION

3.1 PREPARATION

A. Traffic Control. The CONTRACTOR is required to obtain all permits, use appropriate traffic regulating devices, notify all appropriate governmental agencies and conform to all the requirements listed in Section 01570 - Traffic Regulation and Maintenance of Traffic.

B. Flow Control. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the manhole under construction.
1. **Plugging and Blocking of Flow.** A sewer line plug shall be inserted into the line at a manhole upstream from the section to be inspected. The plug shall be so designed that all or any portion of the sewage flows can be released. During the inspection, testing and replacement portion of the construction, flows shall be shut off or substantially reduced as indicated by the OWNER. The upstream manholes shall be constantly monitored for degree of surcharging. After the testing, inspection or repair is complete, flows shall be restored to normal level. See Section 02750 - Wastewater Flow Control for additional information.

2. **Pumping and Bypassing of Flow.** Wherever lines are blocked off and the possibility of backing up the sewage and causing harm to public and private property is foreseen, it shall be the CONTRACTOR's responsibility to bypass flow from manhole to manhole.

3. Bypassing shall be accomplished using sewer plugs with pump connections, by pumping down surcharged manholes, or by other methods acceptable to the OWNER. All bypassed flow must be discharged to a sanitary sewer. Bypassed flow shall not be allowed to enter any storm line, drainage ditch or street gutter. See Section 02750 - Wastewater Flow Control for additional information.

4. During a bypass operation, the pump shall be manned continuously. The CONTRACTOR shall maintain the pump and bypass equipment and shall be responsible for any damages to public or private property due to the malfunction of same.

3.2 **EXCAVATION AND BACKFILL**

A. The CONTRACTOR shall excavate, backfill, and compact in accordance with Section 02222 - Excavation and Backfill for Utilities. 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. Backfilling shall occur in 12-inch lifts with compaction by an engine driven hand-tamp or other mechanical means as acceptable to the OWNER.

3.3 **DEWATERING, SHEETING AND BRACING**

A. The CONTRACTOR shall dewater, sheet and/or brace all excavations in accordance with Section 02222 - Excavation and Backfill for Utilities. 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.

3.4 **NEW MANHOLE CONSTRUCTION**

A. **General:**

   1. At the locations indicated by the OWNER, the CONTRACTOR shall excavate and locate the existing piping in order to obtain the relative elevations of existing sanitary sewer pipes with respect to ground surface elevation. Excavation shall be non-disruptive and non-destructive soil extraction as provided by Accurate Locating, Inc. or approved equal. After all measurements have been obtained, the excavated hole shall be backfilled and surface shall be restored to its original condition. Excavation and measurements shall be witnessed by the OWNER. Inside measurement shall be used when replacing existing manholes.

   2. The sewer pipe connections shall be cut to 2 to 3 feet outside the existing manhole exterior wall. Proper dewatering sheeting and bracing of the hole is critical; no manhole shall be allowed to be installed in an unsafe or wet hole.
B. **Bedding Requirements:** The CONTRACTOR shall excavate an additional 18 inches below the base of the manhole and fill with "Crushed Stone" as defined in Section 02222 - Excavation and Backfill for Utilities and shown in the Drawings. The CONTRACTOR shall also use this crushed stone for bedding of all the sewer connections. No excavated fill shall be allowed in the hole until all connections are complete and proper bedding requirements have been met.

C. **Bases**

1. **Cast-in-Place**
   a. Base shall be to the design and dimensions indicated on the Drawings.
   b. Set pre-cast wall section into fresh concrete for integral joint.
   c. When using wall sections that contain no integral pipe seals, use length of pipe which extends five (5) feet minimum from outside of base dimension. Place approved waterstop on pipe at center point of wall thickness.
   d. Flow channels shall be formed directly in the concrete of the manhole base and shall be smooth and accurately shaped to a semi-circular bottom conforming to the inside of the adjacent sewer sections. Changes in the direction of the sewer and entering branches shall have a true curve of as large a radius as the size of the manhole will permit. Channels shall be so conformed as to allow the unrestricted entry of television cameras into the sewer line.
   e. Complete concrete placement around pipe openings, working well into waterstop. Finish flush on outside.
   f. All slopes (benches) outside flow channels shall be sloped gradually toward invert.

2. **Pre-Cast**
   a. Flow channels shall be placed after pipe placement.
   b. Flow channels, same size as pipe, may be constructed directly with the pre-cast base at time of manufacture. Submit manufacturer's product data to OWNER for approval before placing order.

D. **Setting Precast Sections**

1. Precast reinforced concrete sections shall be set so as to be vertical and with sections in true alignment. A flexible, watertight gasket such as "Ram-Nek" or approved equal shall be used between sections. After the sections are assembled, the remaining space in the joint shall be pointed up and filled with a dense cement mortar and finished so as to make a smooth, continuous surface inside and outside the wall sections.

2. Sewer pipe connections for manholes shall be resilient, waterproof connections designed in accordance with ASTM C 923 "Resilient Connectors between Reinforced Concrete Manhole Structures and Pipes". Resilient pipe connectors shall be installed following casting in a cored or cast opening of the manhole wall. Resilient connectors shall either be a gasket type connector approved equal to the A-Lok pipe to manhole seal as manufactured by Atlantic Concrete Products, Inc. or a flexible neoprene boot with stainless steel clamps approved equal to the Kor-N-
Seal System as manufactured by the Dukor Corporation. When the pipe is installed in the resilient manhole connector, the pipe shall be capable of a 20-degree minimum deflection in any direction.

3. All holes in sections, used for their handling, shall be thoroughly plugged with mortar. All seams, keyways, and pipe connections shall be thoroughly plugged with brick and mortar inside and out as needed. The mortar shall be hammered into the holes until it is dense and an excess of paste appears on the surface; then finished smooth and flush with the adjoining surfaces.

4. The Invert Elevations that were surveyed by the CONTRACTOR prior to manhole construction shall be used to install the inverts in the new manhole. The inverts shall be resurveyed and submitted to the OWNER for as-built purposes.

E. Frames and covers

1. Install pre-cast concrete grade rings, minimum of 4 inches and total maximum of 12 inches, set in two (2) strips of modified polymer sealant/adhesive compound on each sealing face.

2. Bricks shall not be used for grade adjustment.

3. Set maintenance access structure frame to proper elevation and to cross-section slope where required. Set in two strips of sealing compound and cover with a bed of Portland cement and silica sand. Set frame in cement bedding and bring mortar up over frame. Recheck elevation due to possible sealant compression.

4. Contractor shall be responsible to see that all such items as mentioned under this Section are adjusted to the new paving elevation to provide a smooth even transition from pavement to maintenance access structure cover.

F. Finish: All surfaces shall be cleaned and dry prior to applying protective coating. The interior and exterior of the precast sections shall be finished with a minimum of 2 coats in accordance with the following:

<table>
<thead>
<tr>
<th>Application</th>
<th>Description</th>
<th>Interior DFT</th>
<th>Exterior DFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 Coats Minimum</td>
<td>Kop-Coat 300M Coal Tar Epoxy or equal</td>
<td>16</td>
<td>19</td>
</tr>
</tbody>
</table>

G. Backfill: The backfill shall be compacted; road subgrade (if in paved area) shall be replaced with acceptable material and compacted as specified in Section 02500 - Surface Restoration. Prior to backfilling, ensure that all concrete cradles and encasements are dry; all spalls, scars, etc. are repaired; and all coatings have been applied.

3.5 DISPOSAL

A. All excavated material such as pipe sections, concrete, debris or any other items excavated shall become property of the CONTRACTOR. The CONTRACTOR shall take full responsibility for proper disposal and include the cost in the appropriate bid items.

3.6 SURFACE RESTORATION

A. All surface restoration shall be in accordance with Section 02500 - Surface Restoration. Pavement, concrete, sod or any other surface items shall be replaced in equal or better condition than prior to repair.
3.7 TESTING
A. After construction or replacement work at each manhole has been completed and the materials used have been allowed to cure, it shall be tested for excess infiltration by the CONTRACTOR in the presence of the OWNER. The maximum allowable rate of infiltration is 0.0 gallon per hour per vertical foot of depth of the manhole. THERE SHALL BE NO VISIBLE INFILTRATION. All manholes must meet this requirement before acceptance by the OWNER.

3.8 COVER ADJUSTMENT
A. Adjustment of existing (old) work requiring raising the cover shall be performed in accordance with Sub-Section 3.04 herein.
B. Rises in excess of twelve (12) inches shall be made by removing the top section of the manhole and inserting pre-cast sections required to meet the required elevation.
C. When elevation changes require removal of an existing manhole section(s), the OWNER shall be consulted in advance of the work to determine the best method to accomplish the work. The OWNER will inspect all work.
D. Methods and materials for lowering manhole frames shall comply with Sub-Sections 3.04 and 3.08.

3.9 CONNECTIONS TO EXISTING MANHOLE
A. Contractor shall cut an opening (core-bore) in the existing manhole to a size to allow the pipe with a waterstop attached plus one (1) inch clearance on all sides. Cut out existing concrete channel fill, allowing room to form satisfactory new flow channel.
B. Coupling Adapters (Boots) shall be installed sized for the opening and the pipe diameter.
C. Place length of pipe to provide joint at five (5) feet minimum from outside of manhole wall or base. Center waterstop in wall, fill opening with waterproof non-shrink grout material and form new flow channel. Second joint shall be five (5) feet ahead/back. Encase to first joint with Type II concrete.

3.10 CONNECTIONS TO EXISTING SEWERS
A. For proposed sewers of a diameter equal to the existing sewer, a new manhole shall be constructed over the existing sewer to the proper invert elevation.
B. Existing sewer service shall be maintained during base and flow channel work.
C. When broken or damaged pipe results from this operation, replace with new pipe to meet current standards. Saw any piping to be removed to preclude cracking or irregular edges caused by breaking out with a hammer or using other methods.
D. When replacing pipe, use pipe length to have a joint at five (5) feet minimum from manhole wall or base. Cradle and doghouse pipe to first joint with Class A concrete.
E. For proposed sewers of eight (8) inch diameter or less, a direct connection to an existing sewer may be permitted by using a cutting-in saddle or wye. This method would generally apply to single family dwelling units. For industrial, commercial, or multifamily residences, the OWNER may require that a manhole be constructed on the property to be served and over an existing sewer should one exist. All connections to existing sewers are subject to review by the OWNER on an individual basis.
F. Proposed sewers of a diameter larger than the existing sewer to which it is to be connected will not be normally permitted without providing additional capacity to the existing sewer.

3.11 DROP MANHOLES

A. Drop connection shall be made where the invert of any inlet pipe is two (2) feet or more, higher than the invert out of the manhole.

B. Pre-cast manhole sections shall have openings with integrally cast pipe seals to fit design elevations for new installations.

C. When using "doghouse" sections or connecting to existing manholes refer to Sub-Section 3.09 for construction details of pipe through wall section.

D. Connection configuration to manhole shall be made in accordance with Standard Details.

E. Entire configuration of piping shall be encased in Type II concrete to a minimum thickness of six (6) inches.

3.12 PLANNED PIPE OPENINGS

A. When future pipe connections have been planned for manholes, they shall be plugged to preclude exfiltration and infiltration.

B. With integral pipe seals, place a pipe stopper/plug of the size required, properly secured, for any thrust caused by testing, etc.

- END OF SECTION -
SECTION 02757 - POINT REPAIR OF SANITARY SEWERS

PART 1 - GENERAL

1.01 SCOPE

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.

1.02 GENERAL

A. Reference is made to Division 15, “Mechanical”. 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 02750 - Wastewater Flow Control.

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 as 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 and Backfill for Utilities.
1.03 SUBMITTALS

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

1.04 QUALIFICATIONS

A. The Qualifications of the CONTRACTOR shall be submitted prior to contract award. These Qualifications shall include detailed descriptions of the following:

1. Name, business address and telephone number of the CONTRACTOR.

2. Name(s) of all supervisory personnel to be directly involved with this project.

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

4. The CONTRACTOR shall provide his references of previous project lists going back five years including his customers’ names, addresses, and telephone numbers.

5. To be qualified, the CONTRACTOR shall have a minimum of five years previous experience in the work required in this section.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe materials are specified in Division 15, “Mechanical”.

PART 3 - EXECUTION

3.01 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 and Backfill for Utilities. 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 and Backfill for Utilities. 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, 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 as manufactured by Fernco, 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:

   i. Determine the exact location of the repair by means of television inspection with an electronic locating device (sonde).

   ii. If roots are encountered inside the lateral being repaired, a minimum of 15 feet of lateral shall be replaced.

   iii. If the pipe being replaced reaches the private property line, a cleanout shall be installed at that location in both back yard and front yard easements.

   iv. 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, 1901 W. Independence, Shawnee, OK 74801, (405) 273-6302, 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 PVD 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. The CONTRACTOR must receive training by the manufacturer before installing saddle.

   b. Cement-stabilized sand shall be used to supplement the embedment or backfill when accepted by the OWNER. This shall consist of two sacks of cement per cubic yard of sand thoroughly mixed. Only a sufficient amount of water shall be added to assure setting-up of the cement. These mixes shall be made before placing in the trench and only enough shall be prepared to allow placing, shaping and tamping before an initial set has taken place.
Cement-stabilized sand shall be used for repairs in FDOT paved right of ways.

7. The adequacy of point repairs in sewer mains shall be demonstrated by the CONTRACTOR by testing. For service lines, visual review and acceptance by the OWNER will be deemed sufficient. Testing of mains 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:

i. Not more than 4-feet of static head are induced on the main at the lower end of the reach, and

ii. 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, driveways and walks.

3.02 TELEVISION SURVEY

A. Television survey, including Post Construction Survey as indicated in Section 02752 - Television Survey, is required for all point repairs of sanitary sewers.

- END OF SECTION -
SECTION 02759 - REPLACEMENT OF SANITARY SERVICE LATERAL AND CLEANOUT

PART 1 - GENERAL

1.01 SCOPE

A. This Section consists of removing existing sewer service pipe between mainline and the property line, and furnishing, installing, testing and placing in operation new sewer service piping, complete in its place, with fittings, and other appurtenances required for a complete installation.

1.02 GENERAL INFORMATION AND DESCRIPTION

A. The pipe and fittings covered by these specifications shall be furnished by fully qualified manufacturers experienced in the fabrication, casting and manufacture of the pipe materials specified herein. The pipe and fittings shall be designed, fabricated and installed in accordance with the best practice of the trade and the standards specified herein.

B. Portions or reaches of existing sanitary sewer service lines shall be replaced as specified in this Section. The OWNER may authorize additional pipe be removed and replaced as construction proceeds and defective sections of pipe are discovered by direct visual observation.

C. Replacement pipe to the property line including cleanout as per OWNER’S minimum standards shall be the same size and shall be laid between the mainline pipe and the existing service pipe which shall remain in place acceptable to the OWNER unless decided otherwise by the OWNER. It is the CONTRACTOR’s complete responsibility to set controls as necessary to attain true line and grade for the replacement pipe.

D. When replacing sewer service lines from adjacent buildings or residences to the run of a collector main, the CONTRACTOR shall set a time schedule for the period of service interruption in writing and obtain acceptance of it from the OWNER. The CONTRACTOR shall then notify the appropriate tenants at least 24 hours in advance of the pending interruption and inform them of its time frame. Temporary pumping or other measures will be required if the period of interruption of service occurs before 8:00 a.m. or after 5:00 p.m. The importance of avoiding extended periods of public inconvenience cannot be overemphasized.

E. All construction shall conform to Miami-Dade County Water and Sewer Department (MDWASD) standard specifications and details.

1.03 SUBMITTALS

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

PART 2 - PRODUCTS

2.01 GENERAL

A. Pipe materials are as specified
PART 3 - EXECUTION

3.01 GENERAL

A. The CONTRACTOR shall furnish all labor, tools, materials, and equipment necessary for installation and jointing of the pipe. All piping shall be installed in accordance with the Contract Documents in a neat workmanlike manner and shall be set for accurate line and elevation. All piping shall be thoroughly cleaned before installation, and care shall be taken to keep the piping clean throughout the installation.

3.02 PREPARATION

A. Traffic Control. The CONTRACTOR is required to obtain all permits, use appropriate traffic regulating devices, notify all appropriate governmental agencies and conform to all the requirements specified in Section 01570 - Traffic Regulations and Maintenance of Traffic.

B. Flow Control. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the sewer under repair or replacement.

1. Plugging and Blocking of Flow. A sewer line plug shall be inserted into the main-line when service pipe is disconnected. The plug shall be so designed that all or any portion of the sewage flows cannot be released. During the survey, testing and replacement portion of the construction, flows shall be shut off or substantially reduced as acceptable to the OWNER. After the testing, survey or repair is complete, service shall be restored to normal level. See Section 02750 - Wastewater Flow Control for additional information.

2. Pumping and Bypassing of Flow. Wherever lines are blocked off and the possibility of backing up the sewage and causing harm to public and private property is foreseen, it shall be the CONTRACTOR's responsibility to bypass flow from the disconnected lateral to a down-stream manhole.

3. Bypassing shall be accomplished using sewer plugs with pump connections or by other methods acceptable to the OWNER. All bypassed flow must be discharged to a sanitary sewer. Bypassed flow shall not be allowed to enter any storm line, drainage ditch or street gutter. See Section 02750 - Wastewater Flow Control for additional information.

4. During a bypass operation, the pump shall be manned continuously. The CONTRACTOR shall maintain the pump and bypass equipment and shall be responsible for any damages to public or private property due to the malfunction of same.

3.03 EXCAVATION AND BACKFILL

A. The CONTRACTOR shall excavate and backfill in accordance with Section 02222 - Excavation and Backfill for Utilities. 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.
3.04 DEWATERING, SHEETING AND BRACING

A. The CONTRACTOR shall dewater, sheet and or brace all excavations in accordance with Section 02222 - Excavation and Backfill for Utilities. 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.

3.05 SHIPPING, HANDLING AND STORAGE

A. Special care in handling shall be exercised during delivery, distribution and storage of pipe to avoid damage and setting up stresses. Damaged pipe will be rejected and shall be replaced at no additional cost to the OWNER. Pipe and fittings stored prior to use shall be stored in such a manner as to keep the interior free from dirt and foreign matter.

B. No pipe shall be dropped from cars or trucks to the ground. All pipe shall be carefully lowered to the ground by mechanical means. In shipping, pipe and fittings shall be blocked in such manner as to prevent damage to castings or lining. Any broken or chipped lining shall be carefully patched. Where it is impossible to repair broken or damaged lining in pipe because of its size, the pipe shall be rejected as unfit for use.

3.06 REMOVAL AND REPLACEMENT OF SEWER LATERAL PIPE AND CLEANOUT

A. Lateral sewers shall be installed in accordance with all the applicable requirements for pipe installation. Branch fittings shall be installed in the main line sewer as it is constructed, in the locations and configuration of the original laterals or as designated by the OWNER.

B. The existing laterals shall be hand excavated to a joint, saw cut, clean and square and the appropriate adapter installed to connect the replacement laterals. Care shall be taken to maintain the slopes of the existing laterals. The laterals shall be removed and replaced from the main line to the private property line, or to a point along the existing lateral as determined by the OWNER to be in acceptable condition.

C. The CONTRACTOR shall not excavate trenches for laterals on both sides of the street at the same time unless written permission has been secured in advance to close the street.

D. Placement of bedding / cover materials in the trench shall be the same for laterals as provided in Section 02222 - Excavation and Backfill for Utilities.

E. After the limits of a particular portion of the existing sewer which is to be removed and replaced, have been established on the ground, operations shall progress generally as follows:

1. Carefully remove or protect surface features in work area. Excavate to completely expose the existing pipe, taking adequate precautions not to disturb any other existing underground facilities and handling excavated materials as described in other Sections of the Specifications.

2. That section or reach of pipe to be replaced shall be isolated by plugging and/or bypass pumping as described in other Sections of these Specifications, or by any other method proposed by the CONTRACTOR and acceptable by the OWNER.
3. Remove and dispose of the existing pipe and concrete encasement, if any. This shall be phased and coordinated with its replacement so as to minimize public inconvenience.

4. The trench bottom shall be overexcavated a minimum of 8-inches and new embedment material to go beneath the pipe placed and shaped so as to form uniform support for the pipe barrel.

5. Pipe shall be installed in accordance with the manufacturer’s recommendations and to the grade and slope as its existing conditions. Pipe shall be installed and jointed, normally beginning at its low or outlet end and proceeding upstream, with the bell ends facing upstream toward the direction of flow. Replace cleanout. Make connections to new sewer main and cleanouts, and to existing pipe remaining in place. Complete embedment or encasement and place compacted backfill as necessary to avoid flotation if water should enter the trench.

6. Perform leakage test. When this has been successfully completed and acceptable to the OWNER, remove temporary plugs and reconnect wyes or tees to service lines.

7. Complete placement and compaction of backfill.

8. Restore surface features to at least as good condition as existed before construction began, including roadways, driveways and walks.

3.07 PIPE-TO-PIPE CONNECTIONS

A. Pipe-to-pipe connections shall be made by using stainless steel shear rings as manufactured by Fernco, or approved equal.

3.08 TELEVISION SURVEY

A. A television survey (Post Construction Survey) is required for all replacement of sanitary sewer lateral pipe.

- END OF SECTION -
SECTION 02760 - SERVICE LATERAL TELEVISION SURVEY

PART 1 - GENERAL

1.01 SCOPE

A. The work consists of furnishing all labor, materials, accessories, equipment, tools, transportation, services and technical competence for performing all operations required to execute the internal closed-circuit television survey to inspect the repaired service laterals.

B. The survey shall show all that all repair of the laterals is complete and acceptable to OWNER.

1.02 GENERAL

A. Post-construction survey video on CD-ROM shall be delivered to the OWNER on CD-ROM, accompanied with the corresponding work orders, and post-TV logs, for sewer laterals surveyed. The video on CD-ROM shall be direct from a live video source into a video file, format MPEG1, and of good quality for viewing. The recording of multiple laterals on a single CD is acceptable.

B. The television equipment operator shall be certified under the NASSCO (National Association of Sewer Survey Companies) PACP (Pipe Line Assessment and Certification Program).

1.03 SOFTWARE

A. The OWNER plans to utilize a computer-based inspection software to facilitate the complex task of acquiring accurate and detailed field-inspection information. For this and future contracts the OWNER has updated its data collection and data format specifications. The data collection software purchased and utilized by the OWNER is Win Can™. The WinCan™ software shall support the NASSCO PACP coding. All inspection information furnished by the CONTRACTOR shall be written to digital media and shall be capable of being downloaded and viewable (including video on CD-ROM) in the Win Can™ software. Win Can America Inc., can be contacted at 1730 Montano Road NW, Suite E, Albuquerque, NM 87107, Phone: (505) 341-0109.

1.04 EQUIPMENT

A. The television camera used for the lateral survey shall be one specifically designed and constructed for such survey. A Sonde locating device shall be attached to the camera. Lighting for the camera shall be suitable to allow a clear picture of the entire periphery of the pipe. The camera shall be operative in 100% humidity conditions. The camera, television monitor, and other components of the video system shall be capable of producing a minimum 700-line resolution color video picture. The CONTRACTOR shall maintain camera in clear focus at all times. Picture quality and definition shall be to the satisfaction of the OWNER; and if unsatisfactory, equipment shall be removed and replaced with adequate equipment at no additional cost to the OWNER. The lateral camera shall have a pan-and-tilt capability.

B. The camera system shall be able to inspect 3-, 4-, and 6-inch lateral connections up to 70 feet from the sewer mainline. The launcher shall be mounted on a tread tractor that moves
through main sewers and positions 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. The video camera shall include a titler feature capable of showing on the tape the following information:

1. City and State
2. Date/Time
3. CONTRACTOR’s Name
4. Pipe Size (Diameter) and Material
5. Upstream Manhole Number & Distance to Lateral
6. On-going Footage Counter

F. 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.

1.05 SUBMITTALS

A. 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.

1.06 QUALIFICATIONS

A. The Qualifications of the CONTRACTOR shall be submitted prior to contract award. These Qualifications shall include detailed descriptions of the following:

1. Name, business address and telephone number of the CONTRACTOR.
2. Name(s) of all supervisory personnel to be directly involved with this project.

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

4. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the OWNER.

5. The CONTRACTOR shall provide his references of previous project lists going back five years including his customers’ names, addresses, and telephone numbers.

6. To be qualified, the CONTRACTOR shall have a minimum of three years previous experience in the work required in this section.

PART 2 - PRODUCTS

All inspection information and data (including video) written to digital media (CD-ROM).

PART 3 - EXECUTION

3.01 POST CONSTRUCTION SURVEY

A. Procedure

1. Prior to any repair work, the entire service lateral (from mainline to property line / cleanout, whichever is farther from the mainline) shall be televised.

2. Measurement for location of defects shall be above ground by means of a meter device. Measurement meters shall be accurate to tenths of a foot over the length of the section being surveyed. Accuracy of the distance meter shall be checked by use of a walking meter, roll-a-tape, or other suitable device. Linear footage shall be shown on screen during recording.

3. Movement of the television camera shall be temporarily halted for a minimum of ten seconds at each visible point of flow until the source and flow rate from that point are determined.

4. The inspection shall be performed from either the main sewer or the cleanout with proper equipment specified. If the CONTRACTOR chooses to perform the inspection from the cleanout and the cleanout is either inaccessible or does not exist, he shall install a cleanout to facilitate the inspection. All costs of material, equipment, labor, and other costs due to unspecified field conditions shall be borne by the CONTRACTOR. Payment for cleanout installation shall be made by the OWNER as indicated in Section 01025, Measurement and Payment.

5. Above ground horizontal location of lateral shall be marked every five (5) feet utilizing surveyor’s paint on an asphalt or concrete surface and surveyor’s flags in grass. Approximate depth of laterals at these locations shall be recorded on the TV logs.
B. Field Documentation

1. Television Survey Logs. Location of the lateral by indicating the upstream manhole number, distance from the upstream manhole, lateral connection to the main line (left, center or right), and address of the customer serviced by the lateral, shall be noted on the television survey log. Printed and electrically stored location records shall be kept by the CONTRACTOR and will clearly show the location, in relation to the cleanout or the mainline of each infiltration point observed during survey. Footage shall be shown on the log. In addition, other points of significance such as unusual conditions, roots, broken pipe, presence of scale and corrosion, and other discernible features will be recorded and a copy of such records will be supplied to the OWNER. The CONTRACTOR shall measure the depth of the upstream and downstream manholes. Measurements shall be from the invert of the pipe to the top of the manhole rim and shall be recorded on the survey log.

2. Photographs. Digital photographs of the television picture of problems shall be taken by the CONTRACTOR upon request of the OWNER.

3. Video Recordings. The purpose of video (CD-ROM) recording shall be to supply a visual and audio record of problem areas of the lines that may be replayed. CD-ROM recording playback shall be at the same speed that it was recorded. Slow motion or stop motion playback features shall be supplied by the CONTRACTOR. Once recorded, the CD-ROM becomes the property of the OWNER. The CONTRACTOR shall have all CD-ROM and necessary playback equipment readily accessible for review by the OWNER during the Project.

4. Audio. All CD-ROM shall have audio record. As a preamble, at the beginning of the CD-ROM, the CONTRACTOR shall state the following: “(Contractor’s Name) is performing a pre/post TV survey for Job No. ________ (provided by the OWNER), North Miami”. State date, time, operator’s name, area, pipe size and material, upstream manhole number and depth. The CONTRACTOR shall verbally state the position of the lateral with respect to the upstream manhole and describe defects. At the end of each line, state: “End of line” and total linear footage.

5. The CONTRACTOR shall stop the camera at all point repairs and inspect entire repaired pipe sections.

6. The CONTRACTOR shall invert white foreground to black as needed in the line section with light background.

7. In the case of a post-liner survey, the CONTRACTOR shall fully televise both ends of the liner so that the fit of the liner to the host pipe can be evaluated.

8. The post-liner television survey shall be done within 2 weeks of liner installation.

3.03 LOCATION OF LATERAL FROM RESIDENCE

A. Procedure

1. Run a sonde through a roof vent to locate cleanout as well as unmarked sewer lateral. A sonde is a transmitter tied on a line and moved through a sewer or duct. A receiver on the surface follows its movements, 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.

B. Documentation

1. Above ground horizontal location of lateral shall be marked every five (5) feet utilizing surveyor’s paint on an asphalt or concrete surface and surveyor’s flags in grass. Approximate depth of laterals at these locations shall be recorded on the TV logs. Location of buried cleanouts, or location for the purposes of installing a new cleanout shall be marked by two measured distances to permanent recoverable objects. CONTRACTOR shall furnish a schematic of these locations with sufficient detail to be able to relocate from above ground, at a later date.

- END OF SECTION -
PART 1 - GENERAL

1.01 SCOPE

A. The work specified in this Section includes all labor, materials, accessories, equipment and tools necessary for chemical grouting, sealing, and air testing sanitary sewer pipe joints, pursuant to ASTM F2304-03.

1.02 GENERAL

A. Chemical Root Treatment

1. When so directed by the OWNER, the CONTRACTOR shall perform chemical root treatment.

2. The CONTRACTOR shall schedule his work to perform chemical root treatment a minimum of 8 weeks prior to performing the work specified under this Section.

B. Leak Testing

1. Sewer line joint testing shall be accomplished by applying air pressure to each sewer joint, and monitoring the pressure in the void over a one-minute period. The intent of joint testing is to identify defective joints prior to the joint sealing process and check the effectiveness of the seal.

2. Testing cannot be performed and shall not be required on cracked, structurally unsound, or broken pipe, severely corroded or out-of-round pipe, or on visibly leaking joints.

C. Leak Sealing

1. Sources, or possible sources, of infiltration within the sewer system, are to be sealed to eliminate infiltration.

2. The application of the sealing grout within the pipe shall be by means of remote-controlled equipment designed to be positioned at the specific joint or crack to be sealed and to apply the grout under sufficient pressure for the grout to pass through the opening and fill voids outside the pipe as well as the opening in the pipe wall. Control of the device and review of the results shall be by operating the closed-circuit television camera and van-mounted monitor conforming to the requirements of Section 02752 - Television Survey. The method of sealing used shall not damage the pipe or change pipe alignment, and the original cross-sectional area shall not be permanently reduced or changed.

1.03 QUALIFICATIONS

A. The Qualifications of the Grouting CONTRACTOR shall be submitted prior to contract award. These Qualifications shall include detailed descriptions of the following:

1. Name, business address and telephone number of the CONTRACTOR.
2. Name(s) of all supervisory personnel to be directly involved with Grouting for this project.

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

4. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the OWNER.

5. The CONTRACTOR shall provide his references of previous project lists going back five years including his customers’ names, addresses, and telephone numbers.

6. To be qualified, the CONTRACTOR shall have a minimum of three years previous experience in grouting.

PART 2 - PRODUCTS

2.01 CHEMICAL JOINT SEALING MATERIALS

A. Chemical joint sealing materials used on this project shall be AV-118 Duriflex, or AV-100 plus activators, initiators and inhibitors recommended by the manufacturer, Avanti International, Houston, Texas or an approved equal.

B. In those lines which had root removal performed, a chemical root inhibitor shall be added to the grout prior to sealing the joints. CONTRACTOR shall submit the chemical to be used for OWNER’s approval prior to utilization.

PART 3 - EXECUTION

3.01 LEAK TESTING EQUIPMENT

A. The basic equipment used shall consist of a television camera, joint testing device such as a packer, and test monitoring equipment. In combination, the equipment shall be constructed in such a way as to provide means for introducing a test medium under pressure, into the Void area created by the expanding ends of the joint testing device. The testing equipment shall also have the means for regulating the flow rate of the test medium into the Void area in conjunction with the means for continuously measuring the actual static pressure of the test medium at and within the Void area only. The packer device shall be constructed in such a manner as to allow some flow to pass through its center annulus.

B. Void pressure data shall be transmitted electrically and without the use of the test medium or hoses. All test monitoring shall be above ground in a location to allow for simultaneous continued observation of the television monitor and test monitoring equipment by the CONTRACTOR. The OWNER shall witness the testing operation.

C. Sewer line joint testing shall be accomplished before and after the grouting operation by applying a positive pressure to each sewer joint and monitoring the pressure in the Void. The intent of joint testing is to identify defective joints prior to the joint sealing process and determine the effectiveness of the seal repaired.
3.02 CONTROL TEST PROCEDURES

A. Prior to and during the joint testing phases of the work, the CONTRACTOR shall perform Control, Intermediate, and Final testing in accordance with the latest edition of ASTM F2304.

3.03 JOINT TESTING PROCEDURE

A. Sewer line joints shall be individually tested at a test pressure equal to \( \frac{1}{2} \) psi per vertical foot of pipe depth, but in no case exceeding a pressure of 10 psi and in accordance with the following procedures:

1. The packer or testing device shall be positioned within the line in such a manner as to straddle the joint to be tested.

2. The packer ends or testing device ends shall be expanded so as to isolate the joint from the remainder of the line and create a Void area between the packer or testing device and the pipe joint. The ends of the testing device shall be expanded against the pipe with sufficient inflation pressure to contain the test medium within the Void without leakage past the expanded end.

3. The test medium shall be introduced into the Void area until a pressure or flow rate equal or greater than the required test pressure is observed with the Void pressure monitoring equipment.

   a. Air Test – After the void pressure is observed to be equal to or greater than the required test pressure, the airflow shall be stopped and the air test supply line vented. The operator will observe this void pressure for a period of 15 s, if the pressure is maintained, with a pressure drop of less than 1 psi (7 kPa), then the joint will be considered as having passed the test. If the pressure shows additional decay during the recommended time period, it will be considered as having failed and shall be sealed as described in Section 12. Upon completion of the sealing, the joint will be retested at the established test criteria (post-test).

   b. Water Test – A liquid (water) shall be introduced into the void area until a pressure equal to or greater than the required test pressure is observed with the void pressure monitoring equipment. If the required test pressure cannot be developed (due to joint leakage), the joint will have failed the test and shall be sealed as specified. The flow rate of the test liquid shall then be regulated to a rate at which the void pressure is observed to be the required test pressure for a period of 30 seconds. A reading of the test liquid flow meter shall then be taken. If the flow rate exceeds \( \frac{1}{4} \) gallon per minute (due to joint leakage), the joint will have failed the test and shall be sealed as specified.

4. The test medium shall be air or liquid.

3.04 TEST RECORDS

A. During the joint testing procedure, complete records shall be kept, to include the following data:
1. Identification of the manhole section tested.

2. Type of pipe.

3. Diameter of pipe.

4. Length of pipe sections between joints.

5. Depth of pipe to surface.

6. Test pressure used and duration of test.

7. Statement indicating the pass/fail test results for each joint tested, Location (stationing) of each joint tested and location of any joints not tested with an explanation for not testing.

B. In the case of a "passing" joint, a single pressure reading may be recorded. In the case of a "failing" joint requiring grout, three pressures shall be recorded: the initial "failing" pressure; the zero pressure after grout has been injected and the packer deflated; and the final pressure after the grout has been injected and the packer reinflated.

3.05 JOINT SEALING EQUIPMENT

A. The basic equipment shall consist of a closed-circuit television system, necessary chemical sealant containers, pumps, regulators, valves, hoses, etc., and joint sealing packers for the various sizes of sewer pipe. The packer shall be a cylindrical case of a size less than pipe size, with the cables at either end used to pull it through the line. The packer device shall be constructed in such a manner as to allow a restricted amount of sewage to flow at all times. Generally, the equipment shall be capable of performing the specified operations in lines where flows do not exceed the maximum line flows as specified in Section 02750 - Wastewater Flow Control. When the packer is inflated, two widely spaced annular bladders shall be formed, each having an elongated shape and producing an annular void around the center portion of the packer.

B. Before starting the work, a performance test demonstration verifying the accuracy and repeatability of the void pressure meter and fluid pumping equipment should be performed. If these test demonstrations fail to show that the readings are accurate, ±0.5 psi (3 kPa) for void pressure repeatability, and ±0.1 (0.4 L) of chemical pumped into a measured container, the CONTRACTOR shall be required to make the required repair or adjustments to the equipment and gages and retest until the results are satisfactory to the OWNER's representative. The test demonstration may be required at each work shift during the sealing operation.

3.06 JOINT SEALING PROCEDURE

A. In the preparation and application of the sealing grout, the recommendations of the manufacturer of the grout materials shall be followed. Before joint sealing, chemical grout gel times should be measured and recorded. Gel times should also be measured and recorded whenever a new batch is made and at the end of the shift. These gel times measurements are a very effective and meaningful quality assurance procedure.
B. Joint sealing shall be accomplished by forcing chemical sealing materials into or through infiltration points by a system of pumps, hoses, and sealing packers. Jetting or driving pipes from the surface that could damage or cause undermining of the pipe lines, will not be allowed. Excavating the pipe, which would disrupt traffic, undermine adjacent utilities and structures, will not be allowed. The packer shall be positioned over the area of infiltration by means of a metering device and the closed-circuit television in the line. It is important that the procedure used by the CONTRACTOR for positioning the packer be accurate to avoid over-pulling the packer and thus not effectively sealing the point of infiltration. The packer sleeves shall then be expanded using precisely controlled pressures. The pneumatically expanded sleeve or elements shall seal against the inside periphery of the pipe to form a void area at the point of infiltration, now completely isolated from the remainder of the pipe line. Into this isolated area, sealant materials shall be pumped through the hose system at controlled pressures, which are in excess of groundwater pressures. The pumping, metering, and packer device shall be integrated so that the proportions and quantities of materials can be regulated in accordance with the type and size of the leak being sealed.

C. The grout must be injected beyond the joint interface into the soil surrounding the pipe joint.

D. A color additive (dye) should be added to the grout so that a visual residual layer of grout rings the joint providing confirmation the packer was located over the joint and the void was filled during the sealing operation.

E. No joint shall be considered sealed unless, while under continual pressure, an attempt is made to pump grout to “refusal” (up to ½ gallon per inch diameter pipe size). This is to ensure that sufficient chemical has been dispersed into the soil surrounding the joint and that a temporary seal has not been made by applying a minimum amount of chemical grout to the void and the joint area inside the pipe. When chemical grout cannot be pumped to “refusal" within a volume less than or equal to ½-gal per inch diameter pipe size due to latent physical conditions, no additional work shall be undertaken until authorization to proceed has been given by the OWNER/OWNER’s representative.

F. Upon completing the sealing of each individual joint, the packer shall be deflated; moved at least one packer length in either direction, and then repositioned over the joint; with the void pressure meter reading zero pressure, then reinflated and tested as specified in subsection 3.03 - Joint Testing Procedure. Should the void pressure meter not read zero, the CONTRACTOR shall clean his equipment of residual grout material or make the necessary equipment repairs to provide for an accurate void pressure reading. Joints that fail to meet the specified test criteria shall be resealed and retested until the test criteria can be met in order to receive payment.

G. All testing shall be performed by the CONTRACTOR in the presence of the OWNER. It shall be the responsibility of the CONTRACTOR to completely seal every leak authorized for sealing to the extent determined by the OWNER. If, in the OWNER's opinion, it is not necessary to continue with a particular leak, the crew shall move to the next joint or leak. The CONTRACTOR shall remove any small excess sealing grout inside the sewer line. CONTRACTOR shall operate his equipment with care and shall be responsible for any damage to the sewer system or other facilities caused by his operations, and shall repair such damage at his expense and without delay as instructed by the OWNER.

3.07 JOINT SEALING RECORDS

A. Included in the records for joint sealing shall be:
1. The test pressure before and after sealing and the duration of the test.
2. The volume of grout material used to seal each joint.
3. The volume of grout placed per section.
4. The gel set time used.
5. The barrel test results.
6. The grouting material used, including additives and their respective quantities.

3.08 LATERAL SEALING PROCEDURE

A. The following shall apply to the sealing of all reinstated laterals after the main has been lined.

1. The total batch shall be no more than 50 gallons. That means reducing the water in each tank by 5 gallons. This will increase the strength of the “gel” by increasing the solids to 12 percent.

2. The “gel” time shall be 10 seconds longer than the time required by the pumps to fill the inside packer void and at no time shall the “gel” time be less than 20 seconds.

3.09 TELEVISION SURVEY

A. Television survey, including Post Construction Survey, and Warranty Survey, as indicated in Section 02752 - Television Survey, is required for all grouted lines.

3.10 WARRANTY

A. All chemical grouting work described herein shall be guaranteed against faulty workmanship and/or materials for a period of 3 years after the completion of the work.

- END OF SECTION -
PART 1 - GENERAL

1.01 SCOPE

A. The work specified in this section consists of rehabilitating existing sanitary sewer pipe by installing a resin impregnated fiberglass/polyester felt tube into an existing pipe to restore its structural and hydraulic integrity.

1.02 GENERAL

A. The finished sectional pipe liner in place shall be fabricated from materials which, when installed, will be chemically resistant to withstand internal exposure to domestic sewage.

1.03 SUBMITTALS

A. The Contractor shall submit shop drawings and other information to the OWNER for review in accordance with Section 01300, “Submittals”. Included shall be design calculations for the work.

1.04 QUALIFICATIONS

A. The Qualifications of the CONTRACTOR shall be submitted prior to contract award. These Qualifications shall include detailed descriptions of the following:

1. Name, business address and telephone number of the CONTRACTOR.

2. Name(s) of all supervisory personnel to be directly involved with this project.

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

4. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the OWNER.

5. The CONTRACTOR shall provide his references of previous project lists going back three years including his customers’ names, addresses, and telephone numbers.

6. To be acceptable, a minimum of 400 sectional liner installations must be documented.

7. To be acceptable, the installer must have had a minimum of three (3) years active experience in the commercial installation of the product. For purposes of this requirement, “Installer” shall mean the corporation or business entity submitting the bid.
PART 2 - PRODUCTS

2.01 GENERAL

A. The finished liner shall be fabricated from material as specified in this section which when cured will be chemically resistant to the corrosive effects of the raw sewage and hydrogen sulfide. The cured-in-place sectional pipe shall be the New Life System as manufactured by Stephen's Technologies, Inc. or approved equal.

2.02 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.

B. The length and number of liners shall be that deemed necessary by the OWNER to effectively carry out the repairs. The CONTRACTOR shall verify the lengths in the field before cutting liner to length. In general, the minimum length shall be 6 feet for 8- to 12-inch diameter of pipe, and cover a minimum of 6 inches on either side of the pipe joint.

C. For 15- to 21-inch diameter of pipe, a longer sectional liner may be required.

2.03 LINER MATERIAL

A. The lining material shall be a fiberglass matting material and fully impregnated with an epoxy resin as specified.

B. The mixed components of the epoxy resin shall have the following properties:

<table>
<thead>
<tr>
<th>Item</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Solids Content</td>
<td>100% by weight</td>
</tr>
<tr>
<td>2. Pot Life</td>
<td>90 minutes at 70 degrees F</td>
</tr>
<tr>
<td>3. Shelf Life</td>
<td>at least 1 year (sealed)</td>
</tr>
<tr>
<td>4. Viscosity</td>
<td>18,000 cps (average at 70 degrees F)</td>
</tr>
<tr>
<td>5. Density</td>
<td>12 pounds per gallon (max.)</td>
</tr>
</tbody>
</table>

C. The cured epoxy resin material shall have the following properties:

<table>
<thead>
<tr>
<th>Item</th>
<th>Test Value</th>
<th>Reference Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Strength</td>
<td>5,000 psi</td>
<td>ASTM D 790</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>400,000 psi</td>
<td>ASTM D 790</td>
</tr>
</tbody>
</table>

2.04 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 invert)* | ft.
Soil Depth (above crown)* | ft.
Soil Modulus | 700 psi
Soil Density | 120 pcf
Live Load | One H20 passing truck
Design Condition | Fully deteriorated

*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.

B. The lining manufacturer shall submit to the OWNER 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. A safety factor of 2 shall be applied in the design calculation. The host pipe shall be considered fully 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 pipe shall not be considered as providing any structural support. Modulus of soil reaction shall be 700, 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.

PART 3 - EXECUTION

3.01 CLEANING SEWER LINES

A. Prior to any lining of a pipe so designated, it shall be the responsibility of the CONTRACTOR to remove internal deposits from the pipeline in accordance with Section 02751 - Preparatory Cleaning and Root Removal.

3.02 TELEVISION SURVEY

A. Television survey shall be performed in accordance with Section 02752 - Television Survey, including Post Construction Surveys.

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 tape and suitable log shall be kept and turned over to the OWNER.
3.03 FLOW BYPASSING

A. The CONTRACTOR, when required, shall provide for the transfer of flow, through or around a 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 02750 - Wastewater Flow Control.

Note: If the repair can be made in a few hours, bypass pumping may not be required. The placement carriage shall be equipped with a bypass section to allow flow once liner is pressed into place.

3.04 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 accepted in writing by the OWNER prior to the commencement of the work.

3.05 LINER INSTALLATION

A. Prior to liner installation, all active severe leaks which may affect the success of liner installation shall be stopped using chemical grout. The CONTRACTOR shall impregnate the liner with the 100 percent solids epoxy. Drop cloths, tarpaulins, and etc. shall be used to prevent epoxy material from contacting the adjacent ground. Place the liner on the placement carriage and maneuver carriage and liner into position with the use of a video camera. Force the liner against the inside wall of the damaged host pipe allowing epoxy resin to permeate into any cracks in the host pipe. Allow lines to cure for approximately 2 hours in accordance with the manufacturer’s recommendations. Heat may be introduced to speed up curing time. Retract the placement carriage and remove from pipe.

B. After the sectional liner has been cured in place, the CONTRACTOR shall reconnect the service connections. Cutting of the liner pipe shall be done from the interior of the pipeline using a robotic cutter. Where holes are cut through the liner, they shall be neat and smooth in order to prevent blockage at the service connections. Cut-in service connections shall be opened to a minimum of 95 percent of the flow capacity of the building sewer. Cuts shall be wire-brushed to remove jagged edges. All coupons shall be recovered at the downstream manhole and removed. All reinstated service lateral connections (between the liner and the existing pipe) shall be grouted. The reinstatement of the service connections shall be a separate pay item.

3.06 ACCEPTANCE

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.
3.07 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.

3.08 WARRANTY

A. The liner shall be certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for one year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the liner shall be repaired at the CONTRACTOR's expense in a manner mutually agreed by the OWNER and the CONTRACTOR.

- END OF SECTION -
PART 1 - GENERAL

1.01 SCOPE

A. It is the intent of this specification to provide for the reconstruction of pipelines and conduits by the installation of a resin-impregnated flexible tube which is formed to the original conduit and cured to produce a continuous and tight fitting Cured-In-Place Pipe (CIPP).

B. The work specified in this Section includes all labor, materials, accessories, equipment and tools necessary to install and test cured-in-place pipe lining in main lines and in-service laterals.

1.02 GENERAL

A. This specification references ASTM F1216 (Rehabilitation of pipelines by the inversion and curing of a resin-impregnated tube), ASTM F1743 (Rehabilitation of pipelines by pulled-in-place installation of a cured-in-place thermosetting resin pipe), and ASTM D790 (Test methods for flexural properties of unreinforced plastics) which are made a part hereof by such reference and shall be the latest edition and revision thereof. In case of conflicting requirements between this specification and these referenced documents, this specification will govern.

1.03 SUBMITTALS

A. The CONTRACTOR shall submit shop drawings and other information to the OWNER for review in accordance with Section 01300, "Submittals".

B. With the bid, the following submittals are required.

1. Documentation as outlined herein under the section titled, PRODUCT AND INSTALLER ACCEPTABILITY, including installation references of projects that are similar in size and scope to this project. The submittal shall include, at a minimum, the client contact name, phone number, and the diameter and footage of pipe rehabilitated. Documentation for product and installation experience must be satisfactory to the OWNER.

C. After contract award, the following submittals are required.

1. Detailed design calculations as specified herein under the section titled, MATERIALS FOR MAIN LINES AND LATERALS.

2. Various test results as specified herein under the section titled, TESTING REQUIREMENTS.

3. Documentation as specified herein under the sections titled WET-OUT AND CURE REPORT and TELEVISION SURVEY.
1.04 PRODUCT AND INSTALLER ACCEPTABILITY

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

B. Products and installers seeking approval must document an ability to meet all of the following criteria to be deemed commercially acceptable:

1. For a product to be considered commercially proven, a minimum of 1,000,000 linear feet or 4,000-manhole to manhole line sections of successful wastewater collection system installations in the U.S. must be documented to the satisfaction of the OWNER to assure commercial viability. In addition, at least 250,000 linear feet of the product shall have been in successful service within the State of Florida for a minimum of three years.

2. For an Installer to be considered as commercially proven, the installer must satisfy all insurance, financial, and bonding requirements of the OWNER, and must have had at least three (3) years active experience in the commercial installation of the product. For sewer mains, the installer must have successfully installed at least 250,000 feet of the product in wastewater collection systems in Florida. For sewer laterals, the installer must have successfully installed a minimum of 500 lateral liners in Florida. Acceptable documentation of these minimum installations must be submitted to the OWNER. For purposes of this requirement, “Installer” shall mean the corporation or business entity submitting the bid.

3. Sewer rehabilitation products submitted for approval must provide third party test results supporting the long-term performance and structural strength of the product and such data shall be satisfactory to the OWNER. Test samples shall be prepared so as to simulate installation methods and trauma of the product. No product will be approved without independent third-party testing verification.

PART 2 - PRODUCTS

2.01 MATERIALS FOR MAIN LINES AND LATERALS

A. The sewn tube shall consist of one or more layers of absorbent non-woven felt fabric and meet the requirements of ASTM F1216 or ASTM F1743, Section 5. The tube shall be constructed to withstand installation pressures, have sufficient strength to bridge breaks and missing sections of the existing pipe, and stretch to fit irregular pipe sections. The new jointless pipe-within-a-pipe must fit tightly against the old pipe wall and consolidate all disconnected sections into a single continuous conduit, substantially reducing or eliminating infiltration or exfiltration.

B. The wetout tube shall have a uniform thickness that when compressed at installation pressures will meet or exceed the design thickness.

C. The tube shall be sewn to a size that when installed will tightly fit the internal circumference and length of the original pipe with minimal shrinkage, in such a way as to minimize water migration (tracking) between the liner and the host pipe. Allowance should be made for circumferential stretching during inversion, and longitudinal stretching during pull in.
Overlapped layers of felt in longitudinal seams that cause lumps in the final product shall not be utilized.

D. The minimum tube length shall be that deemed necessary by the Contractor to effectively span the distance between the access points and to facilitate a good, "non-tracking" seal. The Contractor shall verify the lengths in the field before cutting liner to length and otherwise preparing it for installation.

E. The outside layer of the tube (before wetout) shall be coated with an impermeable, flexible membrane that will contain the resin and facilitate monitoring of resin saturation during the resin impregnation (wetout) procedure.

F. The tube shall be homogeneous across the entire wall thickness containing no intermediate or encapsulated elastomeric layers. No material shall be included in the tube that may cause delamination in the cured CIPP. No dry or unsaturated layers shall be evident.

G. The wall color of the interior pipe surface of CIPP after installation shall be a light reflective color so that a clear detailed examination with closed circuit television inspection equipment may be made.

H. Seams in the tube shall be stronger than the unseamed felt.

I. The outside of the tube shall be marked for distance at regular intervals along its entire length, not to exceed 5 ft. Such markings shall include the Manufacturer’s name or identifying symbol. The tubes must be manufactured in the USA.

J. The resin system shall be a corrosion resistant polyester, vinyl ester, or epoxy and catalyst system that when properly cured within the tube composite meets the requirements of ASTM F1216 and ASTM F1743, the physical properties herein, and those which are to be utilized in the Design of the CIPP for this project. The resin shall produce CIPP which will comply with the structural and chemical resistance requirements of this specification.

K. The finished pipe in place shall be fabricated from materials which when cured will be chemically resistant to withstand internal exposure to domestic sewage. All constituent materials will be suitable for service in the environment intended. The final product will not deteriorate, corrode or lose structural strength that will reduce the projected product life. In industrial areas a liner system using epoxy vinyl ester resin shall be utilized and a polyester resin shall be used in non-industrial areas. The OWNER shall determine the type of appropriate resin to be utilized for each line segment.

L. The CIPP shall be designed as per ASTM F1216, Appendix X1. The CIPP design shall assume no bonding to the original pipe wall. The structural performance of the finished pipe must be adequate to accommodate all anticipated loads throughout its design life.

M. The CIPP must have a minimum design life of fifty (50) years. The minimum design life may be documented by submitting life estimates by national and/or international authorities or specifying agencies. Otherwise, long-term testing and long-term in-service results (minimum ten (10) years) may be used, with the results extrapolated to fifty (50) years.

N. The CONTRACTOR must have performed long-term testing for flexural creep of the CIPP pipe material installed by his company. Such testing results are to be used to determine the long-term, time dependent flexural modulus to be utilized in the product design. This is a
performance test of the materials (tube and resin) and general workmanship of the installation and curing. A percentage of the instantaneous flexural modulus value (as measured by ASTM D-790 testing) will be used in design calculations for external buckling. The percentage, or the long-term creep retention value utilized, will be verified by this testing. Values in excess of 50% will not be applied unless substantiated by qualified third party test data. The materials utilized for the contracted project shall be of a quality equal to or better than the materials used in the long-term test with respect to the initial flexural modulus used in design.

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

<table>
<thead>
<tr>
<th>Design Safety Factor</th>
<th>2.0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Retention Factor for Long-Term Flexural Modulus to be used in Design (as determined by Long-Term tests described in paragraph 2.02.B)</td>
<td>50 %</td>
</tr>
<tr>
<td>Ovality*</td>
<td>2 %</td>
</tr>
<tr>
<td>Water Table = Grade Elevation</td>
<td>ft.</td>
</tr>
<tr>
<td>Soil Depth (above crown)*</td>
<td>ft.</td>
</tr>
<tr>
<td>Soil Modulus</td>
<td>700 psi</td>
</tr>
<tr>
<td>Soil Density</td>
<td>120 pcf</td>
</tr>
<tr>
<td>Live Load</td>
<td>One H20 passing truck</td>
</tr>
<tr>
<td>Design Condition</td>
<td>Fully deteriorated</td>
</tr>
</tbody>
</table>

*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.

P. The lining manufacturer shall submit to the OWNER 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. 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 pipe shall not be considered as providing any structural support. Modulus of soil reaction shall be 700, corresponding to a moderate degree of compaction of bedding and a fine-grained soil as shown in AWWA Manual M45, Fiberglass Pipe Design.

Q. 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. This tabulation shall be at five-degree Fahrenheit increments ranging from 70 degrees F to 100 degrees F. 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 preconstruction conference so that the OWNER may set procedures for dealing with such an instance caused by construction delays.

R. The layers of the cured CIPP shall be uniformly bonded. It shall not be possible to separate any two layers with a probe or point of a knife blade so that the layers separate cleanly or the probe or knife blade moves freely between the layers. If separation of the layers occurs during testing of field samples, new samples will be cut from the work. Any reoccurrence may cause rejection of the work.
S. Any layers of the tube that are not saturated with resin prior to insertion into the existing pipe shall not be included in the structural CIPP wall thickness computation.

T. Liner shall be neither accepted nor installed until design calculations are acceptable to the OWNER. Liner shall be as manufactured by Insituform Technologies, Inc., 702 Spirit 40 Avenue, Chesterfield, MO 63005, Phone No. 800-325-1159, or approved equal.

2.02 STRUCTURAL REQUIREMENTS FOR MAIN LINES

A. Since the pipe strength is related to the uniformity and density of the pipe wall, only resin vacuum impregnation will be allowed. Resin impregnation without vacuum entraps air and creates voids which weaken the pipe wall. If reinforcing materials (fiberglass, etc.) are used, the reinforcing material must be fully encapsulated within the resin to assure that the reinforcement is not exposed, either to the inside of the pipe or at the interface of the CIPP and the existing pipe.

B. The design for the CIPP wall thickness will be based on the following strengths, unless otherwise submitted to and approved by the OWNER.

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Cured Composite per ASTM F1216</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Modulus of Elasticity</td>
<td>ASTM D-790</td>
<td>250,000 psi</td>
</tr>
<tr>
<td>Flexural Stress</td>
<td>ASTM D-790</td>
<td>4,500 psi</td>
</tr>
</tbody>
</table>

2.03 STRUCTURAL REQUIREMENTS FOR SERVICE LATERALS

A. The design for the CIPP wall thickness will be based on the following strengths, unless otherwise submitted to and approved by the OWNER:

<table>
<thead>
<tr>
<th>Property</th>
<th>Test Method</th>
<th>Cured Composite per ASTM F1216</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Modulus of Elasticity</td>
<td>ASTM D-790</td>
<td>250,000 psi</td>
</tr>
<tr>
<td>Flexural Stress</td>
<td>ASTM D-790</td>
<td>4,500 psi</td>
</tr>
</tbody>
</table>

2.04 REQUIREMENTS FOR MAINLINE/LATERAL CONNECTIONS

A. Mainline/Lateral Connection Interface Seal

1. The interface seal shall provide a water tight connection between the lateral (service connection) and the mainline pipe. The lateral and mainline pipe may or may not have liners installed. If the interface seal requires insertion, the interface seal shall be completely installed via remote device without any excavation. The interface seal between the lateral and the mainline sewer pipe shall be compatible with the lateral pipe (either lined or unlined) and the sewer pipe (either lined or unlined). The interface seal shall have structural properties in accordance with ASTM F1216. The interface seal shall meet the 50-year design life of the CIPP lateral liner.

2. The interface seal shall be a polyester impregnated, corrosion resistant fiberglass insert with an epoxy component. The seal shall be of one-piece construction and shall be designed such that when expanded shall tightly fit both Tee and Wye
connections at the interface between the main line and the lateral sewer. The seal shall extend into the mainline so as to provide a 3-inch “brim” and shall provide a minimum of eight-inch overlap inside the lateral pipe. An epoxy sealant rated for piping applications shall be applied to the interface seal to ensure that there is a watertight connection between the mainline pipe whether lined or unlined and the lateral pipe whether lined or unlined.

3. Where the OWNER has indicated the installation of 4-inch and 6-inch CIPP lateral liner with mainline/lateral connection interface seal up to 16 feet in depth, the connection, with a minimum 3-inch “brim” to create a watertight seal inside the main (lined or unlined), shall be either integrally manufactured to the lateral liner or achieved with the installation of an interface seal.

4. The integrally manufactured lateral liner and mainline connection shall be as manufactured by Insituform Technologies, Inc., 702 Spirit 40 Park Drive, Chesterfield, MO 63005, (800)234-2992, or approved equal. The interface seal connection shall be as manufactured by Cosmic Soudermasthenbau, Kasten, Austria, and distributed by A Merik Supplies, Inc., 2600 Ainsley Ct., Marietta, GA 30066, (770)924-2899, or approved equal.

2.05 TESTING REQUIREMENTS

A. Chemical Resistance - The CIPP shall meet the chemical resistance requirements of ASTM F1216, Appendix X2. CIPP samples for testing shall be of tube and resin system similar to that proposed for actual construction. It is required that CIPP samples with and without plastic coating meet these chemical testing requirements.

B. Hydraulic Capacity - Overall, the hydraulic profile shall be maintained as large as possible. The CIPP shall provide at least 100 percent of the flow capacity of the original pipe before rehabilitation. In lieu of actual measurements, calculated capacities may be derived using commonly accepted equations and values of the Manning flow coefficients (designated “n” coefficients). The original pipe material and condition at the time of reconstruction will determine the Manning coefficient used in the host pipe. A Manning coefficient of 0.009 for a jointless, relatively smooth-wall cured-in-place pipe will be used for the lateral CIPP flow calculation.

C. CIPP Field Samples - When requested by the OWNER, the CONTRACTOR shall submit test results from field installations in the USA of the same resin system and tube materials as proposed for the actual installation. These test results must verify that the CIPP physical properties specified herein have been achieved in previous field applications.

D. Prior to any liner installation, the CONTRACTOR shall submit technical data sheets showing the physical and chemical properties and infrared spectrum analysis per ASTM E1252 (chemical fingerprint) of the proposed resin system as modified for the cured-in-place process. Additionally, copies of the certificates of analysis for resin used on the project must be made available to the OWNER. The CONTRACTOR shall test each lot of resin used by conducting infrared spectrum analyses on field samples. These analyses shall be conducted at the CONTRACTOR’s expense.

E. The CONTRACTOR shall provide resin samples as directed by the OWNER during the duration of the project and infrared spectrography chemical fingerprints shall be run and
compared to the submitted fingerprint to verify the resin used is the resin submitted for use on this project. These analyses shall be conducted at the OWNER’s expense.

F. In the case of liner installation performed under this contract, CIPP samples shall be prepared and physical properties tested in accordance with ASTM F1216 or ASTM F1743, Section 8, using either method proposed.

1. The CONTRACTOR shall submit a method to the OWNER, for approval, to obtain representative samples from the installed liners. These samples will be tested by the OWNER, at the OWNER’s expense, to verify compliance with the installed material specifications. The CONTRACTOR shall produce these test samples when so directed by the OWNER. The OWNER reserves the right to request samples from as many as 10 percent of the liners installed, unless a pattern of failure occurs. In this case, the CONTRACTOR will be requested to provide a greater quantity of samples, up to 25 percent, at no additional cost, and the CONTRACTOR shall bear all costs of this additional testing. Liners which do not pass these material tests will be accepted at reduced payment or rejected pursuant to Section 01025.

2. The cost for sample collection shall be included in the bid price for rehabilitation.

3. Test specimens shall be marked in indelible ink with the appropriate lateral or main section, work order number, date of installation, and orientation to the top of the pipe (direction of up) so the results can be correlated to the field work performed. All test results shall use this designated labeling as a reference.

4. The extraction and labeling of test specimens shall be done in the presence of the OWNER. The OWNER and CONTRACTOR shall, upon completion of sample extraction and labeling, both sign a chain-of-custody form that shall subsequently accompany the sample at all times and shall ultimately be received and signed at the testing laboratory. Test reports shall include a copy of the chain-of-custody form with all signatures to ensure that reported test results are for the correct sample.

5. The flexural properties must meet or exceed the values specified herein.

6. Wall thickness of samples shall be determined as described in paragraph 8.1.6 of ASTM F1743.

7. Visual inspection of the CIPP shall be by closed-circuit television.

PART 3 - EXECUTION

3.01 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 Section 02751, "Cleaning and Root Removal".

3.02 SEWER REPAIRS

A. Any protruding pieces of concrete, dropped joints or broken pipe shall be subjected to point repairs so that the pipe is left in a clean smooth condition in all respects ready for lining,
unless otherwise jointly determined by the Contractor and the OWNER that the defect will not compromise the integrity of the liner.

B. If conditions such as broken pipe and major blockages are found that will prevent proper cleaning, or where additional damage would result if cleaning is attempted or continued, the CONTRACTOR, with the advance concurrence of the OWNER, shall perform the necessary point repair(s), and then complete the cleaning.

3.03 JOINT, CRACK, ANNULAR SPACE, AND LINER END CHEMICAL SEALING

A. Prior to cured-in-place liner installation, all active leaks of a magnitude to compromise the integrity of the liner shall be stopped using chemical grout, at no additional cost to the OWNER.

B. Materials used on this Project shall have the following properties: react quickly to form a permanent watertight seal; resultant seal shall be flexible and immune to the effects of wet/dry cycles; non-biodegradable and immune to the effects of acids, alkalis, and organics in sewage; component packaging and mixing compatible with field conditions and worker safety; extraneous sealant left inside pipe shall be readily removable; and shall be compatible with the CIPP liner resin system utilized. The chemical sealing materials shall be acrylic resin type and shall be furnished with activators, initiators, inhibitors and any other materials recommended by the manufacturer for a complete grout system. Sealing grout shall be furnished in liquid form in standard manufacturer's containers. Sealing grout shall be AV-100 manufactured by Avanti International, Houston, Texas (1-800-877-2570), or approved equal.

C. The Contractor shall modify his equipment as necessary to seal the leaks, however both his equipment and sealing method must meet the approval of the OWNER prior to use. Extreme caution shall be utilized during leak sealing (pressure) operations in order to avoid damaging the already weakened sewer pipe. If any damage occurs, it shall be repaired at the CONTRACTOR’s cost and to the satisfaction of the OWNER. Excessive pumping of grout which might plug a service lateral shall be avoided. Any service laterals blocked by the grouting operation shall be cleared immediately by the Contractor.

3.04 FLOW CONTROL

A. Flow control shall be exercised as required to ensure that no flowing sewage comes into contact with sections of the sewer under repair. See Section 02750, "Wastewater Flow Control" for additional information.

3.05 LINER INSTALLATION FOR MAIN LINES AND LATERALS

A. The pre-lining video of the prepared pipe shall be reviewed and be acceptable to the OWNER for cleanliness and smoothness before the CONTRACTOR begins to line the pipe.

B. The CONTRACTOR shall present to the OWNER, for review, a description of his methods for avoiding liner stoppage due to conflict and friction with such points as the manhole entrance and the bend into the pipe entrance. He shall also present plans for dealing with a liner stopped by snagging within the pipe. This information shall be rendered to the OWNER in a timely fashion prior to the preconstruction conference.
C. The CONTRACTOR shall immediately notify the OWNER of any construction delays taking place during the insertion operation. Such delays shall possibly require sampling and testing by an independent laboratory of portions of the cured liner at the OWNER's discretion. The cost of such test shall be born by the CONTRACTOR and no extra compensation will be allowed. Any failure of sample tests or a lack of immediate notification of delay shall be automatic cause for rejection of that part of the work at the OWNER's discretion.

D. The CONTRACTOR shall designate a location where the tube will be impregnated with resin prior to installation. The CONTRACTOR shall allow the OWNER and/or OWNER to inspect the materials and the "wet-out" procedure.

E. The CONTRACTOR shall submit construction schedules for advance approval by the OWNER. At no time will any service lateral remain inoperative for more than an eight (8) hour period. Any service that will be out of service for more than eight (8) hours will be temporarily by-passed into a mainline sanitary sewer, at the CONTRACTOR's expense.

F. The materials and processes must be reasonably available for pre-installation, installation and post-installation inspections. Areas which require inspection include, but are not limited to, the following:

1. Product materials should exhibit sufficient transparency to visually verify the quality of resin impregnation.

2. Temperature sensing devices, such as thermocouples, shall be located between the existing pipe and the CIPP to ensure the quality of the cure of the wall laminate.

3.06 LINER INSTALLATION FOR MAIN LINES

A. After the inversion is complete, the CONTRACTOR shall supply a suitable heat source and water recirculation equipment 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 to a level required to effectively cure the resin. The heat source shall be fitted with suitable monitors to gauge the temperature of the incoming and outgoing water supply. Another such gage shall be placed between the tube and the host pipe at the termination end at or near the bottom to determine the temperatures during cure. Water temperature in the pipe during the cure period shall be as recommended by the resin manufacturer.

B. Initial cure shall be deemed complete when the exposed portions of the tube appear to be hard and sound and the temperature sensor indicates that the temperature is of a magnitude to realize an exotherm. The cure period shall be of a duration recommended by the resin manufacturer and may require continuous recirculation of the water to maintain the temperature. The CONTRACTOR shall have on hand at all times, for use by his personnel and the OWNER, a digital thermometer or other means of accurately and quickly checking the temperature of exposed portions of the liner.

C. CIPP installation shall be in accordance with ASTM F1216, Section 7, or ASTM F1743, Section 6, with modifications as listed herein.

D. Resin Impregnation: 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. A vacuum
impregnation process shall be used. To insure thorough resin saturation throughout the length of the felt tube, 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, a vacuum point 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. A roller system shall be used to uniformly distribute the resin throughout the tube. If the Installer uses an alternate method of resin impregnation, the method must produce the same results. Any alternate resin impregnation method must be proven.

E. Tube Insertion: The wetout tube shall be positioned in the pipeline using either inversion or a pull-in method. If pulled into place, a power winch should be utilized and care should be exercised not to damage the tube as a result of pull-in friction. The tube should be pulled-in or inverted through an existing manhole or approved access point and fully extend to the next designated manhole or termination point.

F. Temperature gauges shall be placed inside the tube at the invert level of each end to monitor the temperatures during the cure cycle.

G. Curing shall be accomplished by utilizing hot water under hydrostatic pressure in accordance with the manufacturer’s recommended cure schedule.

H. Cooldown: The CONTRACTOR shall cool the hardened pipe to a temperature below 100 F before relieving the hydrostatic head. Cooldown may be accomplished by the introduction of cool water into the inversion standpipe to replace water being pumped out of the manhole. Care should be taken in release of static head so that vacuum will not be developed that could damage the newly installed liner.

I. Finish: The new pipe shall be cut off in the manhole at a suitable location. The finished product shall be continuous over the length of pipe reconstructed and be free from dry spots, delamination and lifts. Should the liner not make a tight seal at the inside manhole wall, a watertight seal shall be made by use of extra polyester fiber felt and epoxy resin. Pipe entries and exists shall be smooth, free of irregularities, and watertight. No visible leaks shall be present and the CONTRACTOR shall be responsible for grouting to remove leaks or fill voids between the host pipe and the liner. During the warranty period, any defects which will affect the integrity or strength of the product shall be repaired at the CONTRACTOR’s expense, in a manner mutually agreed upon by the OWNER and the CONTRACTOR.

3.07 REINSTATEMENT OF SERVICE LATERALS, BRANCH CONNECTIONS, AND DROP MANHOLE CONNECTIONS

A. After the pipe has been cured in place, the CONTRACTOR shall reconnect the existing service connections. This shall be done from the interior of the pipeline without excavation using a robotic cutter. Where holes are cut through the liner, they shall be neat and smooth in order to prevent blockage at the service connections. Cut-in service connections shall be opened to a minimum of 95 percent of the flow capacity of the building sewer. Cuts shall be wire-brushed to remove jagged edges. All coupons shall be recovered at the downstream manhole and removed. The CONTRACTOR shall stop all visible leaks, including at service connections as required. All reinstated service lateral connections (between the liner and the existing pipe) shall be grouted. The reinstatement of the service connections shall be a separate pay item.
B. It is the intent of these specifications that service laterals be reopened without excavation, utilizing a remote-controlled cutting device, monitored by a video TV camera. The Contractor shall certify he has a minimum of 2 complete working cutters plus spare key components on the site before each liner installation. No additional payment will be made for excavations for the purpose of reopening connections and the Contractor will be responsible for all costs and liability associated with such excavation and restoration work.

C. Unless otherwise directed by the OWNER, all laterals will be reinstated. The OWNER will provide specific direction concerning any laterals that will be abandoned and will therefore not require reinstatement. The CONTRACTOR shall abandon a lateral by not reinstating the lateral only with the written consent of the OWNER.

D. The language in this section applies equally to branch connections and drop manhole connections.

3.08 LINER INSTALLATION FOR SERVICE LATERALS

A. The lateral CIPP usually requires an access point to be established at the reconstruction termination point remote from the mainline pipe. The authorization for the access point and required location and excavation shall be obtained and performed by the OWNER of the system. The OWNER may install a clean-out, if required. The clean-out will be constructed of a polyvinyl chloride fitting or its equivalent with a riser pipe of equal diameter to the service pipe. The riser will be extended to the existing grade elevation and capped.

B. The lateral CIPP shall be installed to affect a bond with the mainline invert-and-cure pipe to substantially reduce or eliminate the infiltration into the mainline pipe. The mainline pipe opening shall be prepared to accept the lateral CIPP. The lateral CIPP will protrude into the mainline pipe and form a seal with the inside surface of the mainline invert-and-cure pipe surface. The bonding area of the lateral CIPP and the mainline invert-and-cure pipe shall be maximized to obtain the best possible bond. The protrusion shall not inhibit the closed-circuit television post video inspection of the mainline or service lateral pipes, inhibit flow, or encourage solids deposition.

3.09 ACCEPTANCE

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. No pinholes, cracks, thin spots, dry spots, or other defects in the liner will be permitted. There shall be no visible infiltration through the liner or from behind the liner at manholes and service connections. Cut-ins and attachments at service connections shall be neat and smooth.

B. Ridges or wrinkles in the installed liner shall be accepted or rejected at the sole discretion of the OWNER. If, in the opinion of the OWNER, such defects could cause structural weakening of the liner, impede the progress of a camera during internal television inspection, or encourage solids deposition and potential interruptions to flow, such defects shall be corrected at the CONTRACTOR’s expense in a manner acceptable to the OWNER.

3.10 WET-OUT AND CURE REPORT

A. The CONTRACTOR shall submit "wet out" and "cure" reports documenting the specific details of the liner’s vacuum impregnation and saturation with resin and the CIPP installation.
of the liner. A copy of all "wet out" and "cure" records shall be made available to the
OWNER upon request, and shall be turned over to the OWNER on a weekly basis and prior
to request for payment. If the "wet out" and "cure" reports are not presented prior to a
payment request for a repair work order, payment for the work will not be made and the
request will be rejected. At a minimum, this report shall include, in addition to
CONTRACTOR and Contract identification:

1. Line identification and location
2. Wet-out date
3. Sample identification(s) and technician
4. Installation (in sewer) date
5. Host sewer pipe inside diameter
6. Liner thickness
7. Liner length
8. Liner and resin batch numbers
9. Resin type
10. Wet out length
11. Quantity of resin and catalyst utilized
12. Wet out technicians
13. Time wet out started and completed
14. Applicable remarks
15. Boiler and liner heating fluid pressure and temperature versus time log during cure
   period
16. Cool down report

3.11 CLEANUP

A. After the liner installation has been completed and accepted, the CONTRACTOR shall
   cleanup the entire project area and return the ground cover to the original or better condition.
   All excess material and debris not incorporated into the permanent installation shall be
disposed of by the CONTRACTOR.

3.12 TELEVISION SURVEY

A. Television survey, including Post Construction Survey, and Warranty Survey, as indicated in
   Section 02752 "Television Survey", is required for all cured-in-place lining, including main
   lines and service laterals, and shall be completed within 2 weeks of liner installation.
3.13 PUBLIC NOTIFICATION

A. The Contractor shall make every effort to maintain service usage throughout the duration of the project. In the event that a service will be out of service, the maximum amount of time of no service shall be 8 hours for any property served by the sewer. A public notification program shall be implemented, and shall as a minimum, require the Contractor to be responsible for contacting each home or business connected to the sanitary sewer and informing them of the work to be conducted, and when the sewer will be off-line. The Contractor shall also provide the following:

1. Whether or not an interruption in service is expected, written notice to be delivered to each home or business the day prior to the beginning of work being conducted on the section, and a local telephone number of the Contractor the home or business can call to discuss the project or any problems which could arise.

2. Personal contact with any home or business which cannot be reconnected within the time stated in the written notice.

3.14 WARRANTY

A. The liner shall be certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for one year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the CONTRACTOR's expense in a manner mutually agreed by the OWNER and the CONTRACTOR.
PART 1 - GENERAL

1.01 SCOPE

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 one-piece leak free connection at the interface of the mainline and lateral pipelines.

1.02 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 “T” launching device. The “T” launching device and protective carrying device are winched into the existing sewer. When the “T” 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” as manufactured by LMK Enterprises, Inc., or approved equal.

1.03 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.

1.04 QUALIFICATIONS

A. The Qualifications of the CONTRACTOR shall be submitted prior to contract award. These Qualifications shall include detailed descriptions of the following:

1. Name, business address and telephone number of the CONTRACTOR.

2. Name(s) of all supervisory personnel to be directly involved with this project.

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

4. Specialty technicians shall be certified by the equipment manufacturer and/or its authorized representative. Certifications shall be submitted to the OWNER.

5. The CONTRACTOR shall provide his references of previous project lists going back two years including his customers’ names, addresses, and telephone numbers.
6. To be acceptable, a minimum of 400 T-Liner installations must be documented.

7. To be acceptable, the installer must have had a minimum of three (3) years active experience in the commercial installation of the product. For purposes of this requirement, “Installer” shall mean the corporation or business entity submitting the bid.

PART 2 - PRODUCTS

2.01 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.

2.02 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.

2.03 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 needle 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 with proper catalysts as designed for the specific application. The cured-in-place pipe shall provide a smooth bore interior. Each installation shall have a design report documenting the design criteria for a fully deteriorated pipe section, 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 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.

<table>
<thead>
<tr>
<th>Item</th>
<th>Test Value</th>
<th>Reference Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexural Strength</td>
<td>4,500 psi</td>
<td>ASTM D 790</td>
</tr>
<tr>
<td>Flexural Modulus</td>
<td>250,000 psi</td>
<td>ASTM D 790</td>
</tr>
</tbody>
</table>

2.04 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:
<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Design Safety Factor</strong></td>
<td>2.0</td>
</tr>
<tr>
<td><strong>Retention Factor for Long-Term Flexural Modulus to be used in Design</strong></td>
<td>50 %</td>
</tr>
<tr>
<td><strong>Ovality</strong></td>
<td>2 %</td>
</tr>
<tr>
<td><strong>Groundwater Depth = Pipe Depth (above invert)</strong></td>
<td>ft.</td>
</tr>
<tr>
<td><strong>Soil Depth (above crown)</strong></td>
<td>ft.</td>
</tr>
<tr>
<td><strong>Soil Modulus</strong></td>
<td>700 psi</td>
</tr>
<tr>
<td><strong>Soil Density</strong></td>
<td>120 pcf</td>
</tr>
<tr>
<td><strong>Live Load</strong></td>
<td>One H20 passing truck</td>
</tr>
<tr>
<td><strong>Design Condition</strong></td>
<td>Fully deteriorated</td>
</tr>
</tbody>
</table>

*B 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.*

B. The lining manufacturer shall submit to the OWNER 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. A safety factor of 2 shall be applied in the design calculation. The host pipe shall be considered fully 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 pipe shall not be considered as providing any structural support. Modulus of soil reaction shall be 700, 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.

PART 3 - EXECUTION

3.01 CLEANING SEWER LINES

A. Prior to any lining of a pipe so designated, it shall be the responsibility of the CONTRACTOR to remove internal deposits from the pipeline in accordance with Section 02751 - Preparatory Cleaning and Root Removal. Both mainline and lateral line shall be cleaned.

3.02 TELEVISION SURVEY

A. Television survey shall be performed in accordance with Section 02752 - Television Survey, including Preconstruction and Post Construction Surveys. Both main line and lateral line shall be televised.

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 tape and suitable log shall be kept and turned over to the OWNER.
3.03 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 02750 - Wastewater Flow Control.

Note: If the repair can be made in a few hours, bypass pumping may not be required. The placement carriage shall be equipped with a bypass section to allow flow once liner is pressed into place.

3.04 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 accepted in writing by the OWNER prior to the commencement of the work.

3.05 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 "T" 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 "T" 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 "T" 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 "T" 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 "T" 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.

3.06 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 T-liners installed. The cost for the test shall be included in the T-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 pair of test plugs 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 by use of the clean-out opening. The test plug will be placed not more than five inches inside of the cured in-place lateral liner at its upper most portion. The test plug shall be inflated and sealed against the upper most portion of the cured in-place lateral liner.

3. The pair of plugs 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 3 minutes and during this time the pressure shall not drop below 3.5 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-1216-93 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.

3.07 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.

3.08 WARRANTY

A. The liner shall be certified by the manufacturer for specified material properties for a particular job. The manufacturer warrants the liner to be free from defects in raw materials for one year from the date of acceptance. During the warranty period, any defects which affect the integrity or strength of the pipe shall be repaired at the CONTRACTOR’s expense in a manner mutually agreed by the OWNER and the CONTRACTOR.

- END OF SECTION –
SECTION 02959
SEWER MAIN AND LATERAL CONNECTION SEALING BY CHEMICAL GROUT

PART 1 - GENERAL

1.1 DESCRIPTION

A. Section includes requirements for rehabilitation of defective mainline joints, circumferential mainline cracks, other small mainline defects and defective lateral-mainline interfaces by application of chemical grout material.

1.2 DEFINITIONS

A. Mainline: Sewer Main.
B. Lateral: Service pipe from property line to mainline.
C. Lateral-Mainline Interface: Lateral connection to mainline.
D. Lateral-Mainline Interface Seal: Watertight seal between lateral and mainline.

1.3 QUALITY ASSURANCE

A. Follow ASTM F2304 and F2454-05.
B. Commercially Proven Products:

Minimum 5,000 mainline joints and 500 lateral-mainline interfaces successfully grouted and documented.

C. Personnel involved in sealing of joints and lateral connections: Certified by grout manufacturer they have successfully completed training in handling, mixing and application of grout for sanitary sewer line and joint and lateral connection sealing.

D. Third-Party Inspector: Minimum of 5 years of experience in Chemical grouting applications and have no financial or directorial link to grout manufacturer or Contractor.

E. ENGINEER may inspect and test grout at factory, before delivery to site, while in storage, or prior to use.

F. Internally CCTV inspect host pipe prior to grouting, during grouting and post-grouting.

1.4 SUBMITTALS

A. Submit following Section 01300.

1. Catalog data showing manufacturer’s clarifications and updates, ASTM references, material composition, specifications, and physical and chemical properties of grout.

2. Calculations of expected volumes of annular space between packer and pipe wall, to be used in calculating required gel times.

3. Manufacturer’s recommended procedures for handling, storing, mixing and injecting grout.
   a. Access manholes and site locations.
   b. Work dimensions.
   c. Size of working area.
   d. Impacted portions of existing sewer.
   e. Site access points.
   f. Wastewater Flow Control: Following Section 02750.

B. Submit the following:
   1. Grout manufacturer's certification that CONTRACTOR is approved installer of their system. Certificates of training in handling, mixing, and application of grout for sanitary sewer line and joint and lateral connection sealing for grout truck operator and at least one crewmember involved in sealing process.
   2. Third party lab test results for field installations of same grout system as proposed for actual installation.
      a. Test results must verify grout physical and chemical properties specified herein have been achieved in previous field applications.
   3. CCTV inspection reports and electronic downloads, before and following sewer joint sealing. Furnish original copies of CCTV inspections color DVDs to ENGINEER within 10 days.
   4. Documentation for Products and Installers: ENGINEER'S approval required before acceptance or injection of grout.
   5. Proof of grout manufacturer’s product liability insurance, if requested by ENGINEER.
   6. Pump calibration information.
   7. Field sealing records.
   8. Certification of accuracy and calibration of pressure sensing/monitoring equipment by independent testing firm within one month before use of equipment.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Protect, store, and handle grout or other material during transportation and delivery, while stored on-site, and during installation following manufacturer’s recommendations.
B. Grout Material found defective or damaged due to manufacture or shipment:
   1. Remove from Contract site and replace, following ENGINEER’S direction, at no cost to the OWNER.

PART 2 - PRODUCTS
2.1 MATERIALS
A. Grouting.
   1. Properties and Characteristics.
a. Will perform in presence of infiltrating water, during injection.
b. Packaged for field storage, handling requirements with minimum spillage and worker safety.

2. Cured grout:
   a. Submergible in water without degrading.
   b. Not biodegradable.
      1) Additives may be used to meet this requirement, without effecting long-term strength.
   c. Chemically stable and resistant to concentrations of acids, alkalis, and organic materials found in normal sewage.

3. Composition.

   a. Acrylamide gel:
      1) Minimum of 10 percent acrylamide base material by weight in total grout mix.
      2) Higher concentration percent of acrylamide base material (maximum 20%) may be used to increase strength or offset dilution during injection.
      3) Able to tolerate some dilution and react in moving water during injection. Approximately, 2 centipoise viscosity. Can be increased with additives.
      4) Constant viscosity during reaction period.
      5) Controlled reaction time from 10 seconds to 1 hour.
      6) Curing reaction producing a homogenous, chemically stable, non-biodegradable, firm, flexible gel.
      7) Able to prevent dehydration and increase-mix viscosity, density and gel strength by use of additives.
         a) Diatomaceous earth (Celite 209 or equal) can be added to concentration of five percent.
         b) Use of other additives following manufacturer’s recommendation and Engineer's approval.
      8) Root control additive 2, 6-Dichlorobenzonitrile, may be added following manufacturer’s recommendation and ENGINEER’S direction.

   b. Urethane gel:
      1) Ratio: One-part urethane prepolymer mixed with 5 to 10 parts water by volume.
         a) Recommended mix ratio: One-part urethane prepolymer to 8 parts of water (11 percent prepolymer).
      2) Liquid prepolymer:
         a) Solids content: 77 to 83 percent.
         b) Specific Gravity: 1.04 (8.65 pounds per gallon)
         c) Flash Point: 20 degrees F.
         d) Viscosity: 600 to 1,200 centipoises water at 70 degrees F.
      3) Water for reacting prepolymer: pH of 6.5 to 8.
      4) Curing reaction:
         a) Produces chemically stable, non-biodegradable, tough, flexible gel.
         b) Able to increase mix viscosity, density, gel strength and resistance to shrinkage by using additives in water component of grout.
         c) Minimum 15 percent shrink control agent supplied by the same manufacturer.

   c. Acrylate gel:
      1) Minimum 10 percent acrylate base material by weight or as specified by the
manufacturer.

a) In total grout mix, a higher concentration (percent) of acrylate base material may be used to increase strength or offset dilution during injection.

b) If acrylate base material is in 40 percent solution 27.5 percent by weight of total grout mix: 11 percent base material.

2) Able to tolerate some dilution and react in moving water during injection.

3) Viscosity: Approximately 2 centipoises.

a) Can be increased with additives.

4) Constant viscosity during reaction period.

5) Controlled reaction time: 10 seconds to 1 hour.

6) Curing reaction producing homogeneous, chemically stable, non-biodegradable, flexible gel.

7) Able to prevent dehydration and to increase-mix viscosity, density and gel strength by use of additives.

a) Diatomaceous earth (Celite 209 or equal) can be added to concentration of five percent, by volume.

b) Use of other additives following manufacturer’s recommendations and ENGINEER’S approval.

8) Root control additive 2, 6-Dichlorobenzonitrile, may be added following manufacturer’s recommendation and ENGINEER’S direction.

2.2 **EQUIPMENT**

A. General.

1. CCTV system, necessary chemical grout containers, pumps, regulators, valves, hoses, joint sealing packers for various sizes of sewer pipes, and lateral bladders.

2. Air pressure monitoring system:

   a. Configured with no valves on air line between measuring point and pressure sensing device.
   
   b. Digital readouts located at control panel in grouting truck.

B. Grouting packer:

1. Diameter less than pipe size, with cables attached at each end to pull it through the line.

2. Designed to allow restricted amount of sewage to flow through device, in mainlines where sewage flows do not exceed maximum depth for joint testing/sealing following manufacturer’s recommendation and following ASTM F2304 and ASTM F2454-05.

3. Approved Manufacturers:

   a. Logiball, Inc.
   
   b. Cues, Inc.
   
   c. Or Equal.
PART 3 - EXECUTION

3.1 PREPARATION

A. Access.
   2. Chemical grout sealing of lateral-mainline connections: Through mainline sewers.

B. Sewer Cleaning and Surface Preparation.
   1. Cleaning of Main Line Sewers and Laterals.
      a. Hydraulic high-pressure jetting of reaches is permitted.
      b. Before sealing work, lightly clean each line section.
      c. Remove sludge, dirt, sand, grease, root, and other materials from pipe and collect and remove resulting debris from downstream manhole of sewer section being cleaned.
      d. Collect debris and remove from site. Following jurisdictional requirements and ENGINEER'S approval.
      e. Sewers damaged as result of improper use of cleaning equipment: Promptly repaired at no additional cost to the OWNER.
      f. Clean sewer main within 72 hours before chemical grouting of sewer lateral connections.

C. Pre-sealing CCTV Inspection.
   1. After cleaning, perform CCTV inspection to ensure main is sufficiently clean to perform sealing operations. Document protruding taps and structural defects found during the CCTV inspection.
      a. If ENGINEER finds main is not sufficiently cleaned, remove CCTV and sealing equipment and re-clean at no additional cost to the OWNER.

D. Pre-sealing Reaming.
   1. Ream or trim protruding taps.

E. Structural Defects.
   1. Repair defects that would interfere with sealing operation to ENGINEER'S acceptance prior to grout injection.
   2. If possible, perform a reverse set up for sealing operation from opposite manhole instead of performing a point repair.

F. Bypass Pumping: Before pre-sealing CCTV inspection, and joint testing and sealing can be performed, depth of flow should be at or below levels shown in table.
   1. If necessary, bypass pump to bring flow levels down to acceptable levels.
<table>
<thead>
<tr>
<th>Pipe Diameter (inches)</th>
<th>Maximum Depth of Flow</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 to 10</td>
<td>20</td>
</tr>
<tr>
<td>12 to 24</td>
<td>25</td>
</tr>
<tr>
<td>27 or greater</td>
<td>30</td>
</tr>
</tbody>
</table>

3.2 TESTING

A. Performance Test Demonstrations.

1. Before start of work, verify accuracy and repeatability of void pressure meter and fluid pumping equipment.

2. If test demonstrations fail to show accuracy of +/-0.5 psi for void pressure repeatability and +/- 0.1 gallon of chemical pumped into measured container or bucket, make required repairs or adjustments to equipment and gauges and retest until results meet ENGINEER’S satisfaction.

3. Test may be required at commencement of each work shift during sealing operations.

B. Mainline Joint Pressure Air Testing.

1. Before testing, perform control tests at ground surface to verify accuracy, integrity, and reliability of testing equipment following ASTM F2304.

2. After entering each pipe segment through manhole, and immediately before joint pressure air testing, perform an intermediate test on pipe between joints following ASTM F2454-05.

3. Maintain joint testing air pressure of 3 psi higher than groundwater pressure outside the pipe, up to maximum of 10 psi. If groundwater pressure data is not available, use joint testing pressure of 0.5 psi per vertical foot of pipe depth or 10 psi, whichever is greater.

4. Perform testing following ASTM F2304. Seal joints that do not maintain void pressure drop of less than 1 psi in 15 seconds.

C. Lateral Connection Pressure Air Testing.

1. Before lateral connection testing, perform control tests at ground surface to verify accuracy, integrity and reliability of testing equipment following ASTM F2454-05.

2. Maintain joint testing air pressure of 3 psi higher than groundwater pressure outside the pipe, up to maximum 6 psi. If groundwater pressure data is not available, use joint testing pressure of 0.5 psi per vertical foot of pipe depth or 6 psi whichever is greater.

3. Perform lateral connection testing following ASTM F2454-05. Seal joints that do not maintain void pressure with pressure drop of less than 2 psi in 15 seconds.

3.3 BASIC REQUIREMENTS

A. General.
1. Seal joints, defects or leaking lateral connections that failed air testing or show sign of visible leaks, by internal chemical methods, as directed by ENGINEER.

2. After sealing of joint, defect or connection, perform post air test per ASTM F2304 or ASTM F2454-05 for mainline sewer sealing and lateral sealing, respectively.

3. Sewer that ENGINEER deems damaged as a result of CONTRACTOR’S operations, will be promptly repaired to ENGINEER’S satisfaction at no cost to the OWNER.

4. Grouting materials that set to a hard, rigid product capable of intrusion into sewer lines are not acceptable unless specifically approved by ENGINEER on a case by case basis.

5. Provide qualified, independent third-party inspector to observe grouting mixing process, chemical grouting injections process and post grouting pressure testing. Report findings to ENGINEER.

B. Application Procedures for Joint Sealing and Lateral Connection Sealing.

1. Force chemical grouting material into or through faulty joints, defects or lateral connection by system of pumps, hoses, and sealing packers.
   a. Position packer over faulty joint or lateral connection by means of measuring device and CCTV camera in line.
   b. For mainline sewers, expand packer end bladders using controlled pressure. For lateral connections use lateral packer equipped with lateral bladder and rotating mechanism.
      1) Obtain a tight seal. If a tight seal is not obtained, remove equipment and make adjustments.
      2) Pump grout material through hose system at controlled pressures high enough to overcome external pressures such as groundwater pressures.

2. Design pumping unit, metering equipment, and packer devices so proportions and quantities of materials can be regulated following type and size of leak being sealed.

3. Set chemical pumping rates and mixing ratios as specified herein, following manufacturer’s recommendations and ENGINEER’S adjustments.

4. Determine appropriate gel set times.
   a. To estimate gel set times, divide estimated volume of annular space (in gallons) by grout pumping rate (in gallons per minute), then add between 15 to 25 seconds. Adjust estimate by taking into account temperature of grout tanks, temperature of hoses, temperature of groundwater, amount of groundwater present and other field conditions.
   b. The gel set time is typically between 20 and 40 seconds. Gel set times of less than 20 seconds may be required in presence of high filtration.
   c. Monitor induction periods and gel characteristics through daily gel time tests for each sealing vehicle. Check each new batch once. If only one batch is used, check at least twice per day.
   d. Perform new gel time test when grout additives are modified to change gel times, at beginning of new setup with new starting manhole, or when temperature in tanks and hoses changes by more than 10 degrees F from previous gel time test.
e. Use water with known and controlled pH that will be used during actual grouting operations.
f. Allow grout mixture to settle to remove entrained oxygen, before testing gel time.
g. Use plastic or stainless-steel tanks. Do not use tanks that contain iron or copper.

5. During seal operations, operate void pressure monitoring equipment, described herein.

6. Integrate CCTV, grout pumping, and air pressure monitoring equipment so proportions, quantities, and void pressure for materials and sealing can be instantly monitored and regulated following type and size of joint, break, or leak.

7. Amount of chemical being pumped: Based on number of pumped strokes delivered for each sealed sewer main joint, defect or leaking connection.
   a. Record and provide results to ENGINEER.

8. If large voids are encountered on outside of sewer, including the possibility of "piping" holes to ground surface, which could cause excessive use of grout material, at ENGINEER'S direction change operating pressures and pumping rates as follows.
   a. Reduce pressures and pumping rates, such that intervals between pump strokes are shorter than gel time.
   b. Pump first stage of grout, and then stop pumping until temporary gel of the grout is obtained on outside of pipe.
   c. Increase pressure and pumping rate to pump the second stage and form a second layer.
   d. Repeat this cycle until refusal conditions are reached, or until the inspector judges the grout consumption to be excessive.
   e. Avoid sealing inner surface of pipe from inside before building up layers on the outside.

9. Grout injection complete: When chemical grout is pumped to refusal as defined in ASTM F2304.
   a. If chemical grout cannot be pumped to refusal, within a volume less than or equal to 0.5 gallons per inch of pipe diameter due to latent physical conditions, do not perform additional work until ENGINEER grants authorization.
   b. Lateral connections: When back pressure of grout in void at mainline level drops from 8 psi to 6 psi in greater than 20 seconds after cessation of grout pumping, following ASTM F2454-05.
      1) If using stage grouting, grout injection is complete when refusal pressure of 8 psi is achieved.

10. Sealed Defects.
    a. Remove excess grout gel ring if obtrusive and impedes air testing and CCTV inspection of work as required. If excess grout gel ring cannot be removed by use of packer, jet clean pipe prior to testing seal.
    b. Air test each sealed joint.
       1) If defect or connection fails air test after grout injection, reseal failed joints and air test again.
       2) After lateral connection has been sealed successfully as confirmed by post
air test, break lateral packer seal and test service to assure grout has not blocked lateral connection further upstream.
c. In the event sewage back-up occurs and enters a dwelling, respond within 2 hours of being notified and be responsible for cleanup, repair, property damage costs and claims. After all pipe joints and lateral connections have been grouted, retest all previously unsealed pipe joints and lateral connections. Seal any pipe joints and lateral connections that do not pass the air pressure test.

11. Flush or push forward excess grouting material to next downstream manhole, and remove from sewer system.
   a. Dispose of debris following grout manufacturer’s recommendation, and jurisdictional regulations.
   b. Excess grout material from upstream section(s) will not be allowed to accumulate in sewer.

12. Provide approved plug and/or by-pass pumping if grouting operations restrict or prevent simultaneous sewage flow passage.
   a. Manage Sanitary Sewer Overflow PER Section 02750 - Wastewater Flow Control.

C. Joint, Defect or Lateral Connection Sealing Verification.

1. Mainline joints and defects.
   a. Deflate packer bladders after completing each seal until zero void pressure (±0.5 psi) is shown on the monitoring equipment.
   b. If zero void pressure (±0.5 psi) is not achieved, clear residual grout material from packer or make needed equipment adjustments allowing true pressure reading.

2. Re-test joint, defect or lateral connection as described herein.
   a. Re-seal joints, defects, or connections that do not meet specified test criteria and re-test until test criteria are met, or ENGINEER determines that joint defect, or lateral connection cannot be sufficiently sealed.
   b. Additional testing and sealing will be at no additional cost to the OWNER.

D. Residual Sealing Material.

1. Leave no residual grout material capable of reducing pipe diameter or restricting flow greater than 5 percent pipe capacity.

E. Obstructions.

1. During course of sealing operations obstructions may be encountered preventing travel of packer and camera.
   a. Should obstruction not be passable, begin sealing operations from opposite end of sewer reach.

2. If additional obstructions are encountered after re-employment and no means are available for passing obstructions without damage to equipment, remaining sections of sewer main not sealed may be temporarily excluded from work requirements of
Contract, until point repair is completed.

3.4 FIELD DOCUMENTATION

A. Records.

1. CONTRACTOR to keep complete, accurate, and legible records of operation for each joint, defect or connection sealed.

   a. Include on Record of Operation for each joint or lateral mainline interface tested and/or routed or attempted to be grouted:
      1) Identification of work site, complete component, and address.
      2) Date and time.
      3) Station of each seal measured from upstream manhole.
      4) Location of any joints not tested and reason for not testing.
      5) Grout mixture formation, including additives and catalyst mixture.
      6) Test pressures and durations of tests maintained for each joint passing the air test.
      7) Ambient outside air temperature at time of grout injection.
      8) Grout tank temperatures.
      9) Gel time and time last verified.
     10) Verified address of lateral.
     11) Estimated visible leakage (GPM) from joint/defect connection or lateral.
     12) Number of pump strokes and amount of grout in place.
     13) Beginning, ending, pressure losses, re-test pressures.
     14) Verification lateral is clear after sealing process.
     15) Remaining leakage and location after seal (GPM).

2. Work site will not be accepted until ENGINEER receives original record.

   a. Failure to fill out logs completely will result in non-payment for the questioned mainline joint, defect or connection.

3.5 WARRANTY

A. Provide twelve-month performance and workmanship warranty for the seals from date of acceptance of the OWNER.

B. Perform CCTV inspections during the first wet weather season after initial sealing, to evaluate quality of the initial sealing.

C. CCTV inspect initial retest area consisting of 10 percent of grouted joints and 10 percent of grouted lateral connections.

D. Provide qualified, independent third-party inspector to review CCTV inspection videos to verify integrity of seals.

E. Reseal all joints sealed under this Contract that inspector finds defective within warranty period, at no additional cost to the OWNER.

   1. Defective seals include, but not limited to those with root penetration, signs of infiltration, and cracks in pipe or grouting material.

F. If failure rate of retested joints and lateral connections is 5 percent or less of joints and
lateral connections retested, work shall be considered satisfactory and no further retesting will be required. If the failure rate of retested joints and lateral connections is greater than 5 percent, the ENGINEER shall randomly select another retest area consisting of another 10 percent of the initially sealed joints and lateral connections. Continue this additional retesting and resealing until a failure rate of less than 5 percent is met.

3.6 ACCEPTANCE

A. When sealed joint, defect, and lateral connections pass the post air test.

PART 4 - MEASUREMENT AND PAYMENT

4.1 TEST AND SEAL MAINLINE JOINT OR DEFECT

A. Measurement: By each joint or defect sealed and air tested includes up to two gallons of grout per joint or defect.

B. Payment: At unit price for each size listed in Bid Schedule.

1. Payment includes plugging or by-pass pumping, traffic control, CCTV inspections, pre-sealing cleaning, reaming intruding taps, removal of extraneous materials from sewer main, labor and equipment necessary to seal joints, defects, and post sealing air test.

4.2 TEST AND SEAL LATERAL CONNECTION

A. Measurement: By each lateral connection sealed and air tested, which includes up to two gallons of grout per joint or defect.

B. Payment: At unit price for each size listed in Bid Schedule.

1. Payment includes plugging or by-pass pumping, traffic control, CCTV inspections, pre-sealing cleaning, removal of extraneous materials from sewer main and lateral, labor and equipment necessary to seal connection, post sealing air test, and test to ensure that lateral is clear.

4.3 SEALING MATERIAL

A. Measurement: By gallon of grout used, over initial two gallons per joint or lateral connection.

B. Payment: At unit price listed in Bid Schedule.

1. Payment includes materials, additives, storage, calculations, mixing, testing for in-place percentage and gel time tests.

4.4 RETESTING SEALED JOINTS UNDER WARRANTY

A. Measurement: By unit price for each required item of work. Payment: At contingent price listed in Bid Schedule.

1. Payment includes work related to retesting of sealed joints including cleaning, CCTV inspection, and air testing in the initial retest area only.
a. No compensation will be provided for resealing joint that fails air testing or any additional testing beyond initial retest area.

END OF SECTION